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ABSTRACT

Women's schooling attainment in India continues to lag considerably behind that of men. This paper uses nationally representative district-level data from the 2007–8 District Level Household and Facility Survey (DLHS-3), Indicus Analytics, and the 2011–12 Indian Human Development Survey-II (IHDS-II) to examine the role of socioeconomic and cultural factors in influencing gender differentials in schooling. The results provide quantitative evidence of the role of different economic and sociocultural factors on gender disparities in education. The empirical results show that economic development is an important factor in narrowing gender gaps in education, with wealthier districts more likely to educate girls than poorer districts. However, the norm of patrilocal exogamy, where wives migrate to co-reside with their husband's kin, is associated with worse outcomes for women's schooling relative to men's schooling; and, in keeping with anthropological research, gender-differentiated inequities in education are more pronounced in Northern India.

KEYWORDS

Education, gender differences, economics of the family

JEL Codes: O1, J16

INTRODUCTION

Despite rapid economic growth over the last two decades, India's progress with respect to achieving gender equality is slow. The United Nation's Gender Inequality Index ranks India 132 out of 187 countries, making it, with the exception of Afghanistan, the worst place for women in South Asia (United Nations Development Programme [UNDP] 2013). Estimates from the World Bank (1980, 2012) presented in Table 1 show that Bangladesh and Nepal – countries that are both poorer than India – have better literacy rates for girls, despite being behind in 1980. Furthermore, the deficit in women's literacy is particularly striking when compared to other East Asian countries, where women's literacy is now more or less universal.

Table 1 Literacy rates in selected Asian countries

	Adult literacy rate (% of literate persons in the age group of 15 years and above)			*Girls literacy rate (% of literate women in the age group of 15–24 years)*	
	1960	*1980*[a]	*2010*[b]	*1980*[a]	*2010*[b]
South Asia					
India	28	41	63	40	74
Bangladesh	22	29	57	27	78
Nepal	9	21	60	15	78
Pakistan	15	26	55	24	61
East Asia					
China	n/a	65	94	82	99
Indonesia	39	67	93	82	99
Malaysia	53	70	93	87	98
Vietnam	n/a	84	93	94	96

Notes: [a] 1981 for Bangladesh, India, Nepal, Pakistan; 1979 for Vietnam; 1982 for China.
[b] 2006 for India; 2009 for Indonesia and Pakistan; 2008 for Philippines.
Sources: *World Development Report 1980*, Table 23, for 1960 data (World Bank 1980); *World Development Indicators* (online, January 1, 2013) for other years (World Bank 2012).

There is extensive evidence that the schooling of young women plays an important role in demographic advancement, with higher literacy rates linked to lower mortality and fertility rates (Malhotra, Vanneman, and Kishor 1995; Murthi, Guio, and Drèze 1995; Drèze and Murthi 2001). Furthermore, there is empirical support for the proposition that gender inequality in education contributes to slower economic growth in developing countries (Dollar and Gatti 1999; Klasen 2002; Knowles, Lorgelly, and Owen 2002; Thévenon et al. 2012). The capability to read and write directly enhances the quality of life, promotes fundamental human freedoms, and is a worthy objective in its own right (Nussbaum 2000).

Gender inequality is influenced by a myriad of factors – economic, social, and cultural – that are all important in shaping the role of girls and women in society and determining the scope of educational and economic opportunities available to them. The economics of education literature cites two main explanations for the gender gap in education. The first explanation attributes the gap to labor market discrimination: if employers value women's education less than that of men's education, then economic incentives to educate girls are lower (Kingdon 1998). The second explanation relates to kinship norms in India, which often dictate that a daughter will leave the household after marriage (patrilocal exogamy). Therefore, any returns to the investment in daughters' education are reaped, in many instances, by the in-laws' household. As a result, an

asymmetry arises in parental incentives to educate sons and daughters, which leads to a lower investment in girls' education relative to boys'.

In this paper, we use nationally representative district-level data from India to examine the links between gender inequality in education, kinship norms, and economic development. More specifically, we investigate if there is any evidence of the North–South dichotomy indicated by the anthropological literature, and the extent to which gender differentials are mitigated by economic development. Previous work in this area has used data prior to the deregulation of India's economy (Sundaram and Vanneman 2008), or has been limited to analyses of single Indian states (Kingdon 2010). To our knowledge, ours is the first study on gender differentials in educational outcomes using nationally representative district-level data in the post-liberalization period.

Our study differs from Aparna Sundaram and Reeve Vanneman's 2008 study in several respects. First, their main focus is on the links between women's labor force participation and gender gaps in education. Although we touch on the role of women's labor force participation in influencing gender gaps in education, our focus is mainly on the role of social norms in influencing women's education outcomes. Second, we use more direct questions on social norms than are used in their study. Finally, their analyses are based on census data from 1991, whereas our datasets (based on household surveys) are from 2007–8 and 2011–12, respectively. However, we show that despite a gap of over two decades and incorporating the post-liberalization period, social norms in India continue to be strongly associated with women's education attainment. Moreover, like Sundaram and Vanneman, we also find greater women's labor force participation to be associated with lower gender equality.

BACKGROUND AND LITERATURE REVIEW

In the Indian context, kinship norms relating to marriage, property ownership, and inheritance have been found to play an important role in influencing a range of gendered outcomes (Dumont and Pocock 1957; Karve 1965; Dyson and Moore 1983; Sen 2001; Chakraborty and Kim 2010). The importance of kinship norms is particularly pronounced in developing agrarian societies where, for the great majority of people, kin relationships "still constitute the prime avenue of access to scarce social resources such as information, economic assistance and political support" (Dyson and Moore 1983: 46). An extensive literature from India has examined the role of kinship norms on demographics, linking certain kinship practices with higher infant mortality, larger gender bias in infant mortality, lower sex ratios, and higher fertility rates (Kishor 1993; Malhotra, Vanneman, and Kishor 1995; Chakraborty and Kim 2010).

More recently, studies by Geeta Gandhi Kingdon (2010), Anu Rammohan and Peter E. Robertson (2012), Uma S. Kambhampati (2009), Uma S. Kambhampati and Raji Rajan (2008), and Sundaram and Vanneman (2008) have also examined the connection between particular kinship practices and gender differentials in education, finding the marriage norm of patrilocal exogamy to be associated with greater gender inequality in educational attainment. The term "patrilocal exogamy" describes the marriage pattern whereby the couple resides with the husband's family ("patrilocal"), with "exogamy" indicating marriage outside a specific social unit. It is argued that patrilocal exogamy reduces parental incentives to invest in the health and education of daughters relative to sons because daughters are expected to leave the natal household upon marriage (Dyson and Moore 1983; Kishor 1993; Rammohan and Robertson 2011). For parents in many developing countries, children represent the primary source of financial support in old age, and the practice of exogamy reduces the financial linkages between parents and their daughters. The outcome is a strong asymmetry in parental incentives to invest in their sons and daughters (Kingdon 2010), and as a consequence scarce household resources are directed disproportionately toward boys.

Tim Dyson and Mick Moore's (1983) important study examines the relationship between kinship structures, female autonomy, and demographic performance in India. They argue that differences in kinship systems in North and South India are the primary cause of the marked differences between the two regions in child mortality and fertility measures. The "North–South Indian divide" (or the "North–West and South–East Indian divide") is rooted in long-standing sociocultural differences between these two regions and is routinely accounted for in country-wide studies of India (Kishor 1993; Murthi, Guio, and Drèze 1995; Drèze and Murthi 2001). Northern India is characterized as having kinship structures that disadvantage women. This is reflected in the relatively high fertility rates, high gender bias in child mortality, and low sex ratios in northern India, compared to the South. In North India, marriage norms dictate that a married couple should inhabit the household or place of residence of the groom's kin upon marriage, and also that those two individuals should be unrelated in kinship relations (Dyson and Moore 1983; Basu 1998).

South India, by contrast, is characterized by having kinship structures that promote greater gender equality, contributing to higher levels of women's autonomy and favorable demographic performance compared to the North. Marriages are typically endogamous, allowing intra-kin marriage, and in many cases encouraging unions between cross-cousins (Basu 1992). Marriages generally take place within a village and between persons and families who have known each other since childhood. Since families of

a married couple typically have preexisting relationships, marriage does not cause any major or immediate rearrangement of social relationships. Therefore, as married women in South India tend to remain close to their natal kin, they are able to provide financial support and informal caregiving to aging parents. The financial ties between a daughter and her parents, then, are not weakened by distance or by altered living arrangements, as they are in the North. Although such a broad regional dichotomy overlooks some variation in sociocultural characteristics within regions, dividing the country along these lines according to shared kinship practices provides a meaningful and useful framework with which to analyze and explain the patterns of gender inequality observed across the country.

In the economics literature, North India is consistently found to have worse outcomes for girls than South India in under-5 child mortality, sex ratios, fertility rates, and under-age marriage (Kishor 1993; Malhotra, Vanneman, and Kishor 1995; Murthi, Guio, and Drèze 1995; Chakraborty and Kim 2010). Consistent with Dyson and Moore's (1983) division of India into two broad demographic regimes, South India had considerable and statistically significant lower levels of disadvantage in mortality, child mortality, and fertility for women compared to North India. Sundaram and Vanneman's (2008) study finds a robust and positive relationship between patrilocal exogamy and gender gaps in education, even after taking into account differences in economic development and women's labor force participation. Additionally, they find that girls are less likely to be literate compared to boys in areas with high rates of women's labor force participation. This is supported by Kingdon (2010), who finds that girls receive greatly different treatment in the intrahousehold allocation of education.

The alternative explanation argues that greater opportunities for women to participate in income-generating activities leads to an associated increase in the returns to investment in female education, implying a positive association between rates of women's work participation and education outcomes. Intriguingly, the effect of rising wealth on gender disparities depends on what outcome is under examination, and this reflects the multidimensionality of gender stratification (Mason 1986; Sen 2001). While some gender inequalities, such as education gaps, appear to narrow with increasing wealth, others appear to persist in spite of greater resources (Forsythe, Korzeniewicz, and Durrant 2000). Empirical work in India, however, finds the opposite result: areas with a higher proportion of women's labor force participation are actually less likely to have more educated women relative to men (Kingdon 2010; Sundaram and Vanneman 2008). A number of explanations have been given for this seemingly unexpected result.

The first is that districts with high rates of women's labor force participation in India are more likely to be poorer regions, where

uneducated women take part in low-skilled work out of necessity (Murthi, Guio, and Drèze 1995; Sundaram and Vanneman 2008). In this context, higher rates of women's employment in India may reflect economic hardship faced by unschooled, low-skilled workers, rather than greater economic opportunities and incentives for education. Another important consideration is caste norms, which influence patterns of women's work. An important symbol of social status for high-caste households is for women belonging to such families to take little or no part in any outdoor activities, including work, which results in a sharp decline in the participation of women working outside the home as wealth and status increase (Chen 1995).

Cross-country data show that women's labor force participation follows a U-shaped relationship with per capita income (Elborgh-Woytek et al. 2013). At lower levels of income, higher women's employment reflects the necessity to work due to an absence of social protection programs. However, as household income and social protection increases, women can withdraw from the labor market and focus on household work and childcare. In economically advanced countries, the trend reverses, and women's labor force participation increases as a result of better education, lower fertility rates, and increased access to labor-saving household technology (World Bank 2011; Duflo 2012).

DATA AND ECONOMETRIC STRATEGY

District Level Household Survey 2007–8 (DLHS-3)

The datasets used in the district-level analysis are from the 2007–8 District Level Household and Facility Survey (DLHS-3; International Institute for Population Sciences [IIPS] 2010) and Indicus Analytics (2011). The DLHS-3 is a nationally representative survey of Indian households conducted by IIPS, Mumbai, India. It covers 589,783 households across 585 districts in India. The analysis includes information on households' socioeconomic, health, and demographic characteristics. Nine states were excluded due to inadequate information.[1] The remaining states are representative of 98.9 percent of the total population. In the analysis, gender gaps in education are examined at the district level, the administrative division of an Indian state or territory. Individual household responses are aggregated from the household level to get district-level averages for the variables of interest.

Data for gross domestic product (GDP) per capita in 2007–8 by district is taken from Indicus Analytics and merged with the aggregated DLHS-3 data. The GDP per capita figures from Indicus Analytics are available for all but nineteen districts covered by the DLHS-3 data. These districts were

removed, and the analysis that follows is based on a sample of 486 districts for which we have information on all our variables of interest.

Indian Human Development Survey-II 2011–12 (IHDS-II)

We complement the district-level analyses using household-level data from the recently released Indian Human Development Survey-II 2011–12 (IHDS II; Desai, Vanneman, and National Council of Applied Economic Research, New Delhi 2015). The IHDS is a collaborative research program between researchers from the National Council of Applied Economic Research, New Delhi, and the University of Maryland. Designed primarily to document changes in Indian households' daily lives during an era of rapid transformation, this nationally representative multitopic survey was administered to households in 1,503 villages and 971 urban neighborhoods across India. Our sample consists of 33,093 ever-married women for whom detailed information is available on their household's socioeconomic, demographic, and labor market characteristics.

The IHDS-II has some advantages over the DLHS-3 data for the study of the influence of patrilocal exogamy on gender differences in education. In particular, the survey contains some specific questions that allow us to identify the social norms around marriage and gender roles in the respondent's village. These are discussed in further detail below.

We note that a drawback of the IHDS-II dataset is that it is restricted to sixty districts, making it difficult to observe district-level variations in educational achievements between men and women. For that reason, we present empirical estimates from both datasets.

Dependent variables

Gender gaps in education

For both surveys, the dependent variables are drawn from the "ever-married women's" questionnaire, which was administered to women in the childbearing age group of 15–49 years. In the DLHS-3 for each household, the woman respondent was asked if she or her husband had ever attended school. These household-level responses were aggregated at the district level to obtain a measure of the proportion of women and men who had ever attended school in each district. Accordingly, we define two dependent variables: (i) a simple measure of the proportion of women ever schooled by district, labeled *FemEdu*; and (ii) a measure of the district-level gender gap in education, defined as $GenderGap = MaleEdu - FemEdu$, where *GenderGap* is the gap in education between men and women, *MaleEdu* is the proportion of men ever schooled in a given district, and *FemEdu* is the corresponding number for women. Positive values point to gender

inequality in schooling, with a greater proportion of men educated relative to women.

The summary statistics show that women's education outcomes lag considerably behind that of men in India (see Table 1). Nationally, the education gap is 21.36 percent, with the proportion of men ever schooled at 75.03 percent compared to 53.67 percent for women. The unit of analysis is the district, but in Table 2 we also present descriptive statistics at the state level for key variables. From Table 2, we observe that, with the exception of Kerala, there is a clear bias toward men in educational attainment in all Indian states. The gender gap is the largest in the northern state of Rajasthan at 36.89 percent, with only 33.20 percent of women ever attending school compared to 70.09 percent of men.[2] In Uttar Pradesh – the most populous state in India, containing 16.49 percent of the total population – only 39.97 percent of women are reported to have ever been schooled, compared to 73.4 percent of men. With a population of 199,581,477 recorded in the 2011 Indian Census (Government of India 2011), this amounts to almost 60 million women in this state alone who have never been educated.

Robustness tests

To test the robustness of our results, we use data from the IHDS-II to study the links between patrilocal exogamy and women's education attainment. Our corresponding measures of women's education in the IHDS-II include gender gap in years of schooling (estimated using ordinary least squares [OLS]) and women's years of completed education. For explanatory variables, we include a similar set of variables in the IHDS-II analyses as is used in the DLHS-3. In particular, the literature has already identified the important role of women's labor market returns in influencing women's education investments (Kingdon 1998, 2007). The centrality of marriage in traditional Indian communities also indicates that better-educated women may be more valued for their higher earning potential as well as their improved ability of getting a better marital match. For these reasons, among our explanatory variables in the IHDS-II analyses, we include variables relating to women's labor market participation, husband's education level (in models where we present OLS estimates of women's education), and the source of income of the respondent's marital household.

The IHDS-II contains more refined measures of women's educational attainment. Each respondent is asked about her educational attainment in terms of the number of years of education that she has completed, as well as her highest level of education. Descriptive statistics for the variables used in the IHDS-II are presented in Table 3. In general, levels of educational attainment are low in our sample. According to Table 3, there

Table 2 State-level averages of variables used in the analysis, 2008

	Woman schooled	*Husband schooled*	*Gender gap*	*Log of GDP*	*Urbanization*	*Female work*	*Exogamy*	*Sex ratio*	*Scheduled caste*	*Scheduled tribe*
North										
Jammu and Kashmir	44.64	74.95	30.31	3.23	17.43	27.67	12.54	902	8.94	21.40
Himachal Pradesh	75.08	90.90	15.83	3.92	7.47	19.37	14.31	886	24.44	13.79
Haryana	58.66	82.41	23.75	4.06	25.70	13.34	21.24	829	22.57	0.35
Punjab	69.80	80.48	10.68	3.95	29.28	5.09	13.79	837	35.34	0.31
Uttarakhand	63.79	88.74	23.92	3.38	17.07	12.82	12.40	918	21.08	2.39
Rajasthan	33.20	70.09	36.88	3.20	19.96	15.16	21.50	881	16.86	16.15
Uttar Pradesh	39.97	73.41	33.44	2.77	18.34	9.94	20.82	922	19.63	1.44
East										
Bihar	35.55	65.33	29.78	2.31	9.42	15.46	23.75	950	20.24	2.23
Assam	66.83	76.71	9.88	3.11	12.87	3.58	13.26	886.64	13.20	27.49
West Bengal	60.87	71.27	10.40	3.34	17.53	8.66	27.70	954	34.89	9.24
Jharkhand	41.64	70.47	28.83	2.85	18.68	25.55	16.57	978	11.04	37.76
Orissa	52.87	71.38	18.51	3.13	13.15	14.34	16.08	912	19.99	28.44
Chhattisgarh	43.71	69.49	25.78	3.23	16.28	46.13	25.02	976	12.12	39.69
West										
Gujarat	57.34	79.29	21.95	3.76	28.45	9.70	18.71	909	12.94	22.61
Maharashtra	68.81	82.93	14.12	3.43	26.22	26.56	24.87	895	15.42	18.60
South										
Andhra Pradesh	46.08	59.38	13.30	3.60	22.44	17.07	24.74	957	23.23	10.83
Karnataka	58.77	69.10	10.34	3.41	27.47	13.71	24.94	941	18.17	8.93
Goa	85.21	92.53	7.32	4.68	52.73	3.70	8.57	926	5.33	11.59
Kerala	96.79	97.57	0.78	3.83	23.22	3.74	14.86	947	10.03	2.02
Tamil Nadu	72.79	82.03	9.24	3.55	38.83	9.38	19.81	941	24.45	1.65
Puducherry	85.32	91.05	5.73	4.15	58.04	3.14	10.23	904	25.73	0.22
All India	53.67	75.03	21.31	3.23	21.19	14.52	20.45	912	18.99	13.16

Sources: See Table 1.

Table 3 Variable definitions and summary statistics, 2008

Variable	*Definition*	*Mean*	*Std Dev.*
FemEdu	Proportion of women ever schooled (%)	53.67	19.74
MaleEdu	Proportion of men ever schooled (%)	75.03	12.08
GenderGap	Gender gap in education (%)	21.31	11.38
Log of GDP per capita	Log of gross domestic product per capita (Rs. '000)	3.23	0.60
Urbanization	Proportion of the population living in urban areas (%)	21.19	15.06
Women's labor force participation	Proportion of women participating in paid work in the last 12 months (%)	14.52	0.13
Patrilocal exogamy	Proportion of daughters alive, but no longer living with their natal district (%)	20.44	0.06
Sex ratio at birth	Number of girls born to every 1,000 boys born	912	102
Scheduled castes	Proportion of Scheduled-caste persons in the population (%)	19.00	0.09
Scheduled tribes	Proportion of Scheduled-tribe persons in the population (%)	13.16	0.19
South	Dummy variable, with value 1 for districts in Andhra Pradesh, Karnataka, Goa, Kerala, Tamil Nadu, and Puducherry	0.18	0.39
East	Dummy variable, with value 1 for districts in Bihar, Assam, West Bengal, Jharkhand, Orissa, and Chhattisgarh	0.28	0.45
West	Dummy variable, with value 1 for districts in Gujarat and Maharashtra	0.11	0.31

Sources: 2007–8 Indicus Analytics (2011) for GDP per capita; and DLHS-3 2007–8 (IIPS 2010) for all other variables.

is a 1.89-year gender gap in years of education between the respondent and her husband. In terms of educational attainment, approximately 37 percent of the respondents in our sample have no schooling. Among the respondents with some schooling, 23 percent have completed primary schooling, and only 12.7 percent have levels of education equivalent to higher secondary or above.

Explanatory variables

Our key explanatory variables relate to economic factors, women's labor force participation, patterns of kinship norms, and social stratification. For the DLHS-3, we use two variables to capture district-level economic development: urbanization (measured as the number of persons living in an urban area as a proportion of the total district population) and district's

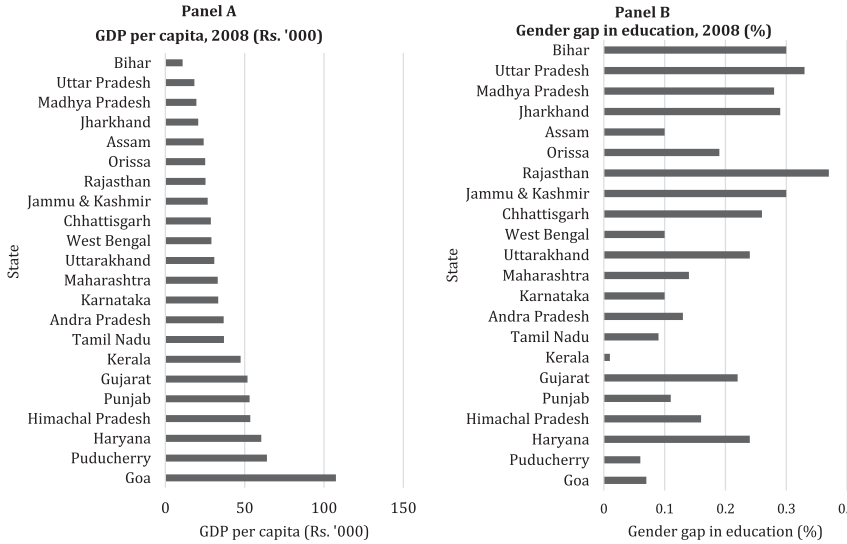

Figure 1 GDP per capita and gender gaps in education by state, 2008.
Sources: Authors' calculation based on data from 2007–8 Indicus Analytics (2011) for GDP per capita; and DLHS-3 2007–8 (IIPS 2010) for gender gap in education.

GDP per capita. In our sample, 21.2 percent live in urban areas – varying from no urban population in the districts of Baksa and Chirang, to 86.1 percent urban population in Bangalore, Karnataka. The second measure of economic development we use is the district-level log of GDP per capita. Here, rather than relying on proxies for income levels, such as poverty indexes or housing quality indexes (as used in previous studies such as Bhattacharya [2006]; Sundaram and Vanneman [2008]), we use a more direct and accurate measure of economic development at the district level. Figure 1 shows the relationship between GDP per capita and gender gaps in education by state. Panel A in Figure 1 ranks Indian states from lowest to highest in terms of GDP per capita, and in Panel B, gender gaps in education are displayed in the same order. From Figure 1, we observe that states with lower levels of economic development tend also to be the ones with higher gender disparities in education outcomes. In terms of GDP per capita, expressed in,000 Indian Rupees (not in logs), the richest Indian states are Goa, with a GDP per capita of 107.50; Haryana, with 60.47; and Himachal Pradesh and Punjab, with around 53. The poorest states are Bihar and Uttar Pradesh, which have a GDP per capita of 10.89 and 18.29, respectively.

The IHDS-II contains data on household per capita income and the respondent's employment status (whether the respondent works, and if so whether she works part time or full time). Kingdon (1998)

has attributed differential educational investments in girls and boys to differential labor market returns to girls and boys. Measures of women's labor force participation are sensitive to the precise definition of what exactly constitutes "work." Interviewees in the DLHS-3 were specifically asked if they had taken up jobs for which they had been paid in cash or kind, sold goods, or worked in a small business, family business, or small farm. Although this definition of work does not include unpaid household work, it is appropriate for our purposes because we are interested in the relationship between income-earning opportunities for women and investment in women's education. According to the data, 14.5 percent of women across India participated in such work in the past twelve months, ranging from below 1 percent in districts in Jammu to over 60 percent in districts in Chhattisgarh. From Table 3, we observe that 51 percent of the respondents in the IHDS-II dataset did not work, with approximately 34 percent working part time and only 15 percent working full time.

As previously discussed, we expect areas with a higher incidence of patrilocal exogamy to also exhibit larger gender gaps in educational outcomes. Since the DLHS-3 provides no direct measure of exogamy, it is approximated using data on women's migration (the district average of the number of daughters who are alive but are no longer living in their natal district). Women's migration is typically for marriage purposes, and is particularly high in West Bengal, where 27.70 percent of women have left their natal districts, and Chhattisgarh, where the figure is 25.02 percent. In the southern states of Goa and Puducherry, where marriage norms tend to be endogamous, the proportion of women who have migrated from their natal districts is much lower at 8.57 and 10.23 percent, respectively.

To account for potential son preference, we use the sex ratio at birth, which is calculated as the number of girls born for every 1,000 boys. The average sex ratio at birth in India is 912.26 girls for every 1,000 boys, ranging from 977.92 in Jharkhand to 829.25 in Haryana. Surprisingly, the lowest sex ratios are found in the wealthiest states. The Indian states of Haryana and Punjab, for example, which rank among the richest states in India, record the worst sex ratios in India at 829.25 and 837.23 girls per 1,000 boys, respectively. These states also account for the largest increases in sex-selective abortions, due to greater access and affordability of sonograms (Sen 2001; Arnold, Kishor, and Roy 2002).[3]

As noted previously, the IHDS-II data contain three specific questions in the women's questionnaire that allow us to identify the marriage norms followed in the respondent's community as well as the respondent's own attitude toward her girl children. These are:

(1) Typically in your community (*jati*) for a family like yours: Is it permissible to marry a girl in her natal village?

(2) Would you consider being financially supported by your daughter?
(3) Do any members of your natal family live close enough for you to visit them and come back the same day?

Each response is coded as 1 = yes and 0 = no, and respondents who answer yes to these questions are assumed to not follow patrilocal exogamy norms. Questions (1) and (2) reflect the attitudes in the respondent's communities and the respondent's own attitudes toward financial support from children, respectively. Since the woman respondent's natal household made the education investment decision, for our empirical estimates we use Question (3), which is a direct measure of patrilocal exogamy. From the descriptive statistics presented in Table 4, we observe that 57 percent of the respondents live close to their natal households, and 54 percent live in communities where it is permissible to marry daughters in their natal village. Yet, only 28.6 percent would consider being supported by their daughters in their old age.

The Pearson correlation matrix reported in Table 5 indicates that all three norms considered in this paper are statistically significant with the expected sign. In particular, there is a statistically significant and positive relationship between proximity to natal household and women's years of education, and between the variable "consider being supported by daughter in old age" and years of schooling.

We stratify the sample into whether the respondent had the same level of education as her husband (that is, no gender gap), more schooling than her husband (gender gap favoring women), or whether the husband has more schooling than the wife (gender gap). It is interesting to note that just over half the sample (51 percent) has less schooling than their husbands, 29 percent has the same level of schooling as their husbands, and around 20 percent has more schooling than their husbands. In the sample of 16,780 respondents whose husbands are better educated than them, we note that 66 percent live in rural areas, and 43 percent live in the Northern states. It is also noteworthy that in the group of women who fall in the no gender gap category, 57 percent have no education.

We include a number of control variables in the analysis to account for the role of class, caste, ethnic, and religious stratification. Scheduled castes (SCs) and scheduled tribes (STs) are two groups that are recognized by the Constitution of India as historically disadvantaged people. For these groups, gendered outcomes in education may differ from other populations due to their unique socioeconomic characteristics. Although SCs and STs tend to be relatively poorer than other populations in India (and hence the *total* proportion of school enrollments are comparatively lower), they may have better schooling outcomes for girls *relative* to boys – that is, more equal gender outcomes. The reason for this is that SCs and

Table 4 Description of variables used in household-level analysis

Variable	*Mean*	*Std. Dev.*
Education variables		
Women's years of schooling	1.45	1.40
No education	0.37	0.48
Primary	0.16	0.37
Completed primary	0.23	0.42
Completed matriculation	0.11	0.31
Higher secondary or graduate	0.13	0.33
Gender gap in years of schooling	1.80	4.09
Explanatory variables		
Log of household income	9.74	1.00
Muslim religion	0.12	0.32
Other religion	0.06	0.24
Reference category: Hindu religion	0.82	0.38
Other backward caste (OBC)	0.40	0.49
Scheduled caste (SC) or scheduled tribe (ST)	0.30	0.46
Other caste	0.25	0.43
Reference category: Brahmin caste	0.05	0.22
East	0.21	0.41
West	0.14	0.35
South	0.21	0.41
Reference category: North	0.43	0.50
Natal family live close enough to visit, return same day	0.57	0.49
Marry daughter natal village	0.54	0.50
Consider being financially supported by daughter in old age	0.29	0.45
Husband's education is below primary	0.17	0.38
Husband's education is completed primary	0.28	0.45
Husband's education is completed matriculation	0.15	0.36
Husband's education is higher secondary or graduate	0.19	0.40
Reference category: Husband has no education	0.21	0.41
Main income source is agricultural labor	0.10	0.30
Main income source is non-agricultural labor	0.23	0.42
Main income source is salaried	0.20	0.40
Main income source is other	0.21	0.41
Reference category: Main income source is cultivation	0.26	0.44
Respondent is employed part time	0.34	0.47
Respondent is employed full time	0.15	0.36
Reference category: Respondent is not working	0.51	0.50
Observations	33,072	

Note: Mean proportions (%) are reported for binary variables.
Source: IHDS-II 2011–12 (Desai, Vanneman, and National Council of Applied Economic Research, New Delhi 2015).

Table 5 Pearson correlation matrix

	Marry daughter natal village	*Consider being financially supported by daughter in old age*	*Women's years of schooling*
Marry daughter natal village	1.000		
Consider being financially supported by daughter in old age	− 0.024***	1.000	
Female years of schooling	0.0823***	0.013*	1.000

Note: ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

STs exist outside the strict Hindu codes of purity and patriarchy, and consequently, they have different social arrangements that may actually be less restrictive on women's mobility and lead to more equal gender outcomes (Srinivas 1980; Béteille 1986). SCs and STs comprise 19 percent and 13.2 percent of the sample population, respectively. We also consider religious stratification by taking into account the district's majority religion.

We use regional dummy variables to capture differences in economic and sociocultural characteristics that are not explicitly accounted for but may influence household human capital decisions (such as inheritance rules, dowry practices, property rights, education policy, education infrastructure, and teacher absenteeism). Following other empirical studies of India (Malhotra, Vanneman, and Kishor 1995; Murthi, Guio, and Drèze 1995; Drèze and Murthi 2001; Bhattacharya 2006), we divide the sample into four distinct regions: North, South, East, and West.[4] In the North, for example, the gender gap in education is 25.95 percent, compared to 9.12 percent in the South. The North appears also to have greater gender bias in terms of sex ratios at birth where, for every 1,000 male births, there are only 873.86 female children, compared to 944.52 in the South.

Econometric methodology

In order to study gender gaps in education, using DHLS data, we estimate a OLS regressions for two dependent variables: the district-level gender gap in education (*GenderGap*), and the district-level proportion of women ever schooled (*FemEdu*).

The two equations are represented as

$$GenderGap = \alpha + \beta q + \mu \tag{1}$$

$$FemEdu = b + \gamma X + \varepsilon \tag{2}$$

where in Equations 1 and 2, respectively, β and γ represent the vector of coefficients, q and X the vector of explanatory variables, α and b are the scalar constant, and μ and ε are the normally distributed error term.

For the household-level analysis using IHDS-II data, we similarly estimate OLS regressions for gender gap in education between the respondent and her husband and years of schooling. We have attempted to use the same set of explanatory variables for both analyses. We note that due to the cross-sectional nature of the dataset, no causal inferences can be drawn.

ESTIMATION RESULTS

In Tables 6 and 7 we present estimates for gender gap and schooling at the district level (DLHS-3) and for household survey data (IHDS-II), respectively.

The key results of our empirical analysis can be summarized as follows: (i) districts with higher GDP per capita are associated with lower gender differentials in education, and respondents from households with higher incomes have better educational outcomes; (ii) patrilocal exogamy is negatively associated with educational outcomes for women; (iii) areas with women's higher labor force participation have *higher* gender gaps in education, and respondent's labor force participation (both part time and full time) is negatively correlated with years of education; and (iv) districts with a higher proportion of SC, ST, and Sikh populations are more likely to have more equitable education outcomes for women. These results are discussed in further detail below.

Role of economic factors

Our estimation results using DHLS data show that GDP per capita has a negative and statistically significant association with gender gaps in education, indicating that households in wealthier districts are more likely to have better-educated women compared to those in poorer districts. Specifically, from Table 6 (column 1), GDP per capita is statistically significant and negatively associated with gender inequality in education and positively associated with women's schooling (column 2). From Table 7, we observe that household income is positively associated with years of schooling for women. However, according to Table 7, this variable is not statistically significant in explaining gender differences in education.

Two possible explanations are discussed. The first is the "queuing effect," in which the gap between men's and women's education begins to narrow only after boys have reached a certain threshold level of educational attainment. The reasoning is that while boys are given priority over girls in education, once most household boys are educated, girls reach the front of the "queue" to receive education, and the gender gaps narrows. The

Table 6 OLS district-level results

Variables	*Gender gap in education (%) [1]*	*Women ever schooled (%) [2]*
Log of GDP per capita	− 0.059***	0.048***
	(0.008)	(0.008)
Urbanization (%)	− 0.011	0.010
	(0.027)	(0.026)
Husband ever schooled (%)	–	1.168***
		(0.034)
Women work participation (%)	0.135***	− 0.120***
	(0.029)	(0.029)
Patrilocal exogamy (%)	0.151**	− 0.064
	(0.064)	(0.065)
Sex ratio at birth	0.00002	0.000002
	(0.00003)	(0.00003)
Scheduled caste (SC; %)	− 0.130***	0.144***
	(0.047)	(0.046)
Scheduled tribe (ST; %)	− 0.051**	0.087***
	(0.022)	(0.023)
Muslim	− 0.052***	0.058***
	(0.019)	(0.019)
Sikh	− 0.098***	0.110***
	(0.021)	(0.021)
Other religion	0.027	− 0.050
	(0.043)	(0.042)
South	− 0.178***	0.182***
	(0.010)	(0.010)
East	− 0.102***	0.104***
	(0.009)	(0.008)
West	− 0.107***	0.096***
	(0.012)	(0.012)
Constant	0.447***	− 0.582***
	(0.042)	(0.049)
Observations	486	486

Notes: ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors are in parentheses.
Source: DLHS-3 2007–8 (IIPS 2010).

implication is that wealthier areas, which generally have more resources and higher schooling rates, also tend to have greater gender equity in schooling.

We test the queuing effect hypothesis plotting the relationship between boys' schooling and gender bias in education (see Figure 2). We observe that the relationship between gender bias in education and boys' education

Table 7 Gender gap in years of education – household level

Variables	*Gender gap in years of education [1]*	*Women's years of schooling [2]*
Log of household income	0.000	0.119***
	(0.025)	(0.006)
Religion: Muslim	− 0.289***	− 0.202***
	(0.073)	(0.019)
Religion: Others	− 0.915***	0.261***
	(0.094)	(0.024)
Caste: Other backward caste (OBC)	0.210**	− 0.309***
	(0.107)	(0.027)
Caste: Scheduled caste (SC) or scheduled tribe (ST)	0.197*	− 0.423***
	(0.110)	(0.028)
Caste: Other	− 0.271**	− 0.072***
	(0.110)	(0.028)
East	− 1.090***	0.259***
	(0.059)	(0.015)***
West	− 0.753***	0.313***
	(0.069)	(0.018)
South	− 1.856***	0.512***
	(0.060)	(0.015)
Natal family live close enough to visit, return same day	− 0.153***	
	(0.045)	0.058***
		(0.011)
Husband's education: Below primary		0.402***
		(0.018)
Husband's education: Completed primary		0.909***
		(0.017)
Husband's education: Completed matric		1.350***
		(0.020)
Husband's education: Higher secondary and above		2.100***
		(0.020)
Main income source: Agricultural labor	− 0.795***	− 0.080***
	(0.085)***	(0.022)
Main income source: Nonagricultural labor	− 0.701***	0.010
	(0.065)***	(0.017)
Main income source: Salaried	0.160**	0.221***
	(0.072)	(0.019)
Main income source: Other	− 0.488***	0.271***
	(0.068)	(0.017)
Respondent's employment: Part time	0.451***	− 0.332***
	(0.053)	(0.014)
Respondent's employment: Full time	0.170***	− 0.177***
	(0.066)	(0.017)

(*Continued*).

Table 7 Continued.

Variables	*Gender gap in years of education [1]*	*Women's years of schooling [2]*
Constant	2.767***	− 0.558***
	(0.265)	(0.068)
Observations	33,072	

Notes: ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors are in parentheses.
Source: IHDS-II (2011–12; Desai, Vanneman, and National Council of Applied Economic Research, New Delhi 2015).

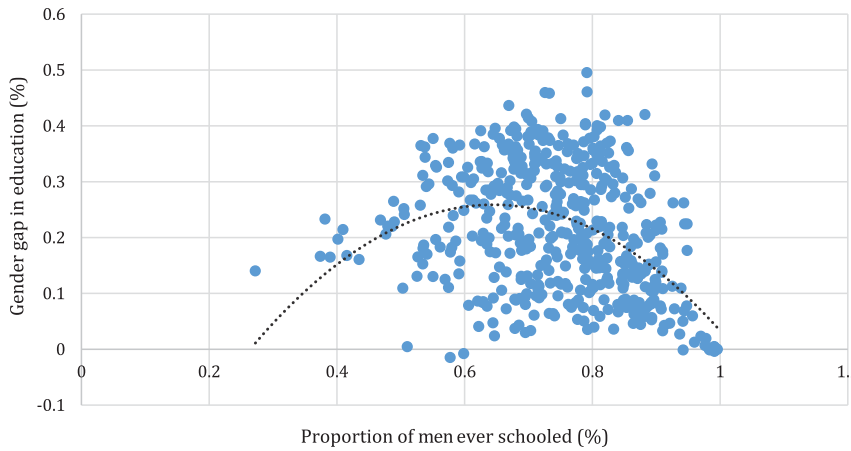

Figure 2 Gender gap in education and the "queuing effect," 2008.
Sources: Authors' calculation based on data from 2007–8 Indicus Analytics (2011).

follows a weak upside-down U-shaped relationship: increasing initially as boys at the head of the queue are educated, and then decreasing thereafter as girls move to the head of the queue. By estimating the quadratic curve of best-fit, the inflection point can be calculated as the point where the gender gap begins to narrow. In Figure 2, the gender bias in education begins to decline after the proportion of educated boys reaches 65 percent.

The queuing effect for gender gaps in literacy, by contrast, is found to be much stronger. Sundaram and Vanneman's (2008) study finds that the gender gap in literacy begins to decline only when boys' literacy levels have reached 93 percent, compared to 65 percent in terms of school enrollment as calculated in this study. This is consistent with research at the International Monetary Fund (Elborgh-Woytek et al. 2013), which finds that while gender gaps in education enrollment are beginning to narrow,

the gender gap in terms of literacy rates continues to be large in many developing countries.

Role of kinship norms

Our results show that patrilocal exogamy is strongly associated with poor educational outcomes for women, after controlling for all other characteristics. OLS estimations using IHDS-II data in Table 7 show that the relative proximity of the marital home to the natal home is statistically significant and negatively associated with gender gaps in education (Table 7, column 1), and positively associated with women's schooling (Table 7, column 2). Note that this is in line with the findings from the DLHS-3 results in Table 6, where the coefficient measured patrilocal exogamy.

These results accord with findings from the anthropological literature and other empirical research of gender inequality in India, which link exogamous marriage norms with larger gender disparities in demographic and education outcomes (Dyson and Moore 1983; Sundaram and Vanneman 2008; Chakraborty and Kim 2010; Rammohan and Robertson 2012). According to Table 6, the variable patrilocal exogamy is statistically significant and positively associated with greater gaps in education. However, the variable sex ratio at birth, which is used as an indicator of son preference, is statistically insignificant. This may be because Indian law prohibits sex selection, and the relatively higher girl infant and neonatal rates may indicate neglect of girl children.

Women's labor force participation

Intriguingly, the results from Table 6 show that districts with higher rates of women's labor force participation are associated with *wider* gender gaps in education, and the effect is statistically significant. In other words, according to Table 6, districts with women's high labor force participation rates are associated with larger disparities between men and women in education. This finding is supported in household-level data (Table 7), where we find that relative to a respondent who does not work, working either part time or full time is significantly and negatively associated with women's schooling and positively associated with greater gender gaps in schooling. Although these results may seem surprising, they are in keeping with previous research from India (Sundaram and Vanneman 2008; Kingdon 2010; Klasen and Pieters 2015). The results are also in line with aggregate trends observed in India, where according to the ILO's Global Employment Trends 2013 report, India's women's labor force participation rate declined over a five-year period from just over 37 percent in 2004–5 to 29 percent in 2009–10 (ILO 2013). More

recently, Klasen and Pieters (2015) also find evidence of a U-shaped relationship between women's labor force participation and education using nationally representative data from urban India. They find that there is stagnation in women's labor force participation in urban India, and underlying this is a combination of rising participation among women with low education and a decline in participation rates among highly educated women. This trend may be attributed to several factors including cultural norms around women in the workplace, women's greater enrollment in secondary schooling and above, and measurement issues with regard to how labor market participation is measured (Hirway and Jose 2011; Verick 2014).

Another possibility is that women of higher caste are less likely to work in order to maintain household status, leading to a systematic decline in women's employment outside the home as wealth and status increase (Chen 1995). Since women from wealthier households are still more likely to be educated but less likely to work, narrower gender gaps are associated with lower proportions of women working outside the home. In other words, higher income levels can lead to more opportunities for women's schooling, but in many cases *fewer opportunities* for them to utilize that education in gainful employment outside the home. This effect reinforces the first explanation and accounts for the positive and statistically significant association between women's labor force participation and gender disparities in education.

Social stratification and regional factors

In terms of regional factors, we observe that relative to Northern India, there is a negative and statistically significant association between living in the eastern, western, and southern Indian states and gender gaps in education, in both datasets. In particular, respondents from southern India have significantly higher gender equality in education outcomes compared to those from the North, even after controlling for the role of other economic and sociocultural variables. This is consistent with anthropological and demographic studies from India, which find greater gender inequalities in the North–West region compared to the South–East region (Dyson and Moore 1983; Basu 1992; Murthi, Guio, and Drèze 1995). Significant regional effects after controlling for pertinent variables (economic development, marriage norms, women's employment, and social stratification) suggest that other factors, which have not been explicitly accounted for in the analysis, may be important in explaining gender gaps. These factors might include variations in the quality of education, with high rates of teacher absenteeism observed in Indian schools, especially in poorer areas; kinship norms related to dowry practices or inheritance rules, which are not taken into account in this analysis;

variations in the coverage and accessibility of schools across districts, with greater traveling distance often raising parental concern over the safety of children (particularly girls); and in general, any differences in state or district policies that influence the affordability, safety, and accessibility of education. These findings are also echoed in years of women's schooling estimates.

Finally, the influence of social groups (SCs and STs) is unclear. While district-level data shows that higher proportions of SCs and STs are in general associated with lower gender bias in education, the household survey data show the opposite influence.

CONCLUSION

This paper uses nationally representative data from the 2007–8 DLHS-3, Indicus Analytics, and the IHDS-II 2011–12 to examine the role of economic and sociocultural factors in influencing women's educational attainment. Gender disparities in education are socially and economically inefficient, and closing the gap remains a central issue in public policy in India, with important implications for equality, demographic progress, and economic advancement.

Our results provide empirical evidence of the role of social norms in influencing women's education outcomes. In particular, we find strong evidence that patrilocal exogamy, where wives migrate to co-reside with their husband's kin, is associated with negative educational outcomes for women. This finding is consistent across different datasets and definitions of patrilocal exogamy, and accords with anthropological research and empirical studies of kinship norms in the Indian subcontinent, which link exogamous marriage norms in North India with more acute gender inequality in demographic outcomes such as child mortality and sex ratios. However, we acknowledge that causal inferences cannot be drawn from our study, since our research is based on cross-section data. Nonetheless, our finding that district-level gender differences in education between men and women are associated with social norms on patrilocal exogamy is important.

As with Sundaram and Vanneman (2008), our study also finds that greater female labor force participation is associated with poorer education outcomes for women. Here the implication for public policy is not entirely clear, as programs aimed at encouraging female work may inadvertently lower the likelihood that women will be educated, by increasing the opportunity cost of enrolling (and remaining) in school. This effect would be particularly strong in poorer districts, where the necessity to work for a living already underpins high rates of female work.

Finally, our analyses show that districts with higher GDP per capita are associated with lower gender differentials in education, and respondents from households with higher incomes have better educational outcomes.

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NOTES

[1] These were Sikkim, Arunachal, Manipur, Mizoram, Tripura, Daman and Diu, Dadra and Nagar Haveli, and Lakshadweep.

[2] In one Rajasthani district, Dausa, the gap between men's and women's education rates is 49.53 percent.

[3] We note that Dubey and Verschoor (2007) show that poverty is associated with better, not worse, sex ratios in India and argue that the adverse sex ratios are mainly to do with women's greater postnatal mortality.

[4] North is defined as all districts in the states of Jammu and Kashmir, Haryana, Punjab, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Madhya Pradesh, and Rajasthan. West is comprised of districts in the states of Gujarat and Maharashtra. South includes districts in Andhra Pradesh, Karnataka, Goa, Kerala, Tamil Nadu, and Puducherry. And finally, East includes districts in the states of Bihar, Assam, West Bengal, Jharkhand, Orissa, and Chhattisgarh.

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