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WOMEN'S LOW EMPLOYMENT RATES IN INDIA: CULTURAL AND STRUCTURAL EXPLANATIONS

Esha Chatterjee
Indian Institute of Technology Kanpur
eshachat@iitk.ac.in

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Reeve Vanneman
University of Maryland College Park
reeve@umd.edu

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WOMEN'S LOW EMPLOYMENT RATES IN INDIA: CULTURAL AND STRUCTURAL EXPLANATIONS

Esha Chatterjee[1],

and

Reeve Vanneman[2]

[1] Assistant Professor, Department of Humanities and Social Sciences, Indian Institute of Technology (IIT), Kanpur, India

[2] Professor, Department of Sociology, University of Maryland – College Park, USA

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Abstract

It has long been known that Indian women's labor force participation rates have a U-shape relationship with their education, rather than a more conventional positive linear relationship. The low rates of employment for moderately educated women are usually explained either as a result of the cultural stigma of women's employment in a patriarchal society or because of the lack of demand from white-collar and light manufacturing jobs for women with middle levels of education. Using especially well suited data from two waves of the India Human Development Survey, we test these explanations by examining the education – employment relationship in districts with low cultural stigma (low observance of purdah) and high proportions of (salaried) employment considered "suitable" for women. We find little support for either the cultural or structural explanations: the education-employment relationship remains U-shaped in districts with low stigma or with more "suitable" salaried employment. Instead, we suggest a better explanation lies in the high levels of gender segregation where most white-collar jobs are reserved for men. We simulate what the education – employment relationship would look like if these white-collar occupations were female dominated as they are in most places in the world and find a more conventional linear relationship.

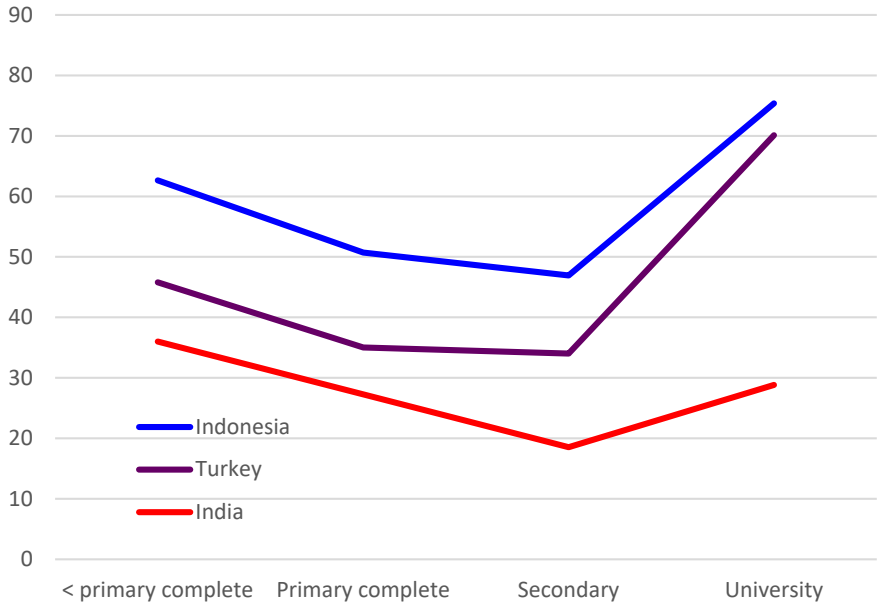
Keywords: Women's Employment, India, Education, Occupational sex-segregation

The generally J-shaped or U-shaped relationship of Indian women's education with their labor force participation has been widely recognized by most past research (Reddy 1979; Sathar and Desai 2000; Das and Desai 2003; Das 2006; Abraham 2013; Chatterjee, Murgai, and Rama 2015; Das et al. 2015; Klasen and Pieters 2015; Andres et al. 2017;Ghai 2018; Klasen 2019). Nevertheless, few studies have had much success in explaining it. In fact, most often, plausible explanations are only suggested without being tested empirically. Instead, most research attention has focused on the overall low and even declining rates of female labor force participation. While this is an obvious concern, it seems to have displaced much research interest in the education – employment relationship. This neglect is unfortunate since the rapid expansion of girls' education in India has pushed recent cohorts of women into the lowest parts of the education – employment curve, and thus should be part of the explanation of the low labor force participation rates (Afridi et al.2018 for rural India).

The weak interest in the education – employment curve is especially surprising since the downward sloping part of the curve is so counter-theoretical. Increases in women's education should usually lead to a rise in women's labor force participation rate: more education makes women more productive so their potential earnings rise, creating a greater incentive to join the labor force and substitute employment for leisure or home labor. This idea of a linear relationship is so fixed in social science that research continues to suggest that women's labor force participation should be rising in India because of the rise in overall education, when the actual empirical U-shape relationship predicts exactly the reverse.

Curvilinear patterns like India's are unusual but not unique among countries across the globe (Klasen et al. 2019). Over two thirds of the 71 IPUMSI countries with relevant educational data (Minnesota Population Center 2017), show monotonically increasing female employment from less than complete primary to primary complete to secondary to university graduates (see Table OA1 in the online appendix). This conventional linear relationship is consistent with human capital theory and rarely occasions much notice. However, in addition to India, Turkey and Indonesia also show a U-shape pattern of declining employment status up to secondary schooling and then an increase among college graduates (see Figure 1). Haiti and some sub-Saharan African countries (Mozambique, Burkina Faso, and Liberia) show an alternative U-shape pattern with lowest employment for primary graduates but increasing for secondary graduates, and further increases for college graduates (see Figure OA1 in the online appendix). On the other hand, Nigeria, Cameroon and Tanzania (see Figure OA2 in the online appendix), reveal an inverted-U pattern with declining employment among university graduates. So, the unexpected counter-theoretical curvilinear patterns, while not normative, are common enough to justify a better look into why they deviate from expectations.

Figure 1: Women's labor force participation by education, curvilinear relationships



Source: Authors' calculations from IPUMSI data.

This paper tests two of the most common explanations of India's U-shape relationship between women's education and their labor force participation: cultural restrictions on higher status women, and the lack of demand for jobs requiring higher education. We test these two explanations with multilevel models that take advantage of the large district-wise variation across India in cultural restrictions on women and in types of occupations. Our results show only modest support for either a cultural stigma explanation of the U-curve or a simple structural demand explanation. While both contextual factors show the expected relationships with the *overall* level of women's labor force participation, the curvilinear pattern with education is still present where cultural restrictions are weakest and where the occupational structure most favors formal sector employment of educated workers.

These disappointing results force us to develop a new explanation based on the gender segregation of clerical and sales work that favors Indian men rather than as is usual in other countries, favoring women for this white-collar work. The methods and results for the occupational sex segregation analyses are different than for the analyses of the two supply and demand arguments so we divide the paper into two parts. In the second part of the paper, we report a simulation that matches unemployed women with demographically similar men currently employed in clerical and sales jobs. The results of this simulation reveal a more linear relationship between education and women's labor force participation if these white-collar jobs were held by women rather than men.

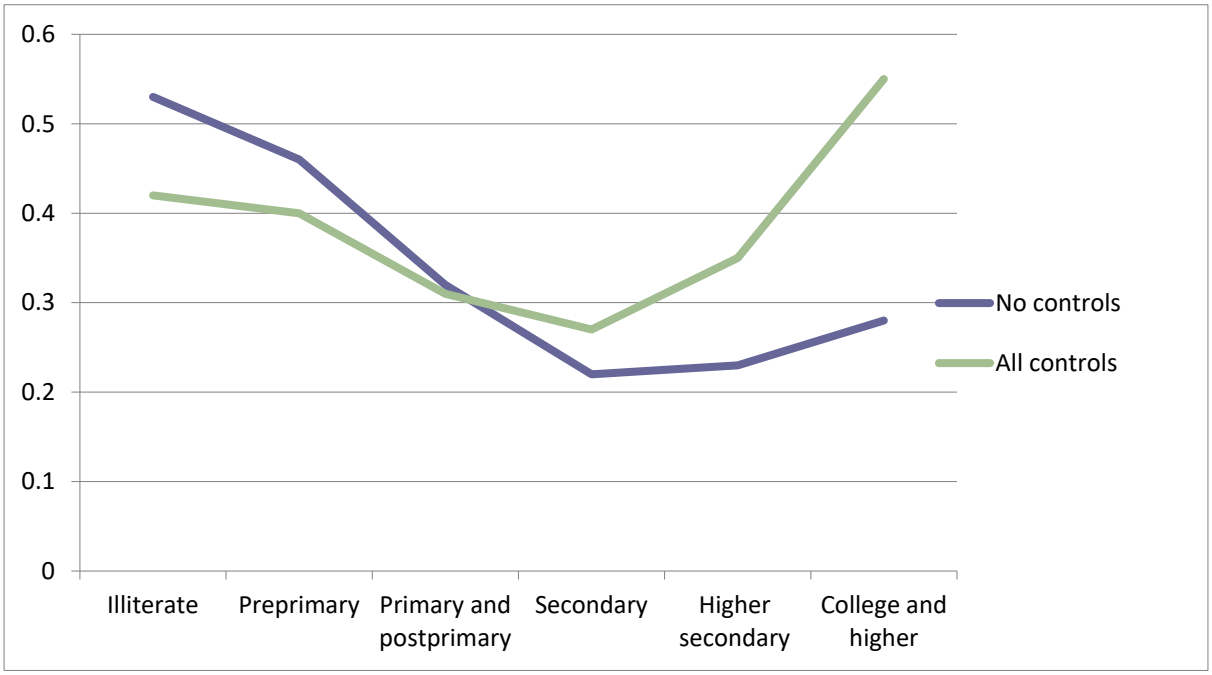
1. Cultural and Demand Explanations

Past work has identified three main types of restraints on moderately educated Indian women's labor force participation: other family income that reduces the need for women's employment, cultural inhibitions on women working outside the home, and weak or inappropriate demand from the local economy.

Other family income. Theory predicts that the relationship between education and employment is governed by both an income and a substitution effect. The income effects are especially important in India because, educated Indian women tend to marry educated men with substantially higher incomes, so their higher family incomes would further discourage women's participation in the labor market. Combined with a cultural norm that confers higher status on women at home, other family income can act as a powerful deterrent to educated women's labor force participation. Where patriarchal norms are dominant, the cultural reinforcement of staying home should help overshadow the incentives of higher pay for educated women (Brinton et al. 1995). Thus, in India, we would expect this other family income effect to be especially strong.

Using unique personal income data from the India Human Development Survey (IHDS), in a previous study, the authors find that other family income accounts for some, but hardly all of the downward sloping part of the education – labor force curve. Besides detailed data on individuals' wage income, the IHDS collected family enterprise net income, and each family member's hours engaged in these enterprises, thus enabling estimation of other family income beyond the woman's own contribution. After these controls for other family income, the curve shifts from a more backward J-shaped relationship to a strongly U-shaped one (see Figure 2). The difference between illiterate women, and secondary educated women is attenuated with the other family income controls, and the higher participation of college graduates is even more pronounced. The curvilinearity, therefore, is enhanced not diminished by the family income controls, leaving open the question of why moderately educated Indian women have such low rates of labor force participation.

Figure 2: Predicted probabilities of women's employment before and after controls for background characteristics and other family income



Source: Calculations from the India Human Development Surveys 1 and 2.
Note: Controls include other family income, caste (four categories), religion (three categories), age (five categories from 25 to 59), children under 5 and 6 to 15, survey, urban or rural residence, and state.

Cultural inhibitions. Past studies have suggested that cultural factors, such as norms restricting the mobility of women, and structural factors, such as a lack of appropriate job opportunities for moderately educated women, play important roles in determining the U-shaped relationship between women's education and labor force participation in India (Das 2006; Das and Desai 2003). But these cultural and structural explanations are more often asserted than tested.

The cultural stigma attached to women's work in a strongly patriarchal society is perhaps the most common explanation for the low employment rates of moderately educated women in India. Female labor in India is not only disproportionately poor women, but even among poor women, it is disproportionately lower caste Dalit (Scheduled Caste) and Adivasi (Scheduled Tribe) women who work for wages (Kingdon 1998; Kingdon and Unni 2001). These associations mean that families of women who have achieved the higher statuses signified by their moderate levels of education are especially against them being employed outside the home.

Gender norms are an important consideration for the resources available to Indian women, both in terms of education and job opportunities. These norms are also a significant determinant of their autonomy (Dyson and Moore 1983; Mason 1984; Basu 1992; Visaria 1996; Mason and Smith 2003). The traditionally patriarchal society in India negatively affects the employment opportunities of women (Presser and Sen 2000). In the absence of patriarchal controls, women are always a part of the labor force (Brinton et al. 1995). In most parts of India, families follow the female homemaker, male breadwinner model, even when the women in the family are educated (Khanna and Varghese 1978; Standing 1991). Das (2006) analyzed how gender determines the structure of the labor market in India. She observed that the primary determinant of the trajectory of a woman's employment in India is their entry into the labor force.

Not unexpectedly, in India gender norms are largely a reflection of the caste, region and religion a woman belongs to (Desai and Jain 1994; Kapadia 1995; Kemp 1986). Labor force participation rates are even lower for women in the North than in the South, where gender relations are somewhat less confining and more egalitarian (Dyson and Moore 1983;Dreze and Sen 1995). Women in the North, for example, are more likely to practice purdah, less likely to be able to go out alone, and more likely to require permission from others to leave the house. All of these restrictions make employment outside the home more cumbersome. The geographic variation of these gender norms across India provides an opportunity to compare the shape of the U-curve in more and less patriarchal areas (the North-South division is only a convenient gloss on the more complex and multi-dimensional pattern of gender inequalities in India, see Kishor 1993).

Labor demand. Structural explanations based on a lack of demand are perhaps less common but have seen increasing attention in recent years (e.g. Klasen and Pieters 2015; Deshpande and Singh 2021). India's recent rapid economic growth might be expected to create industrial shifts favoring the employment of moderately educated women as it has for many other economies around the world. The recent research on India's declining women's labor force participation has emphasized the importance of the sectoral shift out of agriculture -- where work for less educated women is especially concentrated in India– has been cited as a main cause of the declining rates of female labor force participation (Mehrotra and Parida 2017; Verick 2018).

But light manufacturing which might be expected to draw more moderately educated women into the labor force (for instance in neighboring Bangladesh), has grown slowly in India. The otherwise robust growth in the service sector does not seem to have had much of an employment generating effect for moderately educated women. We build on that observation in the second section of the paper.

Previous analyses conducted by the authors using IHDS data had also suggested that the type of work women were able to find was especially important in shaping the education – employment relationship. Work in more secure salaried jobs followed a conventional positive linear slope for women's years of schooling: the more education women had achieved the more likely they were to work in salaried employment. But work in family enterprises or especially in unskilled wage labor was negatively related to levels of education, even after controls for other family income. The combination of these two partial but opposite relationships yield the U-curve for the education – employment results.

Like gender norms, the industrial structure varies widely across India and presents an opportunity to analyze variations in women's education – employment relationship. We investigate these cultural and structural explanations for the U-curve of women's education and employment through multilevel models utilizing the breadth of measures available from the India Human Development Survey.

1.1. Methods: Multilevel Analyses

Our analyses use data from the two waves of IHDS (Desai, Vanneman, and National Council of Applied Economic Research 2005 2012). IHDS1 is a nationally representative sample of 41,554 households spread across all the States and Union Territories of India (except for the small territories of Andaman Nicobar and Lakshadweep). The sample covers 384 districts, 1503 villages and 971 urban blocks. These 41,554 households include 215,754 individuals. In 2011-12 a second wave re-interviewed the same households with an 83 percent re-contact rate. The IHDS2 sample was augmented slightly to adjust for higher attrition in urban areas. The analysis sample is restricted to married women, age 25-59 which is conventional in most labor force participation research. Many women below 25 are often still enrolled in an educational institution so their decision to enter the labor force is quite different from women who are beyond school ages. And women above the age of 59 would be likely to retire which is also a different decision than for women in prime working ages. Both of these circumstances deserve further research but would expand the scope of the research well beyond the question of the curvilinear education – labor force relationship.

The IHDS is a multi-topic survey that includes various modules related to health, education, employment, marriage, gender relations, economic status, social capital, and other issues. The household economic questionnaire was answered usually by the head of the household, or someone who had sufficient knowledge about the income, expenditure, and employment status of household members.

Measuring women's employment is often particularly challenging since many times women engage in part time or seasonal jobs, or they may work from home, or they could participate in the labor market only in times of a family crisis (Beneria and Sen 1981; M. B. Das 2006; Folbre 1995; Hirway 2002). As noted above, the IHDS measure of workforce participation is more detailed than for other surveys. Unlike the National Sample Survey that asks for a woman's principal and secondary status activities, the IHDS has separate modules

for different types of work (e.g., on the household farm, wage labor, in household nonfarm businesses), and asked which household members participated in each type of work during the previous year. In the present study, anyone who worked for at least 240 hours in the previous year across all types of work is considered to be in the labor force. Caring for household animals, collection of firewood or other fuels, and, fetching water from public sources were not included as labor force participation as these are usually regarded as normal (but, of course gendered) household chores in India.

The analyses include individual-level controls for other household income; the number of children five or under and six to fifteen in the household; the number of married women in the household; seven dummies for age (in five-year categories); four caste groups: Forward Castes, Other Backward Castes, Scheduled Castes (Dalits), and Scheduled Tribes (Adivasis); three religion groups: Hindus, Muslims, and other minority religions; urban or rural residence, and survey year (IHDS1 or IHDS2).

Controls for other household income, possible for India only with the IHDS income data, have been shown to explain some but hardly all of the U-shape education curve. We allocate net income from household farms and businesses to individuals based on their proportion of total household hours worked in each enterprise. Other household income is the sum for all individuals other than the woman, of their wages and these estimated proportions of household enterprise income, plus unearned household income such as remittances, rents, and, pensions. Two measures are derived from this estimate: the logarithm of the total and, for a small minority of women in households with negative or very low incomes (2 percent), a dummy variable identifying these low incomes. For these cases, the log of Rs 1000 is interpolated for the other household income measure.[3]

We include district-level measures of cultural and economic contexts derived from the IHDS. The rich array of gender inequality questions in the IHDS is especially useful for testing a cultural stigma explanation. Gender performance theories put forward the fact that men and women participate in a visible display of gender in which a stylized process of intercommunication could mean dominance or deference (Goffman 1976). The symbolic nature of gender shapes choices and causes men and women to take actions in a manner that produces gendered behaviors in daily interactions (West and Zimmerman 1987). These individuals perform gender through their actions that conform to social expectations (West and Zimmerman 2009), and when they do not do so, it is not understood by others (England and Folbre 2010, Schneider 2011). Following prescribed gender norms might earn a woman appreciation from her family and eventually lead to higher autonomy for women (Kariapper 2009; MacLeod 1992; Read and Bartkowski 2000). Gender performance theories would imply that labor force participation has a crucial cultural meaning that differs by gender. In the Indian context, Desai and Andrist (2010) have used the concept of '*gender scripts' or 'scripts that frame actors' day-to-day behavior and yet are constantly modified as actors face competing demand*s' (P 670 Desai and Andrist 2010) as a framework to analyze age at marriage. In the Indian context these scripts are indicative of both 'culture' and 'status' in action.

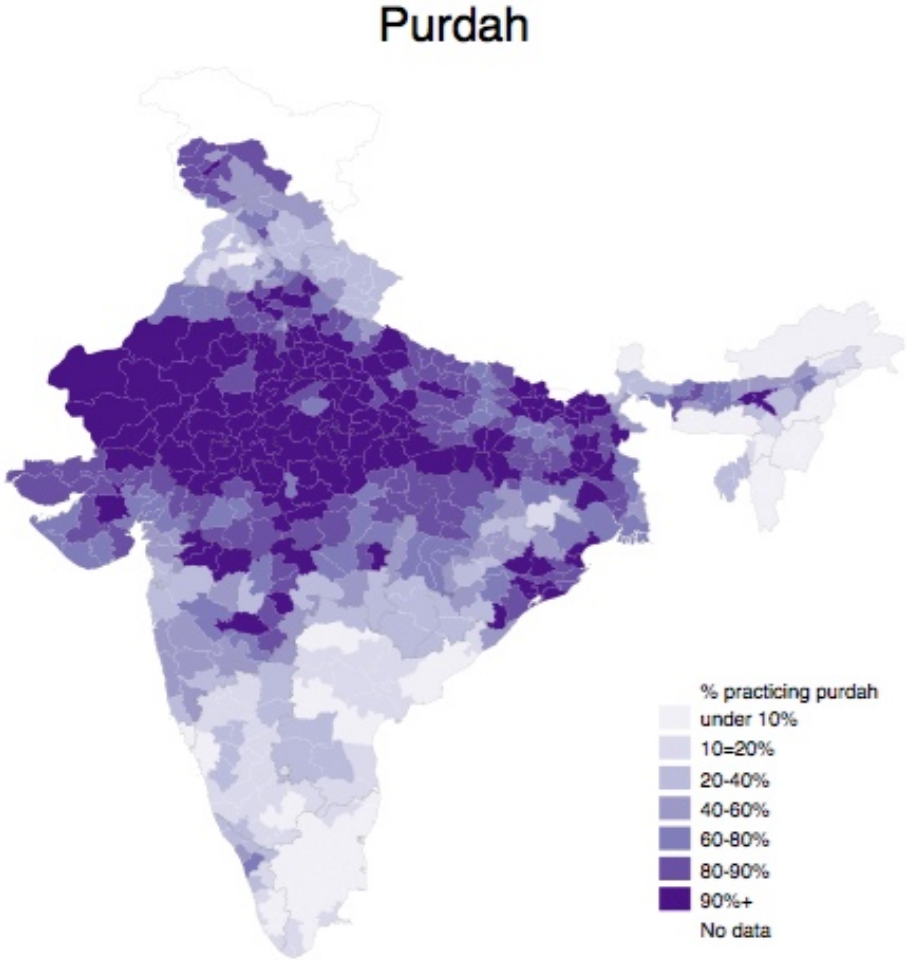
A normative explanation should be contextual; norms are what most local people

[3] This procedure avoids the need to drop women with negative or zero other household income for whom the logarithm would be undefined. The coefficient for the dummy variable can be interpreted as the difference in the log odds of these women being in the labor force compared to what would be predicted for women with Rs. 1000 other family income.

believe and reward, not just the ideas of the woman's own household. This is consistent with most earlier measures of gender cultures (e.g., Desai and Andrist 2010, Kishor 1993). We aggregate the survey measures up to the urban or rural portions of each IHDS district. The IHDS drew rural and urban samples separately, so some IHDS districts have only urban, or only rural samples, while others have both. Although necessitated by the sampling design, treating urban and rural areas as separate normative or market contexts also seems appropriate for India.

We create a district-level gender variable defined by the practice of purdah/ghunghat – women shielding their faces or remaining secluded. Responses to this question have a strong grounding in traditional norms about honor (Desai and Andrist 2010) and vary widely across India (see Figure 3 below, where districts vary from <10 percent practicing purdah, to over 90 percent practicing purdah).[4]

Figure 3: District-level averages of women practicing purdah

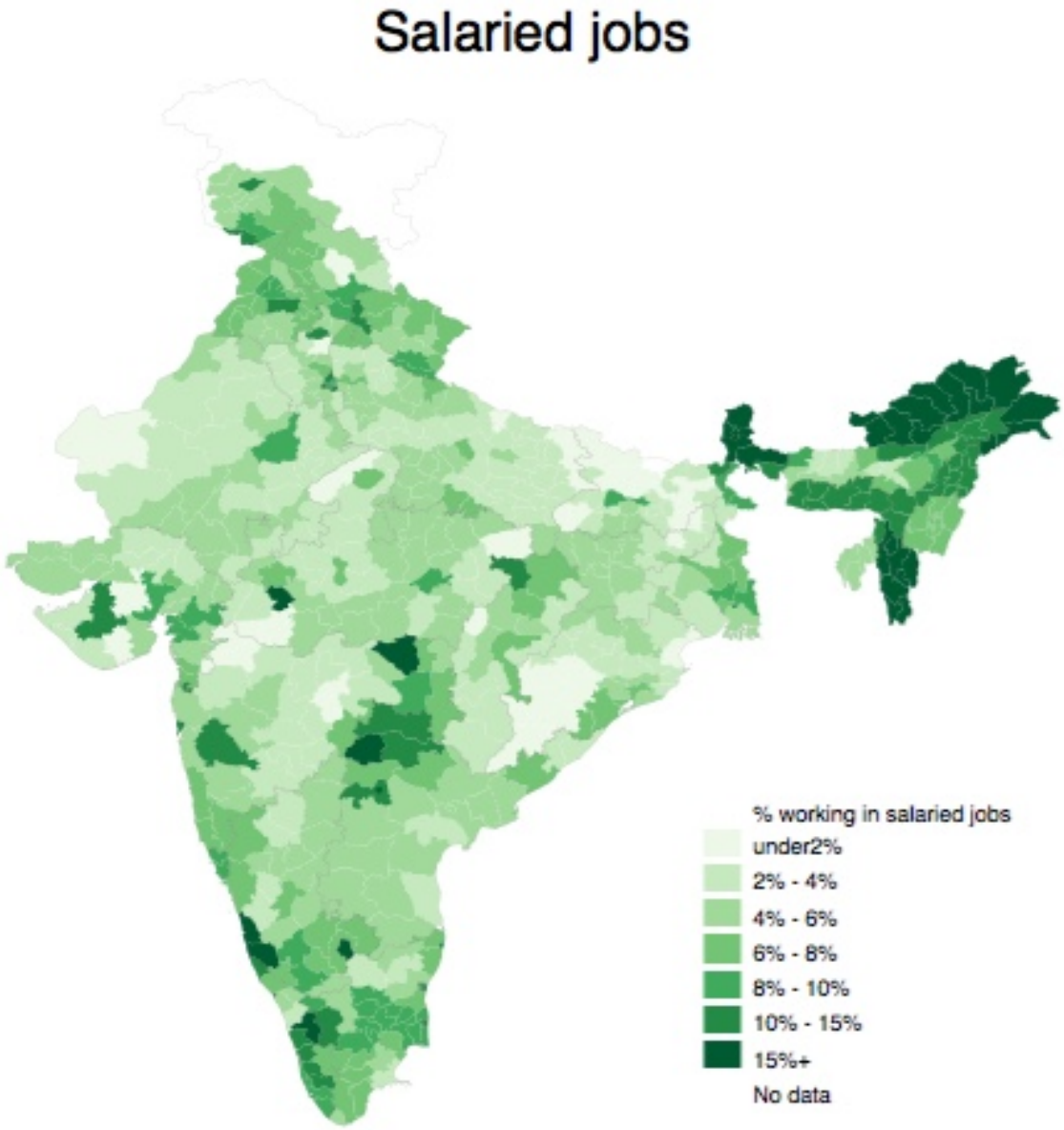


***Source*:** IHDS1 and IHDS2.

[4] As a robustness check, we repeat the analyses using two other district-level measures of gender: restrictions on women's mobility and whether women generally eat separately from men. Results reported in the online appendices are similar for each of the three measures. In another supplementary model we have added *both* individual and district-level purdah measures (table available from the authors on request). The results show that the individual level purdah measure barely achieves a significant relationship (p=.091) with women's labor force participation while the contextual (district-level) relationship remains important. The curvilinear relationship doesn't change much with the individual controls for purdah

Our principal measures of demand build on our earlier finding that salaried employment has the expected positive linear relationship with women's education. The availability of these salaried jobs also varies widely across India (see Figure 4), so we might expect a less curvilinear education – employment relationship where those jobs are most abundant.

Figure 4: District-level average of the percent of all workers employed in salaried jobs (paid monthly).



***Source*:** IHDS1 and IHDS2.

Although contextual measures often are used to minimize endogeneity, both the stigma and industrial structure district-level measures are to some extent endogenous with employment rates of moderately educated women. Where more such women are employed, we might expect more salaried employment to be stimulated and more erosion of patriarchal gender norms to result from that employment. However, patriarchal gender norms are grounded in centuries-old traditions linked to marriage and family structure patterns, so it seems unlikely that new shifts of women into salaried occupations would have much immediate impact on the gender norms. Salaried employment responds more to public sector

and formal private sector industrial expansion, so the availability of educated female labor would not seem to play a major role. In any case, the first question is to see whether the education – employment curve looks different in these areas with low cultural stigma or high labor demand.

1.2. Results: Multilevel Analyses

Table OA2 in the online appendix shows the summary statistics for the sample. The key question we address is: does the overall U-curve relationship between women's education and employment in India become a more conventional positive linear relationship in regions where cultural stigma is low or in regions where demand for moderately educated labor (indicated by the availability of salaried jobs) is high? The most important results come from the cross-level interactions of each of the district-level measures with women's education.

We run two level logistic regressions using hierarchical linear modeling (HLM) software (Raudenbush et al.2016) to obtain the results. The coefficients for education and the district-level variables are presented in Table 1. Neither of our district level interaction results are consistent with a conclusion that stigma or lack of demand are fully adequate explanations for the curvilinearity of the education – employment relationship for Indian women.

Table 1: Multilevel logistic regressions of women's labor force participation

	Combined Model
Education (reference = illiterate)	
Some primary	-0.184
	(0.114)
Primary and post primary	-0.37***
	(0.100)
Secondary	-0.659***
	(0.137)
Higher Secondary to pre college	-0.716***
	(0.184)
College graduate or higher	-0.205
	(0.199)
Spouse's Education (years)	-0.031***
	(0.003)
Log of other family income	-0.376***
	(0.021)
Minimal other family income	-0.852***
	(0.118)
Caste (reference= Forward Castes)	
Scheduled caste (SC)	0.425***
	(0.05)
Scheduled Tribes (ST)	0.701***
	(0.082)
Other Backward Caste (OBC)	0.284***

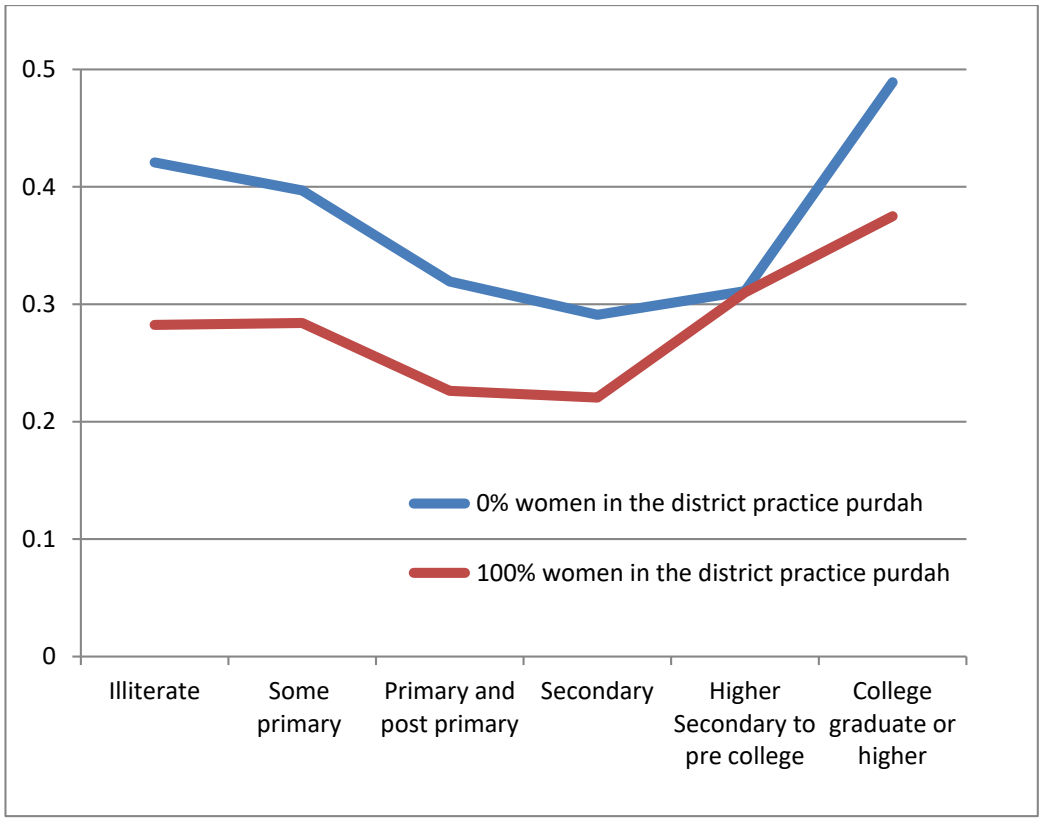
	(0.044)
Religion (reference= Hindu)	
Muslim	-0.477***
	(0.055)
Other religion	0.051
	(0.079)
No. of children aged 0-5	-0.057***
	(0.016)
No. of children aged 6-15	0.079***
	(0.011)
No. of married women in household	-0.012
	(0.015)
Age (reference= 25-30)	
Age 31-35	0.297***
	(0.034)
Age 36-40	0.428***
	(0.037)
Age 40-45	0.399***
	(0.045)
Age 46-50	0.313***
	(0.047)
Age 51-55	0.069
	(0.054)
Age 56-59	-0.256**
	(0.085)
Survey (=1 for 2012)	0.249**
	(0.094)
Urban	-0.566***
	(0.112)
Proportion of Women Practicing Purdah in the district	-0.613***
	(0.144)
Interaction Terms	
Some primary*Purdah	0.107
	(0.137)
Primary and post primary*Purdah	0.14
	(0.111)
Secondary*Purdah	0.241
	(0.161)
Higher Secondary to pre college*Purdah	0.608**
	(0.225)
College graduate or higher*Purdah	0.146
	(0.212)
Proportion of Salaried Jobs in the district	-1.959***
	(0.324)
Interaction Terms	

Some primary*Salaried Jobs	0.327 (0.241)
Primary and post primary*Salaried Jobs	-0.258 (0.222)
Secondary*Salaried Jobs	0.337 (0.23)
Higher Secondary to pre college*Salaried Jobs	0.926** (0.311)
College graduate or higher*Salaried Jobs	1.848*** (0.321)
Constant	0.241 (0.135)

Note: Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05
The maximum number of level-1 units = 72,362
The maximum number of level-2 units = 972

The predicted probabilities of employment derived from this model are graphed in Figures 5 and 6. In each, the U-curve remains in districts with low levels of purdah (Figure 5) or in districts with high proportions of salaried employment (Figure 6).

Figure 5: Predicted probability of employment among Indian women by education level for districts with high and low levels of purdah observance



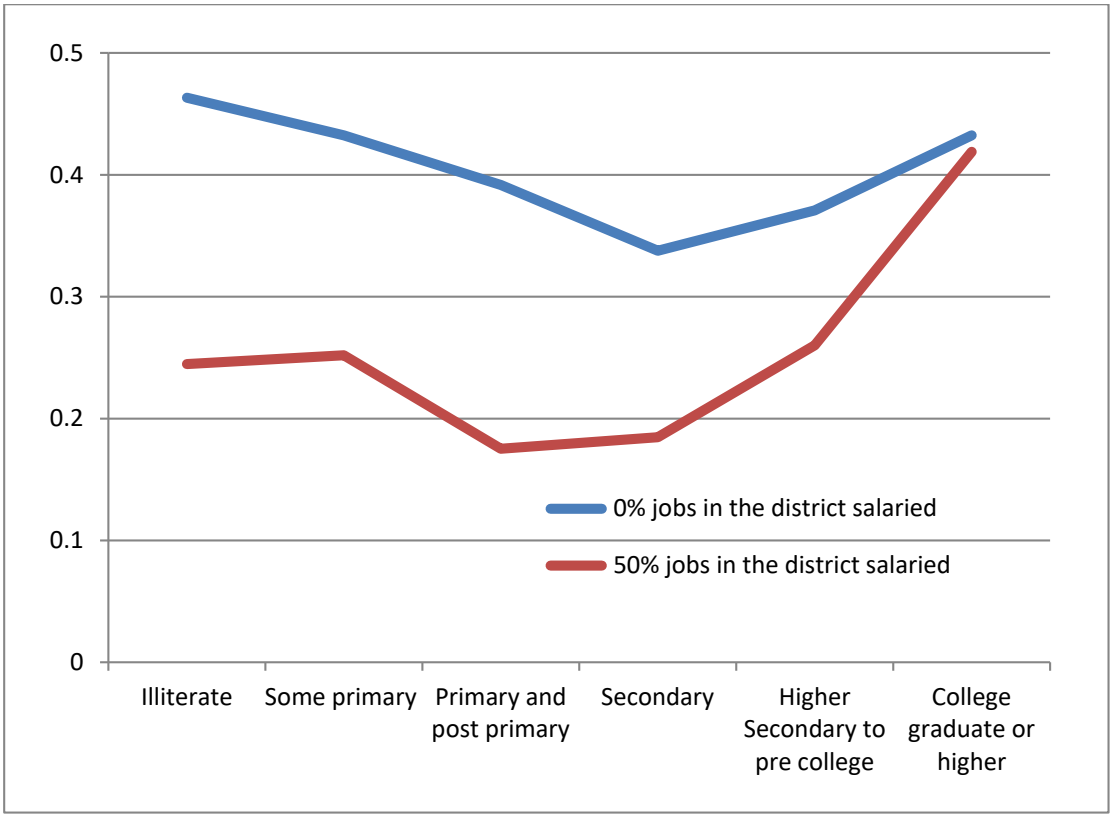
Source: Calculations from the India Human Development Survey I and II.
Note: All other variables in Table 1 are held at their mean.

From Figure 5 three observations are important:

- As expected, the districts with strong purdah norms have lower rates of women's labor force participation (the red line is below the blue line).
- The usual U-curve for education is present both for districts with and without purdah. With strong purdah norms, fewer women work, including those with advanced education, and even illiterate women. The predicted probabilities still decline from illiteracy to secondary education, and then rise with graduate degrees, but the differences are even smaller than what is observed in districts without purdah.
- Without purdah norms (the blue line indicating results for districts where 0 percent women practice purdah), there is still a decline in work among women with moderate levels of education. So, gender norms do not explain the counter-theoretical U-curve. Where there is little or no stigma, there is still a U-curve: women with moderate levels of education are less likely to work than illiterate women. So, something else besides purdah norms must explain that decline.

To test for the effect of the availability of good jobs (i.e., the demand for educated labor), we calculate predicted probabilities of women's employment for districts where 50 percent of the jobs are salaried (about the 90th percentile of districts), vs. 0 percent.

Figure 6: Predicted probability of employment among Indian women by education level for districts with high and low levels of salaried employment



***Source*:** Calculations from the India Human Development Surveys 1 and 2.
***Note*:** All other individual or household variables in Table 1 are held at their means.

From Figure 6 we note that:

- The U-shaped employment curve typical for India is still observed where salaried jobs are available. However, the increased probability of being employed for post secondary educated women is greater where salaried jobs are available than where they are not.
- Nevertheless, overall participation levels are higher where there are *few* salaried jobs. Much lower participation rates are observed in areas where there are a higher proportion of salaried jobs, particularly for women with no education, moderate, and secondary levels of education.
- While the lower rates in areas with more salaried jobs may seem counter-intuitive at first, there is a common misperception of how the labor market is gender segregated in India. It is agricultural jobs which are disproportionately female in India, whether on their own family farms, or as hired agricultural labor. Industrial and service sector work is, in India, predominantly and disproportionately male.
- Finally, and perhaps most importantly, even in the most salary-abundant districts, the education-employment relationship is still U-shaped; illiterate women are more likely to be working than women with intermediate, or some secondary education. The availability of "suitable" jobs does little to pull moderately educated women into the labor force.

Figure OA3 shows those predicted probabilities of employment for districts with: a) low prevalence of purdah/ghunghat, and, low availability of salaried jobs, b) low prevalence of purdah/ghunghat, and, high availability of salaried jobs, c) high prevalence of purdah/ghunghat, and, low availability of salaried jobs, and d) high prevalence of purdah/ghunghat, and, high availability of salaried jobs. The results from this model are consistent with the previous results: all education curves remain noticeably U-shaped. So, neither purdah norms nor the availability of suitable salaried jobs explain much of the downward slope for women with moderate levels of education. While these supply and demand factors are the most commonly cited explanations for the curvilinearity of women's education – employment relationship, when tested, the results do not provide good support for either theory.

1.3. Results: Additional Robustness Checks

In order to test the robustness of our results, we run four further analyses: a) using alternative measures from the IHDS data to measure district wise levels of patriarchy, b) adding other district level controls and state fixed effects to the analysis in Table 1, c) limiting the analyses to only the first time a woman appears in the sample, and d) separate analyses for the poorer Empowered Action Group (EAG) States and for non-EAG States. None of these checks change the basic results that the education – labor force participation relationship remains curvilinear.

Besides purdah observance, IHDS also asked about restrictions on women's ability to leave their homes and about whether women usually ate separately from the men in their homes. We aggregate these measures to the district level as we did for purdah. While the additional measures test for other dimensions of gender, they have some theoretical disadvantages compared to the purdah measure. Though measures such as mobility may be more directly linked to women being able to take up a job. they could be more endogenous; the labor force patterns may dictate the mobility behavior. Men and women eating separately captures a more private dimension of gender segregation which may make it less relevant for labor force participation which is public.

Table OA3 below shows two models for each of the other two indicators of gender restrictions: a) the proportion of families in which men and women do not eat together, and b) the average score on an immobility index indicating the number of places women cannot visit (medical center, local grocery stores, and friends/relatives) unless accompanied by another family member. This index ranges from 0 to 3, a higher score indicating greater immobility. These models control for all other variables included in Table 1 and also include interaction terms of education and the district-level gender variables. Immobility at the district makes a large difference for women's labor force participation: women residing in districts where women have low mobility have a much lower likelihood of participating in the labor force compared to those who reside in regions where women have greater mobility. District-level separate dining makes only a small difference for predicted women's labor force participation. Both models show that women residing in more conservative regions are less likely to participate in the labor force. However, neither of these district level indicators of gender norms alter the U-shaped relationship between women's education and labor force participation (figures OA4 and OA5).

For the second set of robustness checks, we calculate two models with additional controls added to the results reported in Table 1; a) with controls for two other district level variables also aggregated from the IHDS: the availability of public industry jobs and the percentage of women with at least secondary school education; and b) these other district level variables plus state fixed effects. Results are reported in online Table OA4. Both the average educational level of these districts and the availability of jobs in public industries such as jobs in education, medical care, and public administration[5] are, as expected, correlated with the occupational structure of the district. For example, 52 percent of salaried jobs are in these public industries. So, it might be these more public sector jobs or the higher educational levels in a district that influence women's labor force participation more than the prevalence of salaried jobs reported in Table 1.

Again, the results show that gender norms, and labor demand, to do not fully explain the U-shape curve. Interestingly, the additional controls, especially the state fixed effects, do reduce the overall negative relationship of purdah norms with all women's employment. We suspect that much of the purdah effect is between states, rather than between districts within states. Nevertheless, the U-shape education-employment curve remains, again somewhat more so, for non-purdah districts, than for high purdah districts. Greater availability of salaried jobs in the district remains negatively related to the likelihood of a woman being labor force participation; the only exception is for women who are college graduates, for whom a greater availability of salaried jobs means higher probability of employment.

A third set of robustness checks repeats the combined model in Table 1, but restricts the sample to the first, wave of IHDS (2005), thus avoiding double counting women who were re-interviewed in 2012. The results reported in Table OA5 are consistent with the earlier results: the U-shaped curve is still present for districts with low levels or purdah/ghunghat prevalence, and, for districts with high availability of salaried jobs.

[5] Public industries are defined as codes 90-95 in the IHDS industry code based on the 1991 Census industry codes

In a fourth round of robustness checks, the analyses are conducted separately for the poorer, "Enhanced Action Group" (EAG) States (Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttaranchal, and Uttar Pradesh), and, for the remaining, non-EAG States, and, Union Territories. Women residing in EAG States are less likely to be employed compared to women residing in non-EAG States (see Table OA6), however, the U-shaped relationship between women's education and employment remains and does not significantly differ between EAG and non-EAG states.

In conclusion, we find that neither purdah norms nor the availability of suitable salaried jobs explain much of the downward slope for women with moderate levels of education. While these are the most commonly cited explanations for the curvilinearity of women's education – employment relationship, when tested, the results do not provide good support for either theory. Perhaps different measures of these theories might reduce the curvilinearity more, but these disappointing results suggest that a new theory may also be needed.

2. An Occupational Segregation Explanation

An alternative explanation, 'the gender segregation of work', could explain the curvilinear relationship between a woman's education level and her labor force participation. Occupational segregation by gender is a universal phenomenon (Acker 1990; Reskin 1993; Anker 1997; Blau et al.1998; Blau and Kahn 2000; Chang 2004; England 2010). Some jobs are seen as primarily for men, others primarily for women, and, others may be open to both men and women. But, while universal, occupational segregation can manifest itself in different patterns in different places. In most of the world, clerical and sales occupations are a principal employment opportunity for moderately educated women. College graduates tend to work in professional and managerial positions; illiterate or primary school graduates work in agriculture or as unskilled laborers. Clerical and sales work, however, provides the "clean" white-collar employment that demands some level of literacy and numeracy and is "acceptable" for women in a more patriarchal society. Borrowman and Klasen (2020) find a generally positive relationship between increases in occupational segregation and women's labor force participation across a sample of 38 countries.

However occupational segregation varies across countries not only in degree but also in type (Chang 2004). In India, clerical and sales work remains overwhelmingly male dominated. According to the 2011 Census of India, the two-digit occupational category of sales work ("models, sales persons and demonstrators") is 92 percent male; and office clerks are 81.4 percent male (Census of India 2011). As in much of the world, these are the largest occupational categories in which secondary school graduates are over-represented. So, what is different about India, and what might explain the low rates of employment among moderately educated Indian women, is that the jobs that typically require a secondary education are sex segregated as male jobs, although in much of the rest of the world, these jobs are sex segregated as female jobs.

This suggests that a high level of gender segregation may be an unrecognized explanation for the U-curve relating women's education to labor force participation. There is low demand for moderately educated female labor because men continue to reserve those clerical positions for themselves. It is not so much the lack of adequate jobs for moderate levels of education, but the exclusion of women from these jobs that explains the low rates of labor force participation for these women. This male segregation explanation is consistent

with the lack of association between female labor force participation, and the size of the white-collar service sector in India (Klasen and Pieters 2015).

Table 2 presents the gender composition of broad occupational categories for 33 countries with IPUMSI occupational data. In high-income countries, two thirds of clerical and sales workers are women, the most female dominated occupational category. Similarly, in low- and middle-income countries in Latin America, Sub-Saharan Africa, and Southeast Asia, high levels of female concentrations are found in clerical and sales work, similar to high-income countries. However, in India, these white-collar occupations are overwhelmingly male. Female proportions are low in India for almost all occupations but they are especially low for clerical and sales occupations.

Table 2: Percent female of broad occupational categories across 56 countries.

	High-income[2]	**Low- and Middle-income[1]**	**India (IPUMS)**	**India (IHDS)**
Managers	38.6%	36.7%	11.9%	14.0%
Professionals, Technicians	55.6%	54.4%	22.0%	33.5%
Clerical, Sales	67.4%	63.6%	12.0%	13.6%
Manual	23.8%	31.2%	16.5%	21.9%
Agriculture	26.3%	40.8%	32.3%	44.8%
Total	47.9%	42.5%	24.2%	29.9%
Sample size	3,245,693	3,942,297	123,825	101,833

Source: authors' calculations from IPUMSI and IHDS data.

[1] Low- and middle-income countries from Latin America, Sub-Saharan Africa, Eastern Europe, and East and South-East Asia include Armenia, Belarus, Bolivia, Botswana, Cambodia, Cuba, El Salvador, Malaysia, Mongolia, Mozambique, Nicaragua, Nigeria, Paraguay, Philippines, Romania, Rwanda, Senegal, Thailand, Uganda, Venezuela, and Zambia. In three West Asian and North African countries (Egypt, Iran, and Jordan), clerical and sales work is predominantly male; they are not included in the above table.

[2] High-income countries include Canada, France, Hungary, Ireland, Italy, the Netherlands, Portugal, Slovenia, Spain, Switzerland, the United Kingdom, and the United States. For high income countries only, service occupations are included in the sales category because more detailed occupational statistics are not available for almost all high-income countries. For other columns, service occupations are included in manual occupations.

It is remarkable how under-appreciated this gender segregation of white-collar work has been in the literature on Indian women's labor force participation. While much rigorous and insightful work on has been done in the context of developing nations highlighting the importance of sectoral differences in labor demand (e.g., Klasen and Pieters 2015, Klasen 2019) and on the stigma associated with educated women working outside of white-collar jobs (for e.g., Klasen 2019), the fact that male domination of white-collar work could be key to determining the reason behind low levels of employment amongst educated women in India, is yet to be explored.

2.1. Methods: Simulation

The kinds of multilevel empirical tests we use to test the cultural and demand side explanations of Indian women's low labor force participation are not useful for studying the role of gender segregation. Gender norms, and, industrial structure vary widely across India, so that we can compare women's employment in more and less patriarchal areas, and in labor markets with more and less demand for moderately educated labor. However, clerical and sales occupations are so thoroughly gender segregated in India, that there is not much variance across districts in the gender composition of white-collar work. That makes it impossible to compare districts with, and without heavily male proportions of white-collar work. White-collar work is heavily male in all districts.

Instead of comparing districts, we illustrate the possible role of gender segregation by calculating a simulated education – employment relationship for the IHDS data by reallocating male white-collar work to non-employed women with otherwise similar characteristics as the men who actually hold those jobs. Most matches are based on exact matches using the six education categories as well as survey wave, state of residence, urban or rural location, and caste, and, religion groups. Where there are more matching women than male clerical workers, we select the women randomly and recode their work status as employed. Occasionally, there are fewer matching women, than male white-collar workers, and we relax the matching criteria, dropping first the exact match on state and then for the few remaining unmatched male clerical workers, by dropping the urban-rural location match. The result is that every male clerical worker is matched to an equivalently educated woman who is not employed, and her work status is recoded to employed.

This reallocation simulates what the labor force participation rates of women would be if each clerical and sales position were filled by a woman. Our interest here is in how the reallocation might change the shape of the education – employment curve. Allocating unemployed women to white-collar work will inevitably raise the whole labor force participation curve, but will it change the U-shape of that curve? We expect that the result will disproportionately raise the labor force participation rates of moderately educated Indian women, thus straightening out the U-curve curvilinear relationship observed in our other results. If, on the other hand, white-collar work were more concentrated among college graduates (or less likely, among primary graduates or lower), the U-curve would be strengthened, not straightened. Or if clerical work was evenly spread across the education spectrum, or if the numbers of white-collar positions were relatively modest compared to the number of non-employed women with secondary education, the simulation would not noticeably change the shape of the education – employment curve for women.

2.2. Results: Simulation

After matching the male clerical workers with women out of the labor force, we re-compute the labor force logistic regression using women's recoded work status. The results are reported in model 2 of Table 3, and can be compared with the results before the simulation in model 1. Figure 7 illustrates the predicted probabilities for the simulated and actual samples. The curve with the simulated data (the blue line) is much closer to the expected linear relationship with education. In particular, secondary school matriculates are more likely to be in the labor force than women with just primary completed, unlike before the simulation. And women who completed higher secondary or college have much higher rates of employment after the simulation than before.

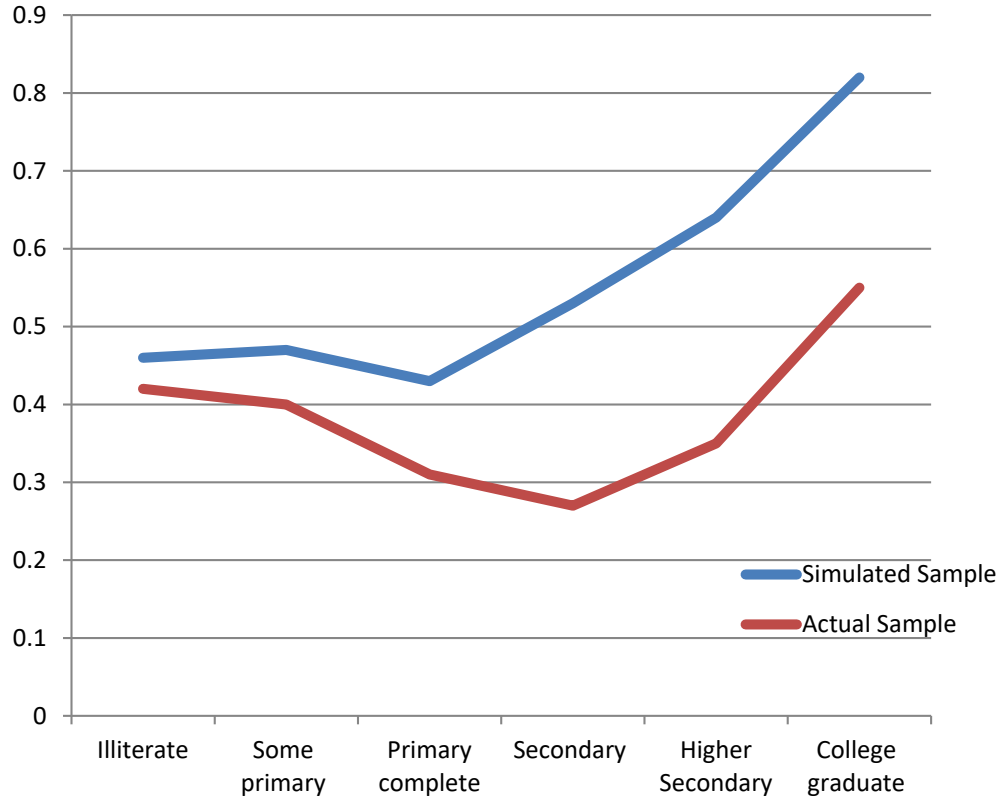
Table 3: Logistic regressions of women's labor force participation for the actual and simulated sample

	Actual Sample	Simulated sample
Education (reference = illiterate)		
Some primary	-0.064	0.022
	(0.048)	(0.045)
Primary and post primary	-0.452***	-0.162***
	(0.037)	(0.035)
Secondary	-0.652***	0.344***
	(0.056)	(0.049)
Higher Secondary to pre college	-0.313***	0.888***
	(0.075)	(0.063)
College graduate or higher	0.530***	2.010***
	(0.068)	(0.065)
Spouse's Education (years)	-0.031***	-0.024***
	(0.004)	(0.003)
Log of other family income	-0.426***	-0.334***
	(0.017)	(0.015)
Minimal other family income	-1.045***	-0.810***
	(0.118)	(0.110)
Caste (reference = Forward Castes)		
Scheduled caste (SC)	0.406***	0.479***
	(0.038)	(0.035)
Scheduled Tribes (ST)	0.785***	0.849***
	(0.055)	(0.052)
Other Backward Caste (OBC)	0.259***	0.282***
	(0.033)	(0.030)
Religion (reference = Hindu)		
Muslim	-0.547***	-0.475***
	(0.046)	(0.040)
Other religion	-0.005	-0.142**
	(0.057)	(0.052)
Urban	-1.224***	-0.879***
	(0.029)	(0.027)
No. of children aged 0-5	-0.048**	-0.042**
	(0.016)	(0.014)
No. of children aged 6-15	0.096***	0.070***
	(0.011)	(0.010)
No. of married women in household	0.000	0.004
	(0.015)	(0.014)
Age (reference = 25-30)		
Age 31-35	0.288***	0.189***
	(0.041)	(0.038)
Age 36-40	0.415***	0.322***

	(0.041)	(0.038)
Age 40-45	0.398***	0.274***
	(0.048)	(0.044)
Age 46-50	0.326***	0.226***
	(0.048)	(0.044)
Age 51-55	0.047	-0.007
	(0.056)	(0.050)
Age 56-59	-0.383***	-0.338***
	(0.083)	(0.074)
Survey (=1 for 2012)	0.273***	0.176***
	(0.026)	(0.024)
Constant	4.735***	3.674***
	(0.184)	(0.166)
State fixed effects	Yes	Yes
Sample Size	72,620	72,620

Note: Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Figure 7: Predicted probability of employment among Indian women (with all controls) by education level, for the actual and simulated sample



***Source*:** Calculations from the India Human Development Survey I and II.

The simulated data for women with only primary education or less are not as different from the actual data. In the simulated data, women with completed primary education are still less likely to be in the labor force than illiterate women (ß = -0.162), but the difference is much less than with the actual data (ß = -0.452). So, the expected linear relationship of education and employment is observed for the simulated data at levels beyond completed primary, and less difference is seen in labor force participation rates among women with completed primary, or, less schooling. The still-lower employment levels for women with primary education may not be surprising for the simulated data since fewer clerical and sales workers are hired with only primary school education. As a result, the effect of the simulation is weaker at these lower levels.

2.3. Additional simulations

Besides segregation, slow growth rates of jobs deemed appropriate for women could depress women's labor force participation. With a faster growth in the supply of educated women, an increase in the employment opportunities available for these educated women is needed (Klasen and Peiters 2015, Klasen 2019). Once women attain higher levels of education, work in jobs that are not white-collar are deemed inappropriate (Borrowman and Klasen 2020).

To test these growth rate explanations, we expand our simulations to create two other hypothetical situations. In the first, we double the size of public industries such as health, education and public services without changing the gender composition of these industries. In the second simulation, we don't change the size of these public industries, but instead, change their gender composition by re-assigning jobs held by men to women with the same levels of education, and other socio-demographic traits, in a way similar to our simulation for clerical and sales jobs in Table 3 and Figure 7. These comparisons help us check whether just a larger size of female-friendly sectors would be enough to increase employment levels of women with intermediate and higher levels of education. Alternatively, the second simulation evaluates whether occupational sex segregation in these industries could be an important reason why women with higher levels of education are not getting these jobs.

Results for these simulations are shown in appendix Figure OA6. Interestingly, doubling the size of large public industries does not change the U-shaped relationship between women's education and labor force participation. Although the probabilities of being in the labor force for all women with at least primary education would be higher with a larger public industry sector, compared to the non-simulated sample, the U-curve remains.

However, changing the gender-composition of large public industries, by re-assigning jobs from men to not employed women with the same levels of education has a similar effect as for the white-collar simulation. The public sector reassignments show a sharp linear increase in women's employment probability as education increases from primary complete to college or more. These increases in the employment probabilities are even sharper than the increases found by changing the gender composition of clerical and sales jobs. But, the employment decline from illiteracy, to completed primary education is somewhat larger for the public industries simulation, than for the white-collar simulation so the education-employment curve is more noticeably U-shaped. Nevertheless, results of both segregation simulations are closer to a linear education relationship than is the observed relationship.

3. Discussion

The curvilinear relationship of Indian women's education and their employment has been consistently noted in the literature but has been surprisingly little studied empirically. Most observers explain the counter-theoretical decline in employment rates with moderate levels of education as a result of the strong patriarchal culture that restricts women's mobility and raises the status of households where women do not work outside the home. Others speculate that India's recent economic development has not generated the kinds of employment that would pull women into the labor market.

The IHDS provides a unique opportunity to explore these issues. We hold constant other family income, a variable that has a more complete measure in IHDS compared to National Sample Survey (NSS) data. The IHDS also has good measures of purdah and occupational position that enable tests of both the cultural stigma and employment demand explanations. We provide preliminary tests of both normative supply-side and structural demand-side explanations by calculating the education – employment relationship in districts where patriarchal norms about purdah are weakest or where more "suitable" salaried employment is most widespread. In neither area do we observe the expected linear positive relationship of women's education and their labor force participation. In fact, those low-purdah, high-salaried employment areas still show a strong curvilinear relationship and declining levels of employment with moderate levels of education. The lack of empirical support for these common explanations is an important challenge to the usual analysis of India's U-shape relationship between women's education and their labor force participation. The problem is not that purdah or labor demand are irrelevant to women's labor force participation, both district measures have substantial *overall* relationships with rates of women's labor force participation. But they are not especially important for moderately educated women in a way that would straighten out the U-shape education curve.

A second contribution of this paper is raising occupational gender segregation as a more likely explanation for the low levels of employment among moderately educated women. In much of the world, moderately educated women, especially those with secondary education but no college degree, have found employment in white-collar clerical and sales jobs. In India, these jobs remain overwhelmingly reserved for men. When we recalculated women's labor force participation rates such that unemployed women who were otherwise similar to those men with white-collar jobs were employed, the education-employment relationship was much closer to the expected positive, linear relationship. Those simulation results suggest that it is the gender-segregated exclusion of women from this white-collar work that helps depress the employment levels of Indian women with moderate levels of education and produces the anomalous U-shape curve.

A sex segregation explanation is similar to and in some ways a *combination* of demand-side and gender stigma explanations. Like demand-side explanations, occupational segregation is another rendition of a scarcity-of-relevant-jobs hypothesis. Women are equally excluded from the labor force if there are lots of jobs available but they are reserved mostly for men or if there are few jobs available for those with secondary education period. Our results suggest it is the former not the latter: there are enough jobs for secondary educated men, but they hoard them and manage to exclude competition from secondary-educated women.

Similarly, an occupational segregation explanation relies on a strong male dominance effect like the supply-side stigma explanation. But the IHDS results also demonstrate the multi-dimensionality of gender inequalities. White-collar jobs are sex segregated in parts of India both where mixed gender contacts are negatively sanctioned and where they aren't. A one-dimensional model of gender inequality underestimates this complexity and perhaps misunderstands the sources of occupational segregation itself. The IHDS results suggest that occupation sex segregation does not result from a *general* aversion to mixed sex interactions but from a more specific economic motivation to exclude women from these valued positions.

Recent studies in the Indian context have highlighted the importance of the demand side arguments (low demand for female labor given inadequate growth in sectors that employ women) in explaining low female labor force participation rates (such as Kapsos et al 2014, Chaudhury and Verick 2014, Klasen and Pieters 2015, Deshpande and Singh 2021). Our gender segregation explanation is consistent with growing awareness that the sectoral and occupational composition of the labor force are important demand-side determinants of women's labor force participation. But what past literature has failed to incorporate adequately is recognition of the gendered nature of labor demand. White-collar employment is not stigmatized for moderately educated Indian women; nor is this a small or declining share of labor demand. White-collar employment is unavailable to Indian women because they are excluded from those jobs because of their gender. It is the unusual male domination of white-collar work in India that produces the unusual U-shape curve of women's education with their labor force participation.

Our results indicate the need for more studies to evaluate the exact type of occupational and sectoral sex segregation that accounts for the non-linear education-employment relationship among Indian women. The predominantly male segregation of both white-collar occupations and public sector industries appears to account for much of the unexpectedly low employment of moderately educated Indian women. The results are less convincing for low levels of education (i.e., primary schooling), although even there, the negative education slopes would be far less negative without such male dominance of these white-collar, and, public sector jobs. Nevertheless, there may be sex segregation of other types of jobs that especially disadvantages women with only primary education.

While our analyses provide the first test of an association of sex segregation with the U-curve, it does not directly address the question of whether the male segregation of Indian white-collar work depresses educated women's employment or whether moderately educated women's lack of labor force participation produces the unusual male segregation of white-collar work. We suspect both processes are underway in a mutually reinforcing circle of sex segregation and low labor force participation. Analysts' inability to otherwise explain the low rates of educated women's employment (including our own efforts above), suggests that the low female participation rates are not a fully exogenous determinant of the male sex segregation of white-collar work.

The results also suggest the importance of understanding better the determinants of the unusual sex segregation of work in India. Theories of gender inequality and social stratification might imply that occupational sex segregation would be less prevalent in labor markets that are highly industrialized and where cultural contexts are marked by gender-egalitarian ideology (Goode 1963; Ramirez and Weiss 1979). But, often the structural traits of such countries namely 'large service sectors' and 'employee-based class structures' can weaken these unifying aspects and push towards a more occupationally segregated female

labor force (Charles 1992). Further, whether ideals of egalitarianism permeate the labor market could be mediated by ‘structure of interest articulation’ whereby corporatist systems show a greater predisposition towards segregation.

Breaking this cycle of sex segregation and women’s low labor force participation may require more aggressive policies of affirmative action favoring women in these occupations and industries (Klasen 2019). And more effective policies may also require more focused mobilization on the restrictive effects of sex segregation of white-collar work.

Men’s resistance to the integration of clerical work has been documented in more advanced economies (Bergmann 2011) even if ultimately their resistance proved fruitless. In India, men continue to dominate these jobs. More attention needs to be paid to the gendered nature of work and labor demand. The role of patriarchy in reducing women’s labor force participation is well recognized, but patriarchal norms are usually blamed for supply-side deficits in women’s labor force participation. Our contribution is to suggest that the influence of gender norms may be differential across the occupational structure. In India, it appears that white-collar work is especially subject to male opposition at the current moment, with unfortunate consequences for the labor force participation of moderately educated Indian women.

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