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The Evolution of Gender Gaps in India[§]

ABSTRACT   We examine the evolution of gender gaps in India between 1983 and 2010 in education, occupation choices, and wages. We find that the gaps have shrunk quite sharply between men and women in most indicators. Our examination of the wage gaps shows that gaps have declined across most percentiles of income groups including the 90th percentile. While convergence in measured attributes like education accounts for most of the decline in the gap in other income groups, the decline in the gender wage gap of the 90th percentile is unexplained with measured attributes predicting that the gap should have widened. The gaps have narrowed most sharply for the youngest cohorts in the workforce suggesting that measured gaps will decline even more sharply over the next two decades.

Keywords: *Gender Gaps, Convergence, Labor*

JEL Classification: *J6, R2*

1. Introduction

One of the biggest challenges that any country faces is in putting its productive resources to work. This process involves both inducing these resources to be offered for profitable employment and then matching them to their best use. The challenge is perhaps easiest to see in the context of putting a country's labor force to work. Consider the case of women in India. In 1983, barely 31 percent of Indian women in the working age group of 16–64 years chose to participate in the labor force. By 2005, this

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number had risen, but barely, to 40 percent. The corresponding numbers for men were around 94 percent. Of the women who did choose to participate in the workforce, how well were they prepared to embrace the challenges of finding work and contributing productively to their jobs? Amongst the Indian workforce that is illiterate, around one-third was women, both in 1983 and in 2005. At the other extreme, in 1983 barely 11 percent of workers with middle school or higher education were women. This number rose to 22 percent by 2005. On the employment side, in 1983 only 10 percent of white collar jobs in India were performed by women. This rose by a bare 5 percentage points to 15 percent in 2005.

To summarize, a large share of working age Indian women choose not to participate in the labor market. When they do, they find themselves very poorly trained with most of them having very little education. Consequently, most women workers end up working in low skill and low return agrarian jobs while the higher skill white collar jobs are typically performed by men. Starting with the basic premise that there are no innate differences between the genders in ability, these statistics tell a rather disheartening overall story of the allocation of talent in the country. They suggest large scale under-utilization of productive resources along with misallocation of labor inputs across occupations that potentially have serious productivity consequences for the country.

While the statistics cited above are disappointing, the period since 1983 has also seen sharp declines in the gender wage gap. The median male wage was 90 percent above the median female wage in 1983. By 2010, this premium had declined to about 50 percent. To put these numbers in perspective, in the US the median gender wage premium declined from 55 percent to 18 percent between 1979 and 2011 (see Kolesnikova and Liu 2011).[1] In China on the other hand, the gender gap has been reported to be rising over the past two decades. National surveys in China report that the average male-to-female wage mark-up has risen from 28 percent to 49 percent in urban areas and from 27 percent to 79 percent in rural areas between 1990 and 2010. The Indian performance is thus quite encouraging when expressed in this relative context.

In this paper, we examine the factors underlying the sharp decline in the gender wage gap. Did the gender wage gap fall across all income groups? Did it decline due to a decline in the gender gaps in the proximate determinants of wages such as education attainment rates and occupation choices

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1. The OECD average for the median wage premium of full-time male workers over their female counterparts in 2009 was 23 percent. There is a lot of variation though with the male premium varying from 35 percent in Austria and the Czech Republic to just around 5 percent in Italy.

of the workforce? We examine this using household level survey data from successive rounds of the National Sample Survey (NSS) from 1983 to 2010. The period since 1983 is a particularly interesting phase in India since it has been characterized by sharp macroeconomic changes. Whether such sharp macroeconomic changes have also coincided with better harnessing and allocation of talent in the country is a question of independent interest.

Our primary finding is that there has been broad-based and significant decreases in gender gaps across a number of indicators. Both education attainment rates and occupation choices of men and women have been broadly converging since 1983. Moreover, a large part of the decline in the gender wage gap is accounted for by convergence in these attributes of wages. We also find that the gender wage gap has declined across most of the income distribution. However, while for the 10th and 50th percentiles of the wage distribution, the decline in the gender wage gap was accounted for by convergence in measured attributes (primarily education), the gender wage convergence in the 90th percentile of the wage distribution was mostly due to unmeasured factors. Strikingly, changes in the measured attributes of this group tended to widen the gender wage gap. This effect is particularly strong in urban India which could reflect reductions in gender discrimination in urban areas though this requires more detailed investigation.

Our results on gender gaps suggest a general pattern of declining socio-economic gaps across a number of different groups in India over the past three decades. In Hnatkovska, Lahiri, and Paul (2012) and Hnatkovska, Lahiri, and Paul (2013), we have shown that gaps between scheduled castes and tribes and the rest have narrowed sharply since 1983 along a number of different indicators. Similarly, in Hnatkovska and Lahiri (2012) we have found an even sharper narrowing of socioeconomic gaps between rural and urban workers between 1983 and 2010. Taken together, our results suggest that the period since 1983 which has been marked by rapid economic transformation and growth in India has also been a period that has seen disadvantaged groups sharply reducing their large historical socioeconomic disparities relative to others.

We should note that inequality in society can be measured as within-group inequality or between-group inequality. Our approach in this paper as well as in Hnatkovska, Lahiri, and Paul (2012); Hnatkovska and Lahiri (2012); and Hnatkovska, Lahiri, and Paul (2013) focuses on between-group inequality. Our finding of declining inequality between groups in these papers is not inconsistent with findings of widening within-group inequality in India during some subperiods since 1983. It is plausible that there is more inequality within and less inequality across groups. More generally, the results suggest that greater work is required to determine the overall

pattern of inequality in India during the last 30 years of market-oriented reforms and growth take-off in India.

This paper is related to some existing literature on the gender difference in labor market outcomes in India. Tilak (1980) used survey data from East Godavari district of Andhra Pradesh analyzed the difference in return to education across gender in India. The paper provides evidence that gender wage gap is relatively less for higher education groups. Using survey data from the Lucknow district of Uttar Pradesh, Kingdon (1998) found that women face significantly lower economic rates of returns to education than men. Kingdon and Unni (2001) found that women face high level of wage discrimination in the Indian labor market using 1987–88 NSS data on Tamil Nadu and Madhya Pradesh. However, education contributes little to this wage disadvantage of women.

A key limitation of these studies is that they are concentrated in specific districts or states and do not produce national level estimates. Using national level "Employment and Unemployment" surveys of the NSS for the years 1983 and 1993, Duraisamy (2002) found that the returns to female post-primary education are higher than that for men in 1983 and also in 1993–94. A study by Bhaumik and Chakrabarty (2008) using 1987 and 1999 rounds of the NSSO employment–unemployment survey found that the gender wage gap narrowed considerably between years 1987 and 1999. The narrowing of the earnings gap was attributed largely to a rapid increase in the returns to the labor market experience of women. Using nationally representative data from India Human Development Survey (IHDS) 2005, Agrawal (2013) found that the wage differential between males and females can largely be attributed to discrimination in the labor market. Differences in endowments play a more prominent role in explaining wage difference between social groups.

Most of the papers in the gender gap literature in Indian context focused on average gap in male–female wages. Khanna (2012) analyzed whether male–female wage gap differs for different wage levels. Using data from the 2009–10 employment–unemployment schedule of the NSS, this paper shows that male–female wage gap is higher at the lower end of the wage distribution.

It is important to recognize at the outset that the focus of this paper is on the evolution of gender gaps amongst full-time workers in the workforce. This has two important consequences. First, the evolution of gender gaps amongst part-time workers is outside the ambit of the paper. While part-time workers are an important component of the workforce, the measurement issues surrounding this category are too serious to tackle within the confines

of this paper. Second, the paper is silent about the trends in the labor force participation decisions of women. This is a very important issue, not just for India but for all economies. Indeed, there is a significant amount of work in this area focusing on the USA and other industrial economies that has found evidence of a U-shaped pattern in the evolution of female labor-force participation rates with participation initially declining with development and rising later on in the development process. India too has seen a decline in the labor force participation rates (LFP) of women over the last 10 years. Whether or not this is part of the same syndrome that one has observed elsewhere in the West or is it due to some other India-specific factor which is something that deserves a paper on its own right. In this paper, we confine ourselves to summarizing some of this literature in a separate subsection.

The next section presents our results on education and occupation attainment rates and gender gaps in those indicators. Section 4 describes the evolution of gender wage gaps and their decomposition into measured and unmeasured attributes. In the last section conclusion has been given.

2. Empirical Regularities

Our data comes from successive quinquennial rounds of the NSS from 1983 to 2009–10. Specifically, we use rounds 38, 43, 50, 55, 61, and 66 of the employment and unemployment surveys of the NSS. Given our interest in labor market characteristics and outcomes, we restrict the sample to working age adults in the age-group 16–64 who belong to households with a male head of household, who are working full-time, and for whom we have information on their education and occupation choices.[2] While the overall NSS quinquennial surveys typically sample around 100,000 households (equivalently, around 460,000 individuals on average), our sample restriction reduces the sample to around 160,000 on average. Table 1 gives the demographic characteristics of the workforce. Clearly, men and women differ very marginally along these demographic characteristics.

Our primary interest lies in examining the evolution of gender gaps in India since 1983 along three dimensions: education, occupation, and wages. Given that education and occupation choices are two fundamental ingredients in wage outcomes, we start with a closer examination of patterns on these two indicators. Before proceeding we would like to address a potential

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2. We leave out female-led households from the analysis since these households are likely to be a typical in the generally patriarchal Indian family setup.

T A B L E 1 . Sample Summary Statistics

| | Males | | | | | Females | | | | |
	Age	SCST	Married	Sample share	Rural	Age	SCST	Married	Sample share	Rural
1983	35.55	0.25	0.79	0.79	0.75	33.69	0.36	0.85	0.21	0.86
1987–88	35.82	0.26	0.8	0.79	0.77	33.82	0.35	0.87	0.21	0.87
1993–94	36.11	0.27	0.8	0.79	0.75	34.62	0.35	0.86	0.21	0.86
1999–2000	36.27	0.28	0.8	0.76	0.74	35.22	0.38	0.88	0.24	0.86
2004–05	36.63	0.27	0.8	0.78	0.73	35.91	0.35	0.86	0.22	0.84
2009–10	37.68	0.28	0.81	0.81	0.71	36.71	0.36	0.86	0.19	0.81

Source: Compiled by authors.
Notes: This table reports summary statistics for the sample. The statistics are reported at the individual level.

concern regarding our sample selection. Given that we are going to analyze outcomes of those in the labor force, one might have legitimate concerns that our findings may be affected by changes in the gender composition of the labor force. This could occur if there were a differential changes in the proportion of women working full-time relative to men, in the LFP of women relative to men or in the relative employment rates of women during the sample period. Figure 1 shows the ratio of male to female rates in labor force participation, employment, full-time workers, and part-time workers. The key point to note is that there are no clear trends in any of these ratios which suggests that our finding are unlikely to be driven by gender-based differential changes in the participation rates.

F I G U R E 1 .   Gender Gaps: Labor Market Participations Rates
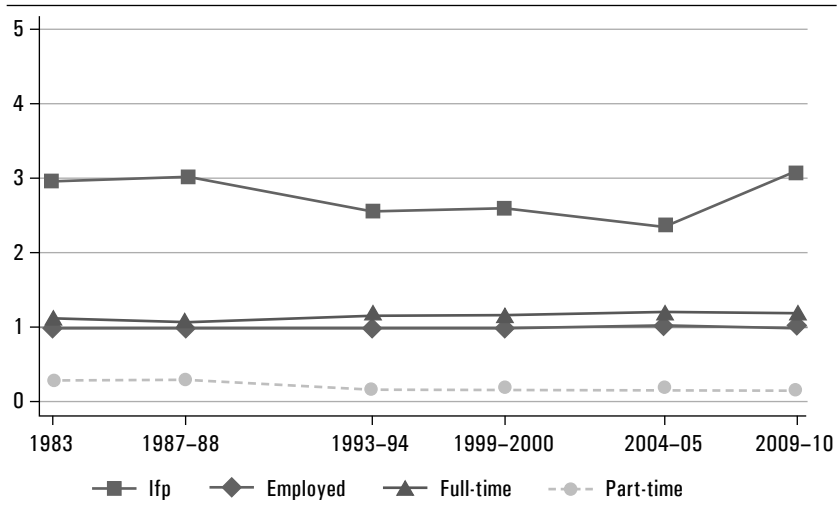
Source: Compiled by authors.

The characteristics of the workforce in terms of their labor force participation choices and outcomes may differ across the genders along a number of other margins. One key factor of interest is potential differences between rural and urban workers. With a large majority of workers still living in rural India, it is important to document any differences in labor force behavior between these two sectors. Table 2 describes the gender differences in the labor force characteristics of workers broken down by rural and urban workers. The key variables we report are LFP, proportion of workers working full time (FULL), proportion working part-time (PART), proportion self-employed (SELF), and proportion unemployed (UNMP).

T A B L E   2 .   Labor Market Characteristics by Gender: Rural and Urban Workers

Panel a: Rural

	Male					Female				
Round	LFP	FULL	PART	SELF	UNMP	LFP	FULL	PART	SELF	UNEMP
1983	0.9365	0.9578	0.0422	0.6131	0.0354	0.3567	0.8557	0.1443	0.6001	0.0438
1987–88	0.9417	0.966	0.034	0.5844	0.0396	0.3449	0.8965	0.1035	0.5692	0.0412
1993–94	0.9512	0.9665	0.0335	0.5836	0.0291	0.4188	0.8246	0.1754	0.614	0.0298
1999–2000	0.9439	0.9626	0.0374	0.5561	0.0365	0.4163	0.8323	0.1677	0.5927	0.0351
2004–05	0.9528	0.9567	0.0433	0.5873	0.0354	0.4557	0.7912	0.2088	0.6661	0.0398
2009–10	0.9511	0.97	0.03	0.5361	0.0297	0.3477	0.8127	0.1873	0.5849	0.0357

Panel b: Urban

	Male					Female				
Round	LFP	FULL	PART	SELF	UNMP	LFP	FULL	PART	SELF	UNEMP
1983	0.9352	0.977	0.023	0.3941	0.06	0.1819	0.8933	0.1067	0.412	0.0808
1987–88	0.9345	0.9834	0.0166	0.4026	0.0614	0.1877	0.9162	0.0838	0.4213	0.0984
1993–94	0.9366	0.9858	0.0142	0.4074	0.0467	0.2173	0.8634	0.1366	0.4515	0.0901
1999–2000	0.9275	0.984	0.016	0.4015	0.0518	0.1981	0.8745	0.1255	0.4453	0.0781
2004–05	0.931	0.9808	0.0192	0.4396	0.0475	0.2383	0.8561	0.1439	0.4957	0.092
2009–10	0.9279	0.9876	0.0124	0.4085	0.0302	0.198	0.8804	0.1196	0.4217	0.079

Source: Compiled by authors.
Notes: This table reports the labor force characteristics of men and women separately for rural and urban workers. LFP indicates Labor Force Participation rates, FULL is proportion of workers working full-time, PART are proportions of part-time workers, SELF indicate proportion of self-employment and UNEMP denotes the unemployment rate.

The numbers in the table show that the patterns are similar for rural and urban workers on most measures. The two key features worth noting are: (a) in both rural and urban areas women are more likely to be working part-time relative to their male counterparts and (b) LFP are higher for rural women relative to urban women. In terms of our focus on full-time workers in the analysis below, the key point that we would like to emphasize is that the composition of full-time and part-time workers has not changed much across gender lines during the sample period.

2.1. Education Attainment

Education attainments of sampled individuals in the NSS survey are reported as categories: Illiterate, Primary, Secondary, etc. While we use the category level information for our analysis further in the text, we also generated statistics on years of education by converting the categories into years of education. This conversion allows us to represent the trends in a more parsimonious manner. The details of the mapping from education categories to years of education are given in the appendix.

Table 3 reports the average years of education of the male and female workforce in India across all the rounds. While the average worker had just three years of education in 1983, the disparity between men and women workers was even more dramatic with men having on average around

T A B L E   3 .   **Education Gaps: Years of Schooling**

	Average years of education			Relative
	Overall	*Male*	*Female*	*educational gap*
1983	2.99	3.54	0.93	3.83***
	(0.01)	(0.01)	(0.02)	(0.08)
1987–88	3.19	3.75	1.15	3.25***
	(0.01)	(0.01)	(0.02)	(0.06)
1993–94	3.82	4.42	1.55	2.86***
	(0.01)	(0.02)	(0.02)	(0.04)
1999–2000	4.32	5.05	2	2.53***
	(0.02)	(0.02)	(0.03)	(0.04)
2004–05	4.82	5.44	2.64	2.06***
	(0.02)	(0.02)	(0.03)	(0.02)
2009–10	5.71	6.21	3.59	1.73***
	(0.03)	(0.03)	(0.06)	(0.03)

Source: Compiled by authors.

Notes: This table presents the average years of education for the overall sample and separately for males and females; as well as the gap in the years of education. The reported statistics are obtained for each NSS survey round which is shown in the first column. Standard errors are in parenthesis.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

3.5 years of education while women had less than a year's schooling! The relative gap in years of education between men and women of the Indian workforce was almost 4. By 2010, the situation had improved, albeit slightly. The relative gap had declined to about 1.7 with men having on average about 6.2 years of schooling while women had 3.6 years. There clearly has been some decline in the education gender gap.

The evidence on years of education does not reveal where and how the catch-up in education levels has been occurring. Did the decline in the gender gap in years of education happen primarily due to women moving out of illiteracy or due to more women moving past middle and secondary school? This question is important since the addition of a year of education is likely to have very different effects depending on what kind of education is that extra year acquiring. We collect the education levels reported in the NSS survey into five categories: illiterate (Edu1), some education (Edu2), primary (Edu3), middle (Edu4), and secondary, and above (Edu5). The last category collects all categories from secondary and above. Given the relatively limited representation of workers in some of the higher education categories at the college and beyond, this allows a relatively even distribution of individuals across categories.
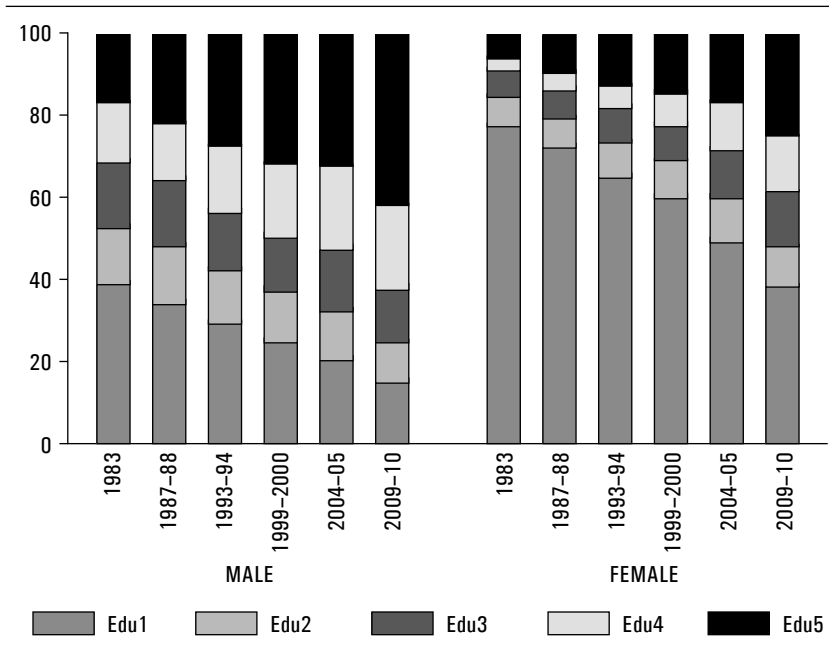
Panel (a) of Figure 2 shows the distribution of men by education category on the left and the corresponding distribution of women. The figure illustrates the direness of the education situation in India. In 1983, 70 percent of male workers had primary or below education levels while the corresponding number for women workers was 90 percent! The period since then has witnessed improvements in these with the proportion of men with primary or lower education level declining to 40 percent by 2010 while for women it fell to around 60 percent. At the other end of the education spectrum, in 1983 around 15 percent of men and 5 percent of women workers had secondary or higher education levels. By 2010, the share of this category had risen to 40 percent for men and 25 percent for women.

Panel (b) of Figure 2 looks at the change in the share of women in each education category over time. The figure makes clear that women have been increasing their share in every education category except for Edu1 (illiterate) where the share has stayed unchanged. The fastest rise in the share of women occurred in education categories 2, 3, and 4 (some education, primary, and middle school). Overall, the figure suggests that the education catch-up has been fairly uniform across categories.
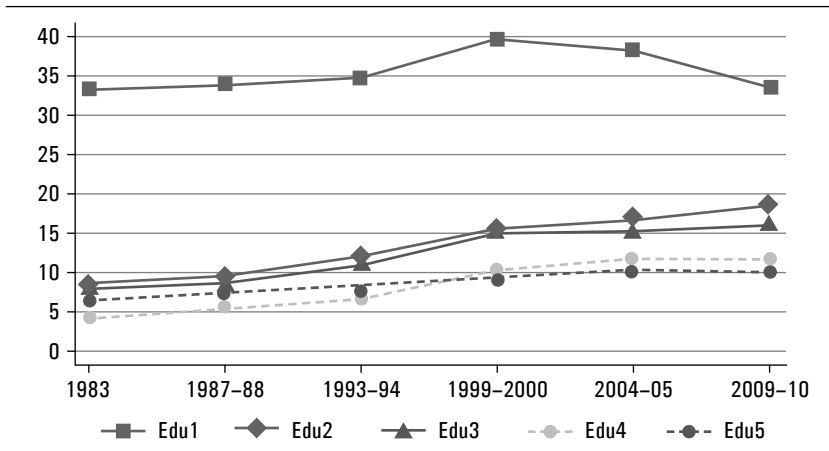
Are the measured narrowing of the gender education gaps as suggested by the data on years of education as well as categories of education

F I G U R E   2 .   **Distribution of Workforce across Education Categories**

(a) Distribution of workforce across edu (Overall)

(b) Share of women in educational categories

Source: Compiled by authors.

Notes: Panel (a) of this figure presents the education distribution of each gender into the different education categories. Panel (b) shows the share of women in all workers in each category.

statistically significant? We examine this by estimating an ordered probit regression of education attainment (measured by education category) on a constant and a female dummy. We do this for each sample round. Table 4 gives the marginal effect of the female dummy in each round, the changes in the marginal effect across specified rounds as well as the statistical significance of the estimates. Corroborating the visual impressions in Figures 1 and 2, the estimates indicate that being female significantly increased the probability of being illiterate and significantly reduced the probability of being in all other education categories in 1983. Over the subsequent 27 years, this over-representation of females amongst illiterate workers and under-representation in other categories declined for all categories except for the secondary and above category. Moreover, the changes over time were statistically significant.[3]

In summary, our review of the education attainment levels of men and women in the Indian labor force suggests that gender gaps in education have declined significantly over the past three decades though the absolute levels of education in the country remain unacceptably low. Additionally, while more women are joining the labor force with secondary school or higher education, they have been not done this fast enough to consistently raise their share of secondary and above educated workers. This partly also be reflecting the fact that secondary educated women in India are still not joining the labor force at high enough rates.

2.2. Occupation Choices

Our next indicator of interest is the occupational choice of the workforce. Specifically, we want to examine differences in the occupational choices between men and women workers in the workforce and how those differences have evolved over time. We use the three-digit occupation classification reported in NSS and aggregate them into three broad occupational categories—Occ1:*white-collar* occupations like administrators, executives, managers, professionals, technical, and clerical workers; Occ2: *blue-collar* occupations such as sales workers, service workers and production workers; and Occ3: *agrarian* occupations which collects farmers, fishermen, loggers, hunters, etc.

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3. We should note that the marginal effect of the female dummy measures its effect on the absolute gap between the probability of that category between the genders. Hence, this is different from the relative gap numbers reported in Figure 2 which reports trends in the relative gap in the probabilities. This explains the difference in our results for the convergence patterns in Edu5 category in Figure 2 and Table 4.

T A B L E 4 . Marginal Effect of Female Dummy on Education Categories

	Panel a. Marginal effects of female dummy						Panel b. Changes	
	1983	1987–88	1993–94	1999–2000	2004–05	2009–10	1983–2005	1983–2010
Edu 1	0.3760***	0.3641***	0.3582***	0.3460***	0.3011***	0.2482***	-0.0749***	-0.1278***
	(0.003)	(0.003)	(0.0035)	(0.0036)	(0.004)	(0.0062)	(0.005)	(0.0069)
Edu 2	-0.0607***	-0.0531***	-0.0367***	-0.0180***	0.0008*	0.0165***	0.0615***	0.0772***
	(0.001)	(0.0009)	(0.0008)	(0.0006)	(0.0005)	(0.0006)	(0.0011)	(0.0012)
Edu 3	-0.0971***	-0.0879***	-0.0648***	-0.0460***	-0.0335***	-0.0099***	0.0636***	0.0872***
	(0.0012)	(0.0011)	(0.001)	(0.0009)	(0.0009)	(0.0009)	(0.0015)	(0.0015)
Edu 4	-0.0935***	-0.0851***	-0.0884***	-0.0883***	-0.0790***	-0.0555***	0.0145***	0.038***
	(0.0011)	(0.001)	(0.0011)	(0.0012)	(0.0013)	(0.0018)	(0.0017)	(0.0021)
Edu 5	-0.1247***	-0.1380***	-0.1683***	-0.1937***	-0.1895***	-0.1992***	-0.0648***	-0.0745***
	(0.0011)	(0.0011)	(0.0014)	(0.0018)	(0.0021)	(0.004)	(0.0024)	(0.0041)
N	164979	182384	163126	173309	176968	133926		

Source: Compiled by authors.

Notes: Panel (a) reports the marginal effects of the female dummy in an ordered probit regression of education categories 1 to 5 on a constant and a female dummy for each survey round. Panel (b) of the table reports the change in the marginal effects over stated periods and over the entire sample period. N refers to the number of observations. Standard errors are in parenthesis.

* p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01.

Figure 3 shows the key features of the occupation distribution patterns of the workforce broken down by gender. Panel (a) shows the distribution of the male workforce across the three occupation categories and the corresponding distribution of female members of the workforce. The two graphs in panel (a) clearly show a robust pattern of occupational churning in the entire labor force: workers of both genders have been switching out of agrarian occupations. The share of agriculture in male full-time employment declined from around 50 percent in 1983 to 30 percent in 2010. Correspondingly, the share of agriculture in female full-time employment also fell, albeit more tepidly, from 70 to 55 percent during the same period. The share of blue-collar employment for males rose from around 40 to 50 percent while that of white-collar employment rose from 10 to around 20 percent. Women, by contrast, saw blue-collar employment's share in their total employment in 2010 rise slightly above its 1983 level of just under 25 percent. White collar employment of women however rose sharply from 5 to just under 20 percent between 1983 and 2010.

Panel (b) of Figure 3 shows the share of women in total full-time employment in each occupation. Note that this is in contrast to Panel (a) which showed the share of each occupation in total full-time female employment. The most visible change in the share of women is in Occ1 which is white-collar employment where women's share has increased from 10 to 15 percent between 1983 and 2010. The share of women in total employment in the other two occupations has not changed much during this period.

The trends documented above suggest that women have been changing occupations during this period. Has this resulted in a decline in the gender disparities in the occupation distribution of the labor force? We answer this question by running a multinomial logit regression of occupational choice on a constant and a female dummy for each round. We then compute changes in the effect of the female dummy across the rounds. Table 5 shows the results. In a confirmation of the visual suggestion previously, in 1983 being female significantly increased the probability of being employed in agriculture while significantly reducing the probability of employment in blue and white collar jobs (Occ2 and Occ1, respectively). While this basic pattern has not changed between 1983 and 2010, the negative marginal effect of the female dummy on the probability of white-collar employment declined significantly during this period indicating that there was statistically significant reduction in the under-representation of women in these occupations during this period. The other two broad occupation categories however, showed a worsening of the initial disparity of representation with the over-representation of women in agricultural employment and under-representation in blue-collar occupations marginally worsening between 1983 and 2010.

F I G U R E 3 .   **Distribution of Workforce across Occupation Categories**

(a) Distribution of workforce across Occ (Overall)
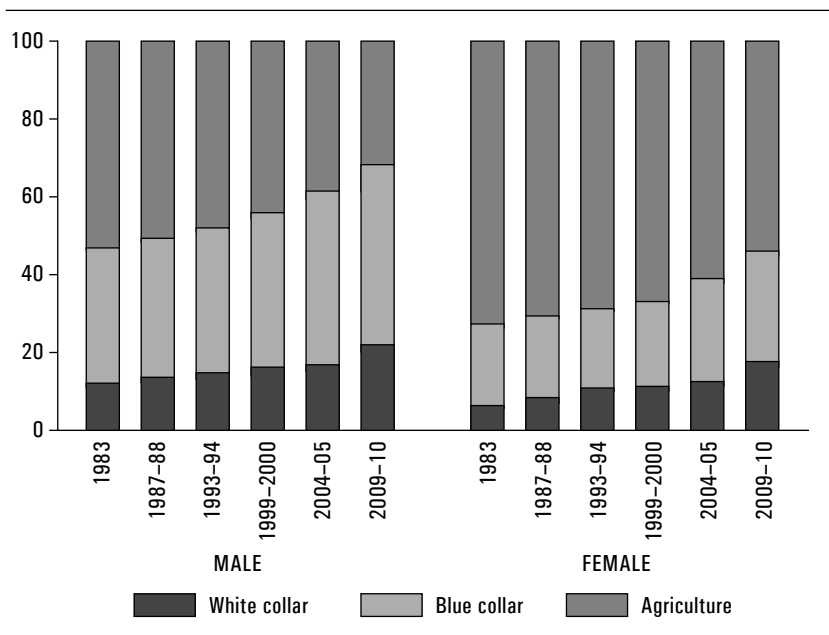
(b) Share of women in occupational categories
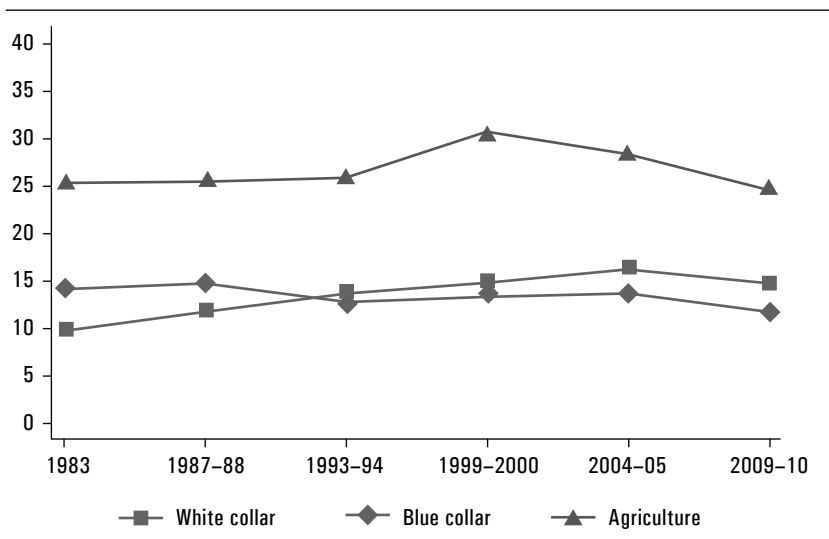
Source: Compiled by authors.

Notes: Panel (a) of this Figure presents the occupation distribution of each gender into the different occupation categories. Panel (b) shows the share of women in each category.

TABLE 5. Marginal Effect of Female Dummy on Occupational Categories

	Panel a. Marginal effects of female dummy						Panel b. Changes	
	1983	1987–88	1993–94	1999–2000	2004–05	2009–10	1983–2005	1983–2010
Occ1	-0.0564***	-0.0488***	-0.0407***	-0.0512***	-0.0370***	-0.0394***	0.0194***	0.017***
	(0.0016)	(0.0015)	(0.002)	(0.0022)	(0.0024)	(0.004)	(0.0029)	(0.0043)
Occ2	-0.1172***	-0.1155***	-0.1481***	-0.1756***	-0.1670***	-0.1592***	-0.0498***	-0.042***
	(0.0031)	(0.0031)	(0.0031)	(0.0034)	(0.0037)	(0.0055)	(0.0048)	(0.0063)
Occ3	0.1736***	0.1644***	0.1888***	0.2268***	0.2040***	0.1986***	0.0304***	0.025***
	(0.0033)	(0.0033)	(0.0035)	(0.0037)	(0.0041)	(0.0064)	(0.0053)	(0.0072)
N	164979	182384	163126	173309	176968	133926		

Source: Compiled by authors.

Note: Panel (a) of the table presents the marginal effects of the female dummy from a multinomial probit regression of occupation choices on a constant and a female dummy for each survey round. Panel (b) reports the change in the marginal effects of the rural dummy over the relevant time periods. Agrarian jobs is the reference group in the regressions. N refers to the number of observations. Standard errors are in parenthesis. * p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01.

In summary, our review of the trends in the disparity between the genders in their occupation distribution suggests a mixed picture. On the positive side, women have been moving out of agricultural jobs into blue- and white-collar jobs thereby behaving like their male counterparts in the workforce. However, in terms of the share of women in the different occupations, only white-collar jobs have seen a significant expansion of the share of women while the under-representation in blue-collar jobs and over-representation in agrarian jobs has increased. This latter effect suggests to us that women have been moving out of agricultural jobs and into blue-collar jobs at a slower rate than their male counterparts.

3. Wage Outcomes and Gender Differences

We now turn our attention to the third indicator of interest—gender gaps in wages. In terms of background, it is worth reiterating that the two key determinants of wages of individual workers are their education levels and the occupations that they choose. In the previous section, we have shown that gender gaps in education have tended to narrow for all but the highest education groups. This trend is likely to be a force toward raising the relative wage of women. We have also shown that women's share of employment has only increased in white-collar occupations. In as much as women are getting disproportionately more represented in agricultural and blue-collar jobs, one might expect this force to lower the relative wage of women if these occupations pay relatively lower wages. Clearly, there are offsetting underlying forces here.

The NSS only reports wages from activities undertaken by an individual over the previous week (relative to the survey week). Household members can undertake more than one activity in the reference week. For each activity we know the "weekly" occupation code, number of days spent working in that activity, and wage received from it. We identify the main activity for the individual as the one in which he spent maximum number of days in a week. If there are more than one activities with equal days worked, we consider the one with paid employment (wage is not zero or missing). Workers sometimes change the occupation due to seasonality or for other reasons. To minimize the effect of transitory occupations, we only consider wages for which the weekly occupation code coincides with usual occupation (one year reference). We calculate the daily wage by dividing total wage paid in that activity over the past week by days spent in that activity.

Figure 4 shows the evolution of the gender wage gaps since 1983. Panel (a) shows the mean and median wage gaps across the rounds, while Panel (b) shows the wage gap across all percentiles for three different years: 1983, 2004–05, and 2009–10. Two points are worth noting from the figure. First, the gender wage gap has shrunk secularly since 1983 for all groups except the very richest groups. In other words, the decline in the gender wage gap has been broad-based and inclusive. Second, there has been a very sharp decrease in the gender wage gap between 2004–05 and 2009–10. Uncovering the reasons behind this phenomenon is interesting in its own right.

Are the measured decreases in the wage gap statistically significant? We test this by running regressions of the log wage on a constant, a female dummy, and controls for age and age squared (to control for potential lifecycle differences between men and women related to their labor supply choices). We run the regression for different quantiles as well as for the mean.[4] Table 6 shows the results. The regression results show that the decline in the wage gaps were significant for all income groups except the 90th percentile for whom there was no significant change in the wage gap between 1983 and 2010. Moreover, they also a statistically significant decrease in the wage gap between 2004–05 and 2009–10.

So, what is driving the wage convergence between the genders? Specifically, how much of the decrease in the gender wage gap is due to convergence in measured attributes of workers? To understand the time-series evolution of the gender wage gaps, we use the Oaxaca-Blinder decomposition technique to decompose the observed changes in the mean and quantile wage gaps between 1983 and 2010 into explained and unexplained components as well as to quantify the contribution of the key individual covariates. We employ ordinary least-squares (OLS) regressions for the decomposition at the mean, and recentered influence function (RIF) regressions for decompositions at the 10th, 50th, and 90th quantiles.[5] Our explanatory variables are demographic characteristics such as individual's age, age squared, caste, and geographic region of residence. Additionally, we control for the education level of the individual by including dummies for education categories.[6]

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4. We use the RIF regressions developed by Firpo, Fortin, and Lemieux (2009) to estimate the effect of the female dummy for different points of the wage distribution.

5. The inter-temporal decomposition at the mean is in the spirit of Smith and Welch (1989). All decompositions are performed using a pooled model across men and women as the reference model. Following Fortin (2006), we allow for a group membership indicator in the pooled regressions. We also used 1983 round as the benchmark sample.

6. We do not include occupation amongst the explanatory variables since it is likely to be endogenous to wages.

F I G U R E 4 .   **Gender Wage Gaps Since 1983**

(a) Relative wage gap

Mean gap   Median gap
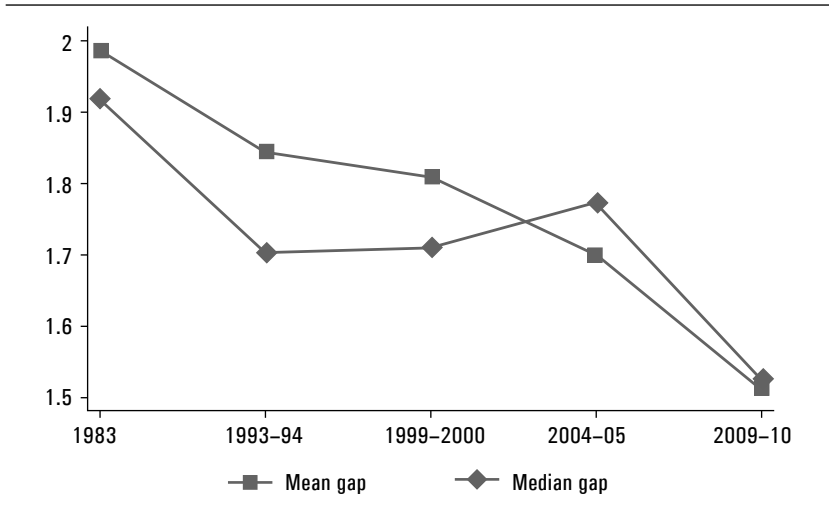
(b) Log ratio of male to female wages

1983   2004–05   2009–10

Source: Compiled by authors.
Notes: Panel (a) of this figure presents the relative male to female wage for full-time workers. Panel (b) shows the log ratio of male to female wages for each percentile.

TABLE 6. Changes in the Gender Wage Gap

	Panel A: Female dummy coefficient					Panel B: Changes	
	1983	1993–94	1999–2000	2004–05	2009–10	1983–05	1983–10
10th Perc	-0.8851***	-0.6020***	-0.4727***	-0.7737***	-0.6035***	0.1114***	0.2816***
	(0.0193)	(0.0157)	(0.0129)	(0.0199)	(0.0277)	(0.0277)	(0.0338)
50th Perc	-0.6872***	-0.6064***	-0.6115***	-0.5164***	-0.3690***	0.1708***	0.3182***
	(0.0097)	(0.0089)	(0.009)	(0.0086)	(0.0112)	(0.013)	(0.0148)
90th Perc	-0.3543***	-0.3506***	-0.4141***	-0.4073***	-0.3841***	-0.0530***	-0.0298
	(0.01)	(0.0132)	(0.0184)	(0.0235)	(0.0354)	(0.0255)	(0.0368)
Mean	-0.6604***	-0.5641***	-0.5810***	-0.5777***	-0.4622***	0.0827***	0.1982***
	(0.0083)	(0.0095)	(0.0095)	(0.01)	(0.0139)	(0.013)	(0.0162)
N	63981	63364	67322	64359	57339		

Source: Compiled by authors.

Notes: Panel (a) of this table reports the coefficient on the female dummy in a regression of log wages on a constant, a female dummy and controls for age (age and age squared). Panel (b) reports changes in the coefficient across the relevant rounds. N refers to the number of observations. Standard errors are in parenthesis. * p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01.

The results of the Oaxaca-Blinder decomposition exercise are reported in Table 7. The table shows that all of the gender wage convergence for the median and around 75 percent of it for the mean can be accounted for by measured covariates. For the 10th percentile measured covariates explain around 50 percent of the observed convergence. Encouragingly, convergence in education was a key contributor to the observed wage convergence for all these groups.[7] The convergence at the 90th percentile between 1983 and 2010 however cannot be explained by measured covariates. In fact, the observables covariates of wages predict that the gender wage gap should have actually widened rather than narrowed The source of the wage convergence at the 90th percentile is thus a puzzle as it is almost entirely unexplained.

T A B L E 7 .   **Decomposition of the Changes in the Wage Gap**

|	Measured gap	Explained	Unexplained	Explained by education
	Change (1983 to 2009–10)			
10th Perc	–0.1220***	–0.0638***	–0.0582**	–0.0241***
	(0.0267)	(0.0097)	(0.0273)	(0.0078)
50th Perc	–0.2102***	–0.2452***	0.0349	–0.1378***
	(0.0287)	(0.0143)	(0.0257)	(0.0099)
90th Perc	–0.1665***	0.1484***	–0.3148***	0.0455*
	(0.0569)	(0.0352)	(0.0544)	(0.0259)
Mean	–0.2157***	–0.1512***	–0.0645***	–0.0891***
	(0.0169)	(0.0105)	(0.0158)	(0.0083)

Source: Compiled by authors.
Note: This table presents the change in the rural–urban wage gap between 1983 and 2009–10 and its decomposition into explained and unexplained components using the RIF regression approach of Firpo, Fortin, and Lemieux (2009) for the 10th, 50th and 90th quantiles and using OLS for the mean. The table also reports the contribution of education to the explained gap (column iv). Bootstrapped standard errors are in parenthesis. * p-value < 0.10, ** p- value < 0.05, *** p-value < 0.01.

To gain greater perspective on the underlying forces driving the contraction in the gender wage gap, Panel (a) of Figure 5 shows the gender wage gaps by education category. Examining Panel (a) it is clear that the dispersion in the wage gap by education category has declined perceptibly since 1983. Moreover, gender wage gaps have declined sharply for groups with some education (edu2), primary education (edu3), and those with middle

7. As we show below, adding occupation choices to the list of explanatory variables does not significantly raise the share of the explained component in the observed wage convergence. This is not unusual. Blau and Kahn (2007) report that over 40 percent of the gender wage gap in the USA remains unexplained even after accounting for a rich set of explanatory variables including education, race, occupation, industry, union status, experience, etc.

F I G U R E 5 .   **Gender Wage Gaps by Education and Occupation Categories**

(a) Relative wage gap by education
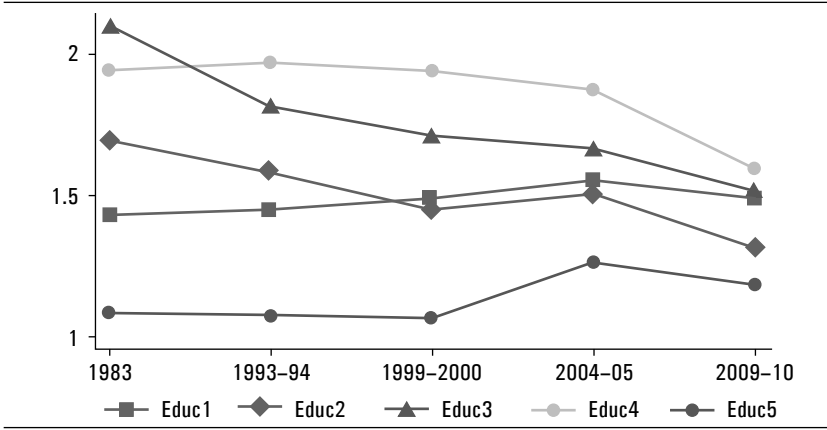
(b) Relative wage gap by occupation
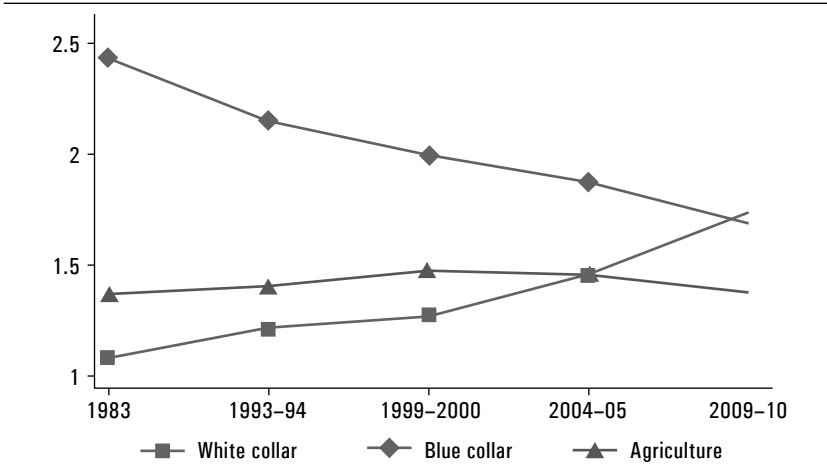
Source: Compiled by authors.

Notes: Panel (a) of this figure presents the relative male to female median wage gap by education category, while Panel (b) shows the median wage gap between men and women in different occupations.

school education (edu4) while increasing slightly for illiterates and those with secondary and above education. Since women have been increasing their representation in education categories 2, 3, and 4 while reducing their relative representation in categories 1 and 5, the behavior of the wage gaps by education category in Panel (a) of Figure 5 suggests why education accounts for a large part of the observed gender wage convergence.

Panel (b) of Figure 5 gives the median wage gaps by occupation category. The median wage gaps were the highest in blue-collar jobs (Occ2) and used

to be the lowest in white collar jobs (occ1) in 1983. By 2010, the wage gaps in these two occupations had converged while the wage gap in agrarian jobs remained relatively unchanged. Recall from Table 5 that between 1983 and 2010 women reduced their under-representation in white-collar occupations. At the same time their over-representation in agrarian jobs rose and the under-representation in blue-collar occupations worsened.

The effect of occupation choices on the wage gap is thus ambiguous. On the one hand, the movement of women towards white-collar occupations that had lower average wage gaps would have tended to lower the wage gap. The increased under-representation in blue-collar jobs, typically characterized by high gender wage gaps, would also tend to lower the overall wage gap as would the decline in the wage gap over time in that occupation. However, the increase in the wage gap in white-collar occupation over time would have had the opposite effect of widening the wage gap.

In summary, our results on wage outcomes of the workforce indicate that the gender wage gap has narrowed significantly across all percentiles except the very top of the income distribution. Most of this convergence was due to convergence in measured covariates of wages. Additionally, there has been a very sharp convergence in male and female wages between 2004–05 and 2009–10. While the reasons behind this require more careful examination, our preliminary examination of the issue suggests that a narrowing of the gender gap in education was a key contributing factor. It is tempting to attribute the convergence to factors such as the National Rural Employment Guarantee Program (NREGA) which guarantees 100 days work in the off-season to every rural household. However, we do not believe that our results are driven by NREGA for a couple of reasons. First, as Figure 4 illustrates clearly, the convergent trends pre-date the introduction of NREGA (which was only introduced in 2006). Second, the convergent patterns characterize both rural and urban areas whereas NREGA only applied to rural areas. Clearly, some factors that were common to both rural and urban areas are likely to have been at play rather than a rural India specific program like NREGA.

4. The Young

The trends we have documented above do suggest significant narrowing in gender gaps across multiple categories. However, a key reason for examining these trends is to also anticipate what one might expect to see over the next couple of decades in terms of gender disparities. While forecasting such

trends are very difficult, one measure which usually provides windows into future trends would be the trends in the gender gaps of the young workers.

To probe this more closely, Figure 6 shows that the primary force driving the catch-up in education is the increasing education levels of younger cohorts. Thus, in 1983 the relative gender gap in years of education between men and women workers aged 16–22 was three. By comparison, in 2005, the education gap was 1.4 for the 17–23 year old cohorts who were born between 1982 and 1988. Clearly the gap is lower for younger birth cohorts.

We take a closer look at the gaps amongst younger workers by concentrating on the characteristics of 16–25 year olds in each survey round. We start with education. Figure 7 reports the years of education of the 16–25 year olds in every survey round broken down by females and males and by rural and urban. As can be seen from the figure, young workers in the 16–25 age group have been increasing their years of education in both rural and urban India. Moreover, in both areas the gap between men and women has narrowed sharply. Perhaps, most impressively, in 2010, women workers in urban areas had more years of education on average than their male counterparts. Even in rural India, in 2010 the gap was just above one year for this group. These trends suggest that over the next two decades, the gender gap in education should become very small. These trends would get even stronger as more and more educated women begin participating in the labor force.
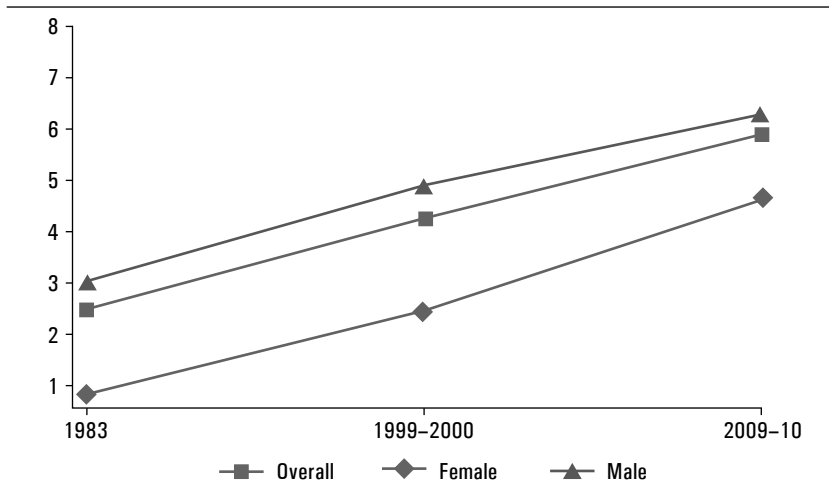
F I G U R E 6 . **Education Gaps in Years by Birth Cohorts**
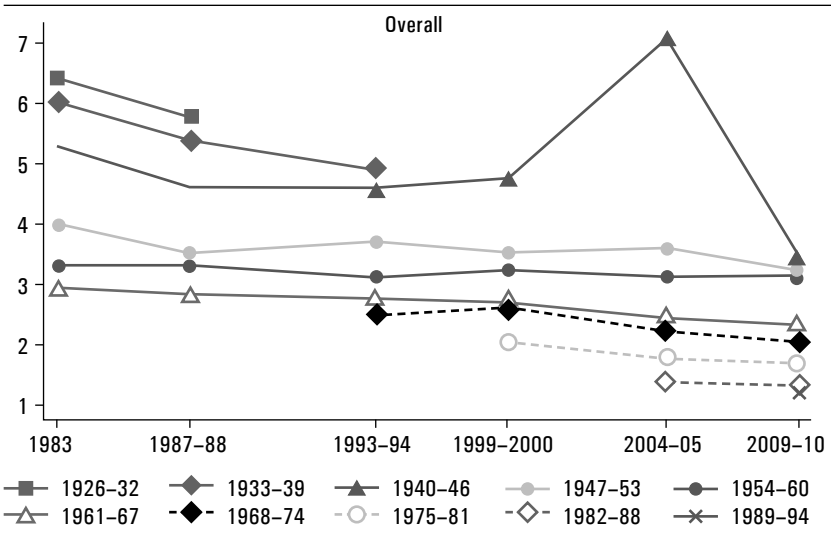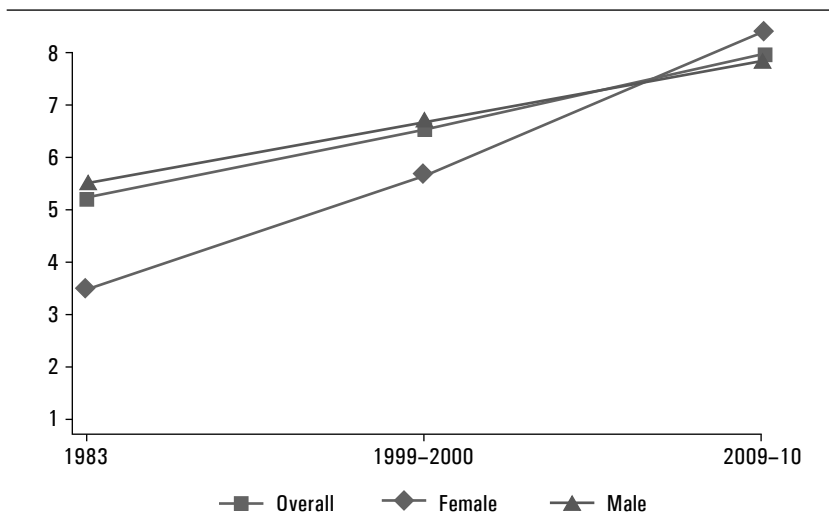

Source: Compiled by authors.

F I G U R E 7 .   Gap in Years of Education: 16–25 Year Olds

(a) Years of education of age-group 16–25 (Rural)

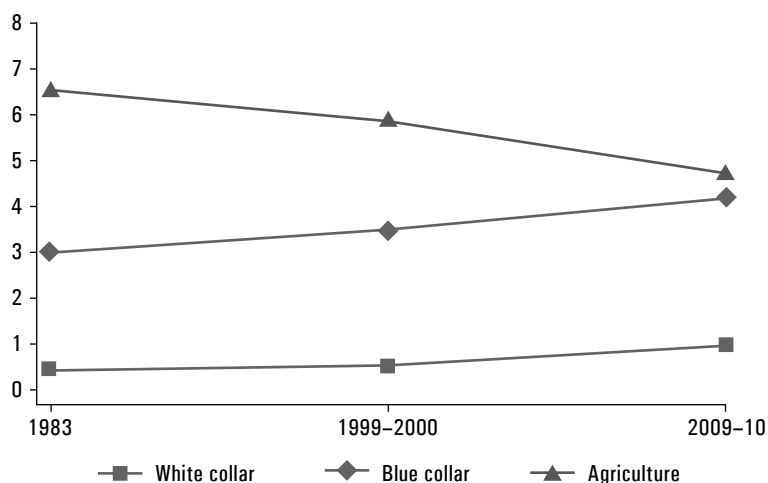(b) Years of education of age-group 16–25 (Urban)

Source: Compiled by authors.
  Note: Panel (a) of this figure presents the years of education of female workers in the 16–25 age cohort across the six survey rounds. Panel (b) shows the corresponding figures for male workers aged 16–25.

How have the 16–25 year olds been behaving in terms of their occupation choices? Are there significant differences between the genders on this dimension? Figure 8 shows the occupation choices of women (Panel a) and men (Panel b). The patterns are very similar for the two. The share

F I G U R E 8 . **Occupational Distribution of 16–25 Year Olds**

(a) Occupational distribution of age-group 16–25 (Males)

(b) Occupational distribution of age-group 16–25 (Females)
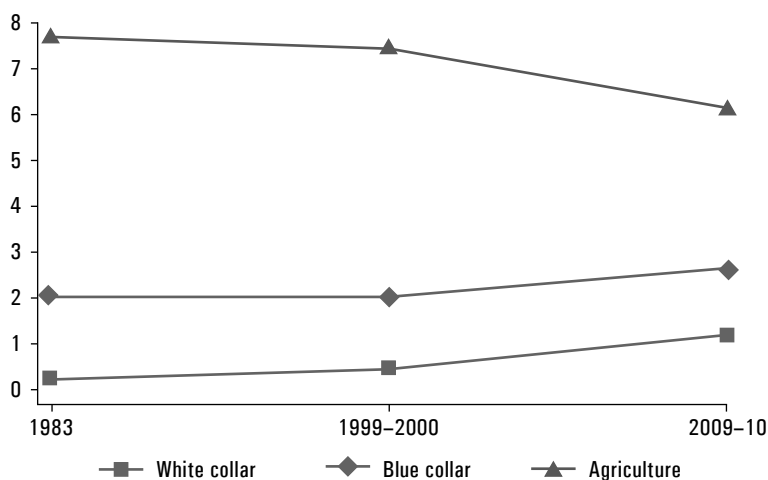
Source: Compiled by authors.

Notes: Panel (a) of this figure presents the occupation distribution of female workers in the 16–25 age cohort across the six survey rounds. Panel (b) shows the corresponding figures for urban male workers aged 16–25.

of agricultural occupation has declined, while the share of the other two occupations has risen for both men and women between 1983 and 2010. In terms of comparisons of the occupation distribution, by 2010, the share of the female workforce in the 16–25 age group that was engaged in white-collar jobs was marginally higher than the corresponding proportion for male workforce in the 16–25 age-group. On the other hand, while women in this age group have been switching out of agriculture into blue-collar occupations, their male counterparts in the same age group have been doing so at a faster rate. Consequently, even in 2010 almost 60 percent of young female workers were engaged in agrarian jobs while blue-collar jobs accounted for only 30 percent of their employment. The corresponding numbers for young male workers on the other hand were 50 percent and 40 percent, respectively. The key though is that the gaps have narrowed much faster for these younger workers as compared to their older counterparts.

The rapidly shrinking gender gaps amongst younger workers suggests to us that going forward gender gaps are likely to narrow even faster as more and more of the older cohorts drop out of the labor force and more younger cohorts with similar education and occupation choices replace them in the workforce.

5. Female Labor Force Participation

A number of existing studies found that a U-shaped relationship exists between female labor force participation and economic development (Fatima and Sultana 2009; Goldin 1995; Kottis 1990; Mammen and Paxson 2000). They argue that in low-income societies, women work on family farms or enterprises and thus female labor force participation is high. As society gets richer there is higher focus on industrialization. Thus, blue collar jobs become more important and woman's participation in the labor market falls accordingly. This can be explained by income effect arising from rising family income, incompatibility of factory work with child care and social stigma associated with working outside home. With further economic development, female labor force participation increases once again due to the expansion of higher education among females and the emergence of a white-collar jobs. The stigmas associated with jobs disappear overtime and at such advanced stages of development, the substitution effect on account of higher female wages dominates the income effect.

Empirical support for the U-hypothesis is primarily based on cross-country analysis (Cagatay and Ozler 1995; Mammen and Paxson 2000). Panel analyses, on the other hand, have produced mixed results. While Luci (2009) and Tam (2011) have argued that the U-shaped LFP hypothesis has support within countries over time, Gaddis and Klasen (2014) found that the evidence of a U-shaped relationship is weak and extremely sensitive to underlying data.

In the Indian context, there is mixed evidence on the U-shaped relationship. On the one hand, Olsen and Mehta (2006) found that a U-shaped relationship exists between female employment and educational status. Using 1999–2000 NSS data, they found that women with low education as well as those with university degrees more likely to work than middle educated women. Using panel data between 1983–2010 from the NSS, Lahoti and Swaminathan (2013) however did not find a significant relationship between level of economic development and woman's participation rates in the labor force. Female labor participation rates tend to also vary between rural and urban areas and across sub-rounds of the NSS data, as shown by Bardhan (1984).

As the discussion above makes clear, female labor force participation is a complicated subject that requires a separate paper on its own. We hope to return to this issue in future work.

6. Conclusion

Allocating talent is one of the major challenges for any country. It is an even bigger issue in rapidly developing economies with their changing economic structure. In this paper, we have examined one aspect of this talent allocation process by examining the evolution of gender gaps in India since 1983. The absolute differences between males and females in the Indian labor force are huge in a number of different indicators including education attainment rates, LFP, occupation choices, as well as wages. However, the gaps have narrowed along all these indicators in the last 27 years. Most encouragingly, the majority of the wage convergence is accounted for by measured covariates of wages, particularly education.

We believe that our results here, in conjunction with our previous work in Hnatkovska, Lahiri, and Paul (2012); Hnatkovska, Lahiri, and Paul (2013); and Hnatkovska and Lahiri (2012) on scheduled castes and tribes and rural–urban disparities, suggest that the past three decades have been a period of a sharp narrowing of historical inequalities between different segments of

the Indian workforce. Given that these gaps have narrowed most sharply for the youngest cohorts in the workforce particularly for education, we believe that labor market disparities between these groups will shrink even more rapidly over the next couple of decades.

Our study has ignored three key areas that can shed greater light on the evolution of gender gaps. First, our study has focused on aggregate India-wide trends. Given the huge variation in policies and outcomes across states in India since 1983, on profitable approach would be to exploit the cross-state differences to better identify the causal channels at work. This is a research approach that we hope to take in the future. Second, as we mentioned earlier, a fascinating topic that we have no addressed at all are trends in female LFP in India. This has first-order implications for gender disparities but comes with a host of data and conceptual issues that render a full-scale examination of it difficult in this paper.

Third, the past 30 years have also seen a sharp increase in measured productivity (both total factor productivity and labor productivity) in India. How much of this productivity increase can be attributed to better allocation of skills and talent by the labor market? Our previous work in Hnatkovska and Lahiri (2011) and Hnatkovska and Lahiri (2012) on caste gaps and rural–urban gaps suggest that aggregate productivity changes may have been crucial in driving the declining wage gaps across these groups. However, that work took the productivity changes as exogenous to labor market allocations. Depending on how much of a productivity effect there is from improved labor allocations, this may or may not be a good allocation. We intend to address these questions in future work.

References

Agrawal, T. 2013. "Gender and Caste-Based Wage Discrimination in India: Some Recent Evidence," *Journal for Labour Market Research,* 47 (4): 1–12.

Bardhan, P. 1984. *Land, Labor and Rural Poverty.* New York: Oxford University Press.

Bhaumik, S.K. and M. Chakrabarty. 2008. "Does Move to Market have an Impact on Earnings Gap Across Gender? some Evidence from India," *Applied Economics Letters*, 15 (8): 601–605.

Blau, F.D. and L.M. Kahn. 2007. "The Gender Pay Gap: Have Women Gone as Far as they can?" *The Academy of Management Perspectives*, 21(1): 7–23.

Cagatay, N. and S. Ozler. 1995. "Feminization of the Labor Force: The Effects of Long-Term Development and Structural Adjustment," *World Development*, 23(11): 1883–94.

Duraisamy, P. 2002. "Changes in Returns to Education in India, 1983–94: By Gender, Age-Cohort and Location," *Economics of Education Review*, 21(6): 609–22.

Fatima, A. and H. Sultana. 2009. "Tracing Out the U-Shape Relationship between Female Labor Force Participation Rate and Economic Development for Pakistan," *International Journal of Social Economics*, 36(1/2): 182–198.

Firpo, S., N.M. Fortin, and T. Lemieux. 2009. "Unconditional Quantile Regressions," *Econometrica*, 77(3): 953–73.

Fortin, N.M. 2006. "Greed, Altruism, and the Gender Wage Gap," Working Paper, University of British Columbia.

Gaddis, I. and S. Klasen. 2014. "Economic Development, Structural Change, and women's Labor Force Participation," *Journal of Population Economics*, 27(3): 639–81.

Goldin, C. 1995. "The U-Shaped Female Labor Force Function in Economic Development and Economic History." in T. P. Schultz, ed., *Investment in Women's Human Capital and Economic Development*, pp. 61–90. University of Chicago Press, Chicago, USA.

Hnatkovska, V. and A. Lahiri. 2011. "Convergence Across Castes," IGC Working Paper, International Growth Center.

———. 2012. "Structural Transformation and the Rural-Urban Divide," Working Paper, University of British Columbia.

Hnatkovska, V., A. Lahiri, and S. Paul. 2013. "Breaking the Caste Barrier: Intergenerational Mobility in India," *Journal of Human Resources*, 48(2): 435–73.

———. 2012. "Castes and Labor Mobility," *American Economic Journal: Applied Economics*, 4(2): 274–307.

Khanna, S. 2012. "Gender Wage Discrimination in India—Glass Ceiling Or Sticky Floor?" *Centre for Development Economics (CDE),* Working Paper No. 214, Delhi School of Economics, Delhi, India.

Kingdon, G.G. 1998. "Does the Labour Market Explain Lower Female Schooling in India?" *The Journal of Development Studies*, 35(1): 39–65.

Kingdon, G.G. and J. Unni. 2001. "Education and Women's Labour Market Outcomes in India," *Education Economics,* 9(2): 173–95.

Kolesnikova, N. and Y. Liu. (2011): "The Gender Pay Gap may be Much Smaller than most Think," *The Regional Economist*, 19(4): 14–15.

Kottis, A.P. 1990. "Shifts Over Time and Regional Variation in Women's Labor Force Participation Rates in a Developing Economy: The Case of Greece," *Journal of Development Economics*, 33(1): 117–32.

Lahoti, R. and H. Swaminathan. (2013): "Economic Growth and Female Labour Force Participation in India," *IIM Bangalore Research Paper*, 414, Banglalore, India.

Luci, A. 2009. "Female Labour Market Participation and Economic Growth," *International Journal of Innovation and Sustainable Development*, 4(2): 97–108.

Mammen, K. and C. Paxson. 2000. "Women's Work and Economic Development," *Journal of Economic Perspectives*, 14(4): 141–64.

Olsen, W. and S. Mehta. 2006. "A Pluralist Account of Labour Participation in India," *Global Policy Research Group* Working Paper, GPRG-WPS-042, Manchester, UK.

Smith, J.P. and F.R. Welch. 1989. "Black Economic Progress After Myrdal," *Journal of Economic Literature*, 27(2): 519–64.

Tam, H. 2011. "U-Shaped Female Labor Participation with Economic Development: Some Panel Data Evidence," *Economics Letters*, 110(2): 140–42.

Tilak, J. 1980. "Education and Labour Market Discrimination," *Indian Journal of Industrial Relations*, 16(1): 95–114.

Comments and Discussion

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I think the findings are generally plausible. Most of my comments are small and on details.

1. The paper talks about workers, but NSS data are actually on time disposition, in terms of person-days in the reference period, and distinguish between "usual status,""weekly status,"and "current daily status" (the estimates for participation in labor force, unemployment, etc. are usually different for these different statuses). It'll be useful to spell this out for the labor market characteristics discussed in the paper and if there are significant differences for the different statuses.

2. Why are workers in female-headed households left out?

3. There are many studies on female labor force participation rates, some using the NSS data. This paper should be linked to that literature. One would also like to have an analysis of LFP for rural and urban workers in terms of different expenditure groups, castes, manual or nonmanual jobs, etc. Female LFP in rural areas also varies significantly across seasons (NSS sub-rounds). Even if the female labor force participation issue is not handled in the paper some ideas on its possible link with the pattern of wage gap may be called for (e.g., if the pattern were U-shaped what implication does it have for the pattern of wage gap?)

4. Similarly, the analysis of the narrowing of gender education gaps could be controlled for expenditure group, caste, area of residence, etc.

5. I would suggest that in the occupational classification the "agrarian" occupation be subdivided into "self-employed" and "wage-employed" or cultivators and agricultural laborers, as these are large distinct categories.

6. Since a large number of women work only part-time, the Figure 3 for occupational categories may be done for part-time work (or subsidiary occupation categories) as well.

7. For the marginal effect of female dummy in Table 3 should be shown after controlling for household expenditure, caste, area, etc. Sometime

a woman's occupational choice (or whether she'll enter the labor force at all) may also depend on the employment or underemployment status of the males in the household.

8. Under-representation of women in blue-collar occupations may be related to education, and particularly to lack of opportunities for women in acquiring vocational skills and training. This may also be the reason why the median wage gaps were highest in blue-collar jobs.

9. The factors behind withdrawal of women from the labor force at an intermediate level of income and education (bringing about an S-shaped labor supply curve) observed in different parts of India may be associated with the under-representation of women in blue-collar job.

10. It makes sense to compare the wage rates of men and women, or of any two kinds of workers when the tasks are actually comparable. Changes in gaps of average wage rates for broad occupational categories may hide a lot of technological and demographic changes and may not reflect changes in gaps in task-specific wage rates.

11. One would like to know if the equality in male–female wage rates in NREGA had any effect at all on decrease in the gender wage gap. Even though the sharpest decrease may be in urban white-collar jobs and the decrease started prior to the onset of NREGA, it is worth checking if in the rural sector, controlling for education, NREGA has any effect on the wage gap for manual workers.

12. In the Oxaca-Blinder decomposition exercise in Table 7 the explanatory variables may also include availability of NREGA work, proximity to cities, indicators of general connectivity, etc.

13. Since there is plenty of evidence of a sharp regional pattern of gender disparity-related indicators (more in north and west India compared to south and east India), it may be interesting to break down the data by states.

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This paper contains some good news about the evolution of the Indian economy over the past three decades: gender gaps in the labor market have narrowed significantly, contrary to perceptions of rising inequality in general, and to the experience of the Chinese economy over a comparable

period. Authors' earlier work has shown a similar shrinking of caste gaps as well. Specifically, gender wage gaps for full time workers have fallen, particularly in the middle and bottom of the wage distribution. This can mostly be accounted for by falling gender gaps in education, and shifts in occupation structure away from manual to non-manual work (where wage gaps are narrower).

The authors suggest these facts reflect a better utilization of the economy's workforce, possibly contributing to the growth process. This argument is not fleshed out in any detail. They indicate toward the end of the paper that establishing the direction of causality needs further research. Implicitly, the main question of interest is therefore what the facts imply for progress in equity and fairness, and for India's performance on the dimension of gender empowerment (one of the UN Millenium development goals).

While they are careful not to interpret the facts in such broad terms, their results naturally invite a discussion along these lines. So let me venture forth in this direction, and state a number of qualifications that I would add to interpreting the facts as indicating substantial progress in reducing gender-based inequality.

First, the facts pertain only to convergence in wages and education. But other dimensions also matter. The authors discuss gender gaps in labor force participation, where progress has been less marked. Women's participation rates have risen only slightly, from 31 percent to 40 percent over this period. Moreover, since 2005, women's participation has fallen, consistent with the general tendency for a U-shaped pattern of women's participation with economic development. Moreover, the paper does not address gender gaps in health and nutrition or the problem of "missing women," where improvements have been less marked or altogether absent.

Second, there are qualifications owing to statistical problems. The paper focuses only on full-time workers. One expects a large part of the female workforce to be employed part-time. The data however shows less than 20 percent of rural working women were part-time workers, and less than 12 percent in urban areas. This seems to me suspiciously low, and poses questions about the way the NSS defines participation particularly for the part-time work. The authors argue the data shows no noticeable differences in trends of part-time work for men and women. Table 2 in the paper however shows the part-time rate for rural women rose from 14 percent in 1983 to 21 percent in 2005 and 19 percent in 2010, whereas for men it remained stationary around 4 percent in 1983 till 2005 and fell to 3 percent in 2010. There is also the problem of controlling for endogenous selection between full-time, part-time work and not working at all. For instance, those women

not experiencing the same relative wage gains may have dropped out or switched to part-time work, imparting an upward bias to the estimated convergence.

Third, there was a sharp increase in the wage gap in white collar occupations, and a less marked increase in the highest education category (see Figure 5)—contrary to the general tendency for wage gaps to narrow in other occupations and education categories.

Fourth, there are still many unobserved factors unaccounted for, so it is premature to make any inferences concerning trends in gender discrimination on the labor market. Factors not controlled for include experience, location, quality of human capital, intensity of labor supply, job assignments, and investment in skills. This is particularly true at the top end of the wage distribution, where education, occupation, and age fail to explain much of the observed narrowing. Indeed, controlling for age alone seems to make a considerable difference; while the raw data shows reduction in wage gaps at the 90th percentile, this disappears in Table 6 (Panel b, 1983–2010). Table 7 shows that observed attributes predict a 15 percent increase in the gap at the 90th percentile, as against an observed fall of 17 percent. Hence, unobserved factors accounted for a significant narrowing of the wage gap at the top. One can only speculate whether this reflects reduced discrimination—in an increasingly knowledge-based economy, one expects the relative importance of brains to brawn to rise, and accordingly gender gaps in wages to narrow. Set against this, the rising wage gap in white collar occupations represents a puzzle.

Finally, it is worth noting that substantial progress still remains to be made on the dimensions that have been documented in the paper. Wage and education gaps still remain large, there is yet a long way to go. Nevertheless, these qualifications aside, it is good to hear of substantial progress from truly abysmal disparities three decades ago.

General Discussion

T.N. Srinivasan felt that the authors need not have confined themselves to NSS quinquennial-round data from 1983 but could have also used the annual rounds, which have enough sample size at the national and major-state levels. Second, he also noted that Bardhan's suggestion that NSS definitions of usual status and daily status could both be used for measuring participation was not right: daily status was in person days, not persons, as the other definitions, and so not useable for the purposes of the paper unless we went into

time allocation details. He was also concerned that the wage information that the paper was using was most likely coming from the regular wage and salary category, which is less than 20 percent of the labor force, so it was not clear how to interpret that information from a relatively small portion of the total workforce. Third, he felt, like Bardhan, that female labor force participation is a joint, household level decision and may not be captured by individual, female, dummy-based analysis as done in the paper but may need household-level variables. Finally, regional analysis is very important. For example, in thinking of the demographic dividend, states with poorer education levels (and other concomitants of productivity) are likely to have a higher proportion of the young (due to higher fertility) in the emerging workforce, and so the dividend may not be so easily realized in such states. But this one could not tell without looking at the regional detail.

Mihir Desai pointed to the dramatic changes reported in the paper during 2004–05 and 2009–10, with a big drop in female labor force participation and major wage gains coming disproportionately in those five years. Was this due to NREGA, the rapid economic growth in at least the first half of that period, or something simply in the data that was leading to these distinctive results? This was an important question because the period is recent and the effect just in these five years so dramatic. Similarly, it would be useful to elaborate on the anomalous results on higher education not having an impact for females and second, for the 90th percentile, the measured values being very different from what one would expect.

Devesh Kapur asked if the paper had done its analysis by religion and within and cross castes, and if so, whether the gaps were occurring differentially across religions and castes or was it uniform across religions and castes. Second, as the male–female gaps decline, are these related as cause or consequence with fertility decisions? Finally, the share of services in GDP grew substantially relative to manufacturing during this period. Since manufacturing is a sector dominated by the male workforce and services may not be, is the increase in services contributing to the increase in female labor force participation and the decline in wage gap?

Rinku Murgai pointed out that, in looking at the 2011–12 NSS round, rural female labor force participation had again seen a sharp drop, whereas many people had thought that the decline between 2004–05 and 2009–10 was an anomaly, perhaps because 2009–10 was the worst drought year in four decades. Was this a measurement issue or could it be related to urbanization? Work that she was doing suggested that this may be closely related to details of the NSS sampling frame—areas that are now urban are still being classified as rural, and the "rural" decline is really a consequence of

rapid urbanization. But the really important question then needs to be recast as to why women in urban areas do not work. There has always been a big gap between rural and urban female labor force participation in cross section data, and it is important to understand why.

Subir Gokarn echoed comments by Mookherjee and Kapur on manufacturing versus services and posed the question of what might have happened had India followed the traditional manufacturing route to development. Would we have had greater disparity but at higher average wages, which from a welfare perspective may have been a better outcome? Are the feel-good aspects of the results in the paper about greater equality, but at lower wages, then not so worthwhile compared to the counterfactual of what might have happened if manufacturing had grown more in relative terms? This may be important from a policy perspective. Gokarn further noted that public sector employment peaked in about 1998, roughly half way into the period the paper considers, and then has fell continuously thereafter. Assuming that public sector employment is less wage discriminatory by gender, the decline in the share of public sector employment would suggest results that would go in the other direction from the paper's results. It would be useful to shed light on this.

Sonalde Desai felt that the authors may actually be understating the case because they rely on NSS data. Using NCAER's IHDS data (2004–05 to 2011–12), which collects information on multiple jobs (so that in a year people could be working on more than one job), suggests that there is a sharp decline in participation in agriculture for both men and women who were solely in agriculture. For men, it went down from 50 percent to 35 percent, so a lot of nonagricultural work, and for women, from 83 to 66 percent. So this suggests that there has been a major transition in rural labor markets that is not being captured by NSS data. That also suggests that the participation equation would be really worth modeling between agricultural and nonagricultural, nonhousehold work, and with different datasets one might actually get even more positive results.

Shekhar Shah asked the question whether the increase in female labor participation reported in the paper is happening fast enough relative to the aging of India's predominantly young population that it will overcome the drag effects of the extremely low female participation rates that India has started its demographic transition with.

Rohini Somanathan (Chair) asked whether the narrowing of the wage gap suggested in the paper has brought us closer to equal work for equal pay. What can the paper do to get at that? Can the paper model the participation decision as Dilip Mookherjee had suggested? She thought there were also

a number of other things that could be done with the NSS data to answer questions like this. She thought that the paper could look at the NSS data by detailed organized sectors and see if their growth has led to more equal pay for equal work: How the wage gap was behaving in these sectors as opposed to others. Finally, when looking at the distributions, suppose there was some inherent discrimination, then as more women start participating, then you would expect the highest ability women to come into the top earning categories. Conditional on being in the top wage categories, women's ability would be higher than men's ability. And so, when one sees these different percentiles behaving differently, we would have a set of predictions for why they would do so because of the underlying discrimination, perhaps even an explanation for why education seems to narrow wage gaps rather than widen them.