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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.

JEL classification: J6, R2.

Keywords: Gender gaps, convergence, labor.

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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 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 to 49 percent in urban areas and from 27 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 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

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.

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 have 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 socioeconomic 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, 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.

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. The last section concludes.

2. Empirical Regularities

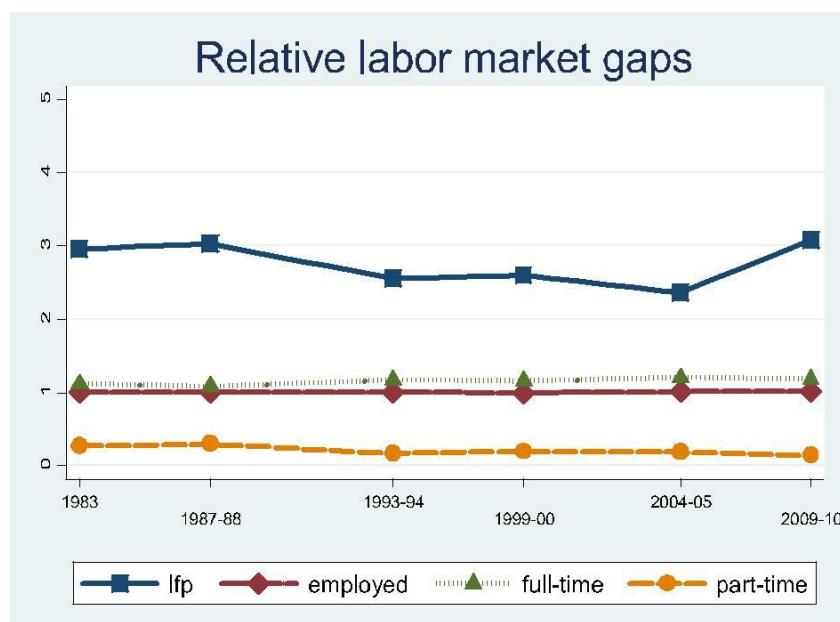
Our data comes from successive quinquennial rounds of the National Sample Survey (NSS) from 1983 to 2009-10. Specifically, we use rounds 38, 43, 50, 55, 61 and 66 of the Employment and Un-employment surveys of the NSS. Given our interest in labor market characteristics and outcomes, we restrict the sample 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. 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. More details regarding the data and our sample characteristics are contained in the data appendix. Table 1 gives the demographic characteristics of the workforce. Clearly, men and women differ very marginally along these demographic characteristics.

Table 1: Sample Summary Statistics

Years	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
1999-00	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

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

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 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 labor force participation rates 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.

Figure 1: Gender gaps: Labor market participations rates

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 labor force participation rates (LFP), proportion of workers working full time (FULL), proportion working part-time (PART), proportion self employed (SELF), and proportion unemployed (UNMP).

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; (b) labor force participation rates 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: Ill-literate, Primary, Secondary, etc.. While we use the category level information for our analysis below, 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 2: Labor market characteristics by gender: Rural and urban workers

Panel a: Rural

Round	Male					Female				
	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
1999-00	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

Round	Male					Female				
	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
1999-00	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

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.

Table 3 reports the average years of education of the male and female workforce in India across all the rounds. While the overall education level of the workforce was a dismally low 3 years in 1983, the disparity between men and women workers was even more dramatic with men having on average around 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 to 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.

Table 3: Education Gaps: Years of Schooling

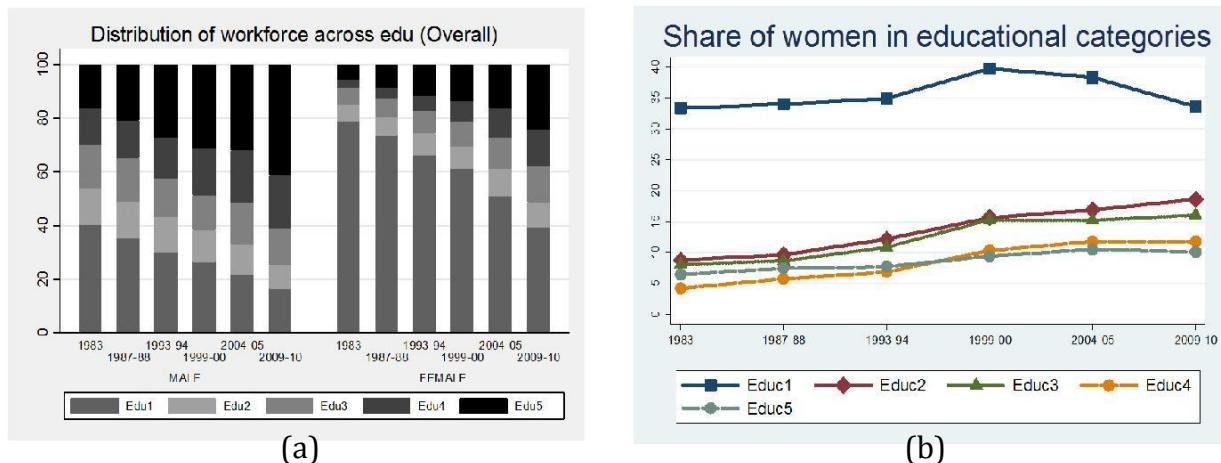
Years	Average Years of Education			Relative Educational Gap
	Overall	Male	Female	
1983	2.99 (0.01)	3.54 (0.01)	0.93 (0.02)	3.83*** (0.08)
1987-88	3.19 (0.01)	3.75 (0.01)	1.15 (0.02)	3.25*** (0.06)
1993-94	3.82 (0.01)	4.42 (0.02)	1.55 (0.02)	2.86*** (0.04)
1999-00	4.32 (0.02)	5.05 (0.02)	2 (0.03)	2.53*** (0.04)
2004-05	4.82 (0.02)	5.44 (0.02)	2.64 (0.03)	2.06*** (0.02)
2009-10	5.71 (0.03)	6.21 (0.03)	3.59 (0.06)	1.73*** (0.03)

*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*

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.

Figure 2: Distribution of workforce across education categories



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.

Are the measured narrowing of the gender education gaps as suggested by the data on years of education as well as categories of education 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.²

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 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.

Table 4: Marginal effect of female dummy on education categories

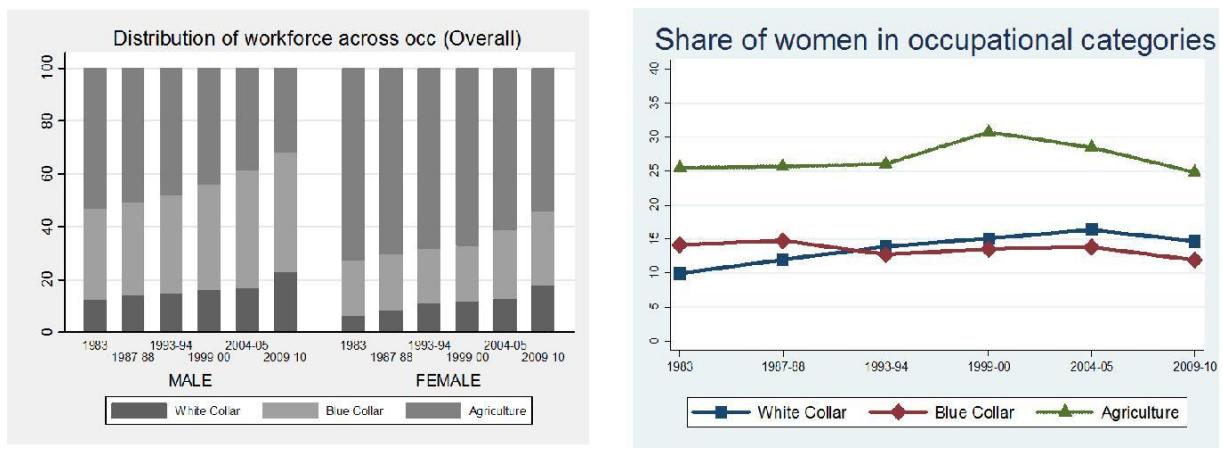
	1983	Panel A. Marginal effects of female dummy				2009-10	Panel B. changes	
		1987-88	1993-94	1999-00	2004-05		1983-2005	1983-2010
Edu 1	0.3760*** (0.003)	0.3641*** (0.003)	0.3582*** (0.0035)	0.3460*** (0.0036)	0.3011*** (0.004)	0.2482*** (0.0062)	-0.0749*** (0.005)	-0.1278*** (0.0069)
Edu 2	-0.0607*** (0.001)	-0.0531*** (0.0009)	-0.0367*** (0.0008)	-0.0180*** (0.0006)	0.0008* (0.0005)	0.0165*** (0.0006)	0.0615*** (0.0011)	0.0772*** (0.0012)
Edu 3	-0.0971*** (0.0012)	-0.0879*** (0.0011)	-0.0648*** (0.001)	-0.0460*** (0.0009)	-0.0335*** (0.0009)	-0.0099*** (0.0009)	0.0636*** (0.0015)	0.0872*** (0.0015)
Edu 4	-0.0935*** (0.0011)	-0.0851*** (0.001)	-0.0884*** (0.0011)	-0.0883*** (0.0012)	-0.0790*** (0.0013)	-0.0555*** (0.0018)	0.0145*** (0.0017)	0.038*** (0.0021)
Edu 5	-0.1247*** (0.0011)	-0.1380*** (0.0011)	-0.1683*** (0.0014)	-0.1937*** (0.0018)	-0.1895*** (0.0021)	-0.1992*** (0.004)	-0.0648*** (0.0024)	-0.0745*** (0.0041)
N	164979	182384	163126	173309	176968	133926		

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.

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 3-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..

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 into 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.

Figure 3: Distribution of workforce across occupation categories

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.

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 above, 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.

Table 5: Marginal effect of female dummy on occupational categories

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

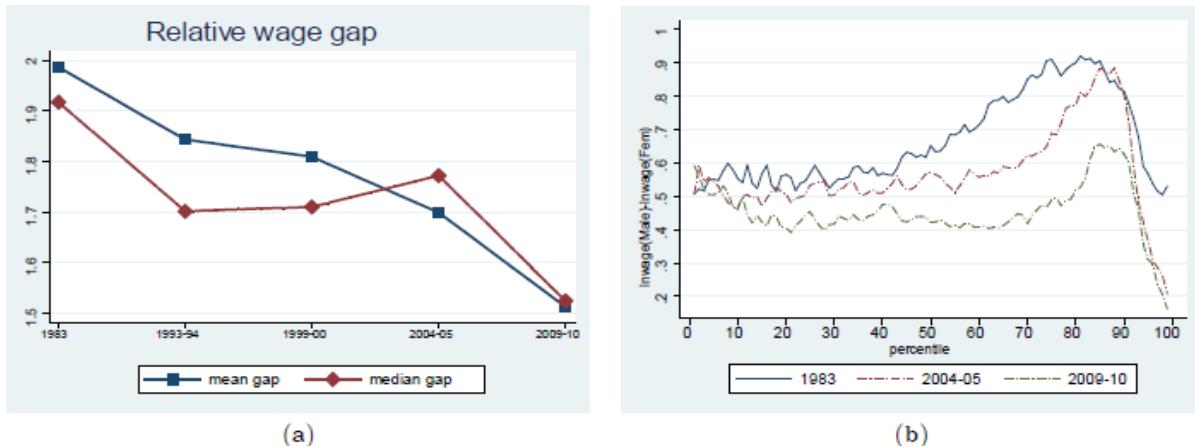
Note: Panel (a) of the table presents the marginal effects of the female dummy from a multinomial probit regression of occupation choices on a constant and a female dummy for each survey round. Panel (b) reports the change in the marginal effects of the rural dummy over the relevant time periods. Agrarian 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 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 towards 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.

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.

Figure 4: Gender wage gaps since 1983

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.

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.³ 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.

Table 6: Changes in the gender wage gap

		Panel A: Female Dummy Coefficient				2009-2010	Panel B: Changes	
		1983	1993-1994	1999-2000	2004-2005		1983-2005	1983-2010
10th Perc	-0.8851*** (0.0193)	-0.6020*** (0.0157)	-0.4727*** (0.0129)	-0.7737*** (0.0199)		-0.6035*** (0.0277)	0.1114*** (0.0277)	0.2816*** (0.0338)
50th Perc	-0.6872*** (0.0097)	-0.6064*** (0.0089)	-0.6115*** (0.009)	-0.5164*** (0.0086)		-0.3690*** (0.0112)	0.1708*** (0.013)	0.3182*** (0.0148)
90th Perc	-0.3543*** (0.01)	-0.3506*** (0.0132)	-0.4141*** (0.0184)	-0.4073*** (0.0235)		-0.3841*** (0.0354)	-0.0530*** (0.0255)	-0.0298 (0.0368)
Mean	-0.6604*** (0.0083)	-0.5641*** (0.0095)	-0.5810*** (0.0095)	-0.5777*** (0.01)		-0.4622*** (0.0139)	0.0827*** (0.013)	0.1982*** (0.0162)
N	63981	63364	67322	64359	57339			

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.

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

³ We use the Recentered Influence Function (RIF) regressions developed by Firpo, Fortin, and Lemieux (2009) to estimate the effect of the female dummy for different points of the wage distribution.

Recentered Influence Function (RIF) regressions for decompositions at the 10th, 50th, and 90th quantiles.⁴ 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.⁵

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.⁶ 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.

Table 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*** (0.0267)	-0.0638*** (0.0097)	-0.0582** (0.0273)	-0.0241*** (0.0078)
50th Perc	-0.2102*** (0.0287)	-0.2452*** (0.0143)	0.0349 (0.0257)	-0.1378*** (0.0099)
90th Perc	-0.1665*** (0.0569)	0.1484*** (0.0352)	-0.3148*** (0.0544)	0.0455* (0.0259)
Mean	-0.2157*** (0.0169)	-0.1512*** (0.0105)	-0.0645*** (0.0158)	-0.0891*** (0.0083)

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 school education (edu4) while increasing slightly for illiterates and those with secondary and above education. Since women have been increasing their representation in education

⁴ 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

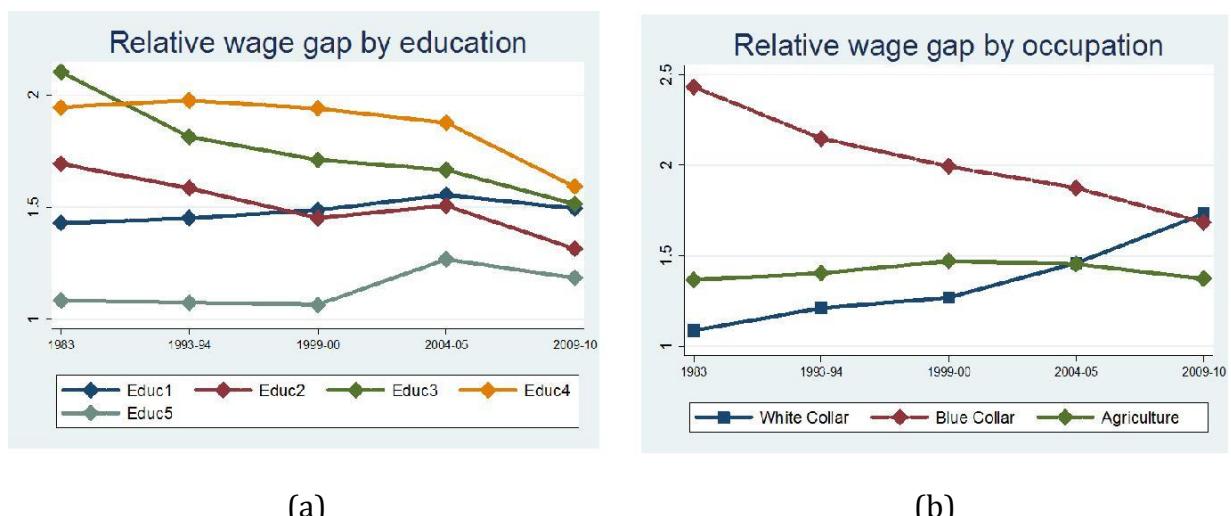
⁵ We do not include occupation amongst the explanatory variables since it is likely to be endogenous to wages.

⁶ 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..

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.

Figure 5: Gender wage gaps by education and occupation categories



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.

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.

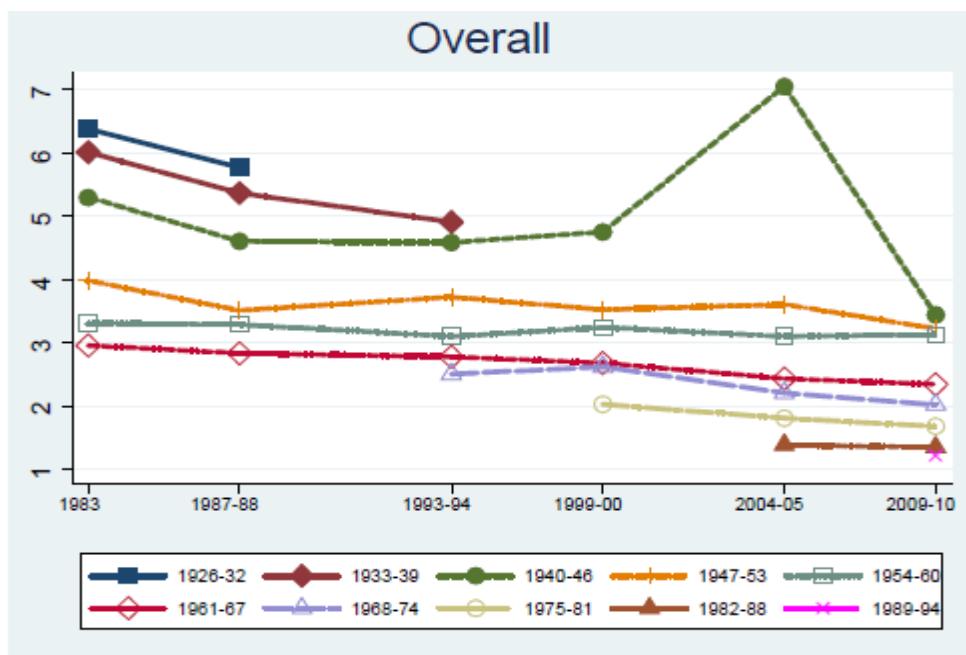
In summary, our results on wage outcomes of the workforce indicate that the gender wage gap has narrowed significantly across all percentiles except the very top of the income distribution. Most of this convergence was due to convergence in measured covariates of wages. Additionally, there has been a 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.

4. The Young

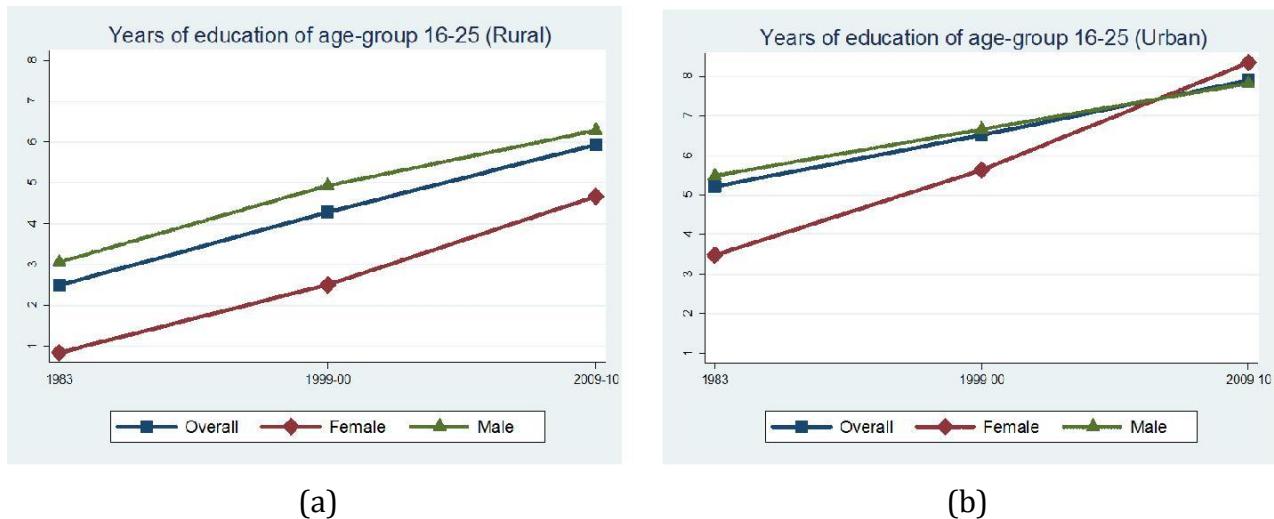
The trends we have documented above do suggest significant narrowing in gender gaps across multiple categories. However, a key reason for examining these trends is to also anticipate what might expect to see over the next couple of decades in terms of gender disparities. While forecasting such trends are very difficult, one measure which usually provide 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 3. By comparison, in 2005, the education gap was 1.4 for the 17-23 year old cohort who were born between 1982-88. Clearly the gap is lower for younger birth cohorts.

Figure 6: Education gaps in years by birth cohorts



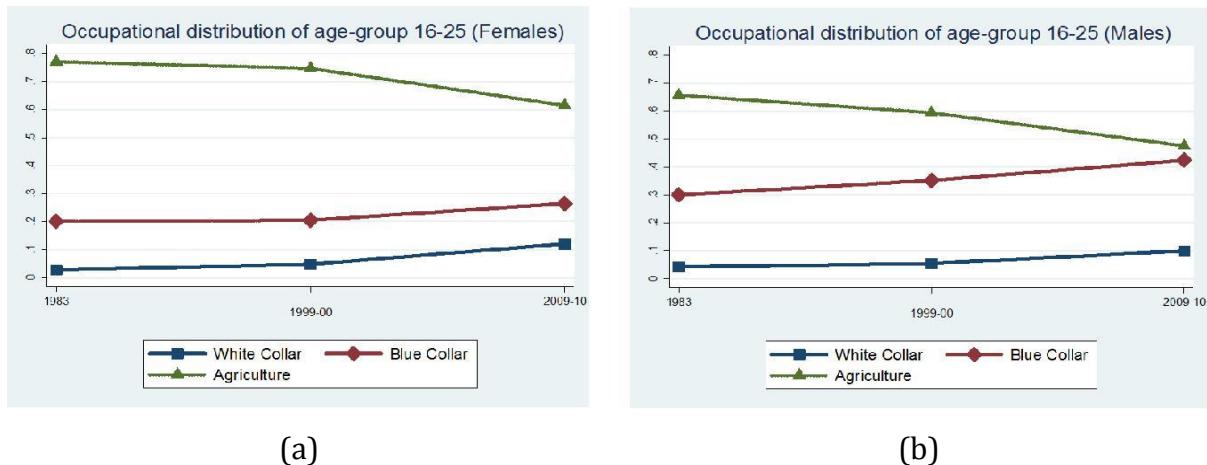
We take a closer look at the gaps amongst younger workers by concentrating on the characteristics of 16-25 year olds in each survey round. We start with education. Figure 7 reports the years of education of the 16-25 year olds in every survey round, broken down by females and males, and by rural and 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 1 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.

Figure 7: Gap in years of education: 16-25 year olds

Notes: 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 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.

Figure 8: Occupational distribution of 16-25 year olds

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.

5. 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, labor force participation rates, 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 will shrink even more rapidly over the next couple of decades.

Two important research questions arise naturally from these results. First, how much have the aggregate changes in the macroeconomic environment contributed to the declining disparities? Second, the past thirty 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.

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