



Educational returns beyond the mean: Differences along wage distributions of men and women in India's formal labor market



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ABSTRACT

Unlike previous studies on educational returns in developing countries, this paper examines the distributional impacts of education on wages using a recently developed econometric approach – unconditional quantile regressions. The results yield unconditional impacts of education at different points of the wage distribution and, therefore, are more informative from a policy perspective than both traditional regression and quantile regression methods commonly used for estimating educational returns. We use a nationally representative dataset on labor markets in India, collected in 2005–2006. The results reveal significant heterogeneity in education's effects along the wage distribution and striking differences in these patterns by gender: the effect of primary education is found to be significantly higher for women than men in the middle of the wage distribution; while the effect of post primary education exhibits a distinct pattern whereby women get significantly higher rewards than men above the median and significantly lower rewards than men below the median. These findings have direct implications for the targeting of education policies that seek to reduce gender wage inequality.

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1. Introduction

A long standing body of empirical research, spanning almost four decades, has been devoted to estimating the returns to education in labor markets around the world (for reviews, see [Card, 1999](#); [Psacharopoulos and Patrinos, 2004](#)). The rate of return to education is a critical input into a variety of government policies, including those aimed at combating poverty ([Dreze and Sen, 1998](#); [Schultz, 1993, 2004](#); [Dollar and Kraay, 2004](#)) and stimulating economic growth ([Lucas, 1988](#); [World Bank, 1993](#); [Barro and Sala-i-Martin, 2004](#)). Education is also considered a key instrument for lessening differences in wages among subpopulations of workers such as men and women (e.g. [Blau and Kahn, 2000](#)). In developing and transitioning economies, investments in education and their returns are particularly relevant to policy makers. Labor markets in these economies play a vital role in spreading the benefits of economic growth and in influencing the migration of labor from rural to urban areas. Information regarding educational returns in these economies serves as an indicator of how well labor markets are functioning and whether

human capital is being efficiently allocated across labor market sectors ([Zhang et al., 2002](#)).

The relationship between education and wages is commonly modeled in the empirical literature using the theory of human capital, which regards individuals' educational attainment as an investment in the labor market ([Becker, 1964](#)). The rate of return to this investment is estimated using a human capital earnings function, specified as a regression of logged wages on measures of education and experience (e.g. [Mincer, 1974](#)). The coefficient on education in this model is an estimate of the average return on education.

Most investigations into returns to education have assumed that the effect of education is homogeneous across individuals. But as investigations have progressed, there is growing evidence that the effect of education is heterogeneous in at least two dimensions. First, returns to education may vary within and across groups of individuals with common observed attributes such as gender, education levels, and age cohorts. Empirical studies readily recognize this type of heterogeneity and account for it with a number of econometric and other approaches, such as using gender dummy variables, introducing multi-factor education variables and using age splines to represent age cohort effects (e.g. [Azam, 2012](#); [Chamarbagwala, 2010](#); [Duraisamy, 2002](#)). Second, heterogeneous returns may occur if the unconditional impacts of education on wages vary at different points of the wage distribution (e.g. [Lemieux, 2006](#); [Koop and Tobias, 2004](#);

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Anderberg and Andersson, 2003). Education, while increasing the mean or expected wage, may concurrently increase or decrease the variance of wages, thereby influencing the entire distribution of wages.

Though the empirical literature on labor markets in developed countries is paying increased attention to education's distributional consequences, this issue is largely neglected in the developing countries literature. Most current literature on returns to education in developing countries either focuses on mean returns or addresses distributional issues using quantile regressions (see reviews by Psacharopoulos, 1973, 1985, 1994). The latter approach, although useful in its own right, provides only conditional impacts.

The absence of considering such heterogeneity in developing country contexts is somewhat ironic, for it is in these settings that distributional issues are likely to be most important for public policy. Poverty alleviation policies frequently target particularly vulnerable groups who are disproportionately represented at the bottom of the wage distribution. Focusing on average effects and ignoring heterogeneity, therefore, could potentially lead to education policies with mis-targeted investments. Similarly, policies seeking to reduce wage inequality pay careful attention to how changes in the stock and the mean return to education have caused wage inequality to rise over time (e.g. Blau and Kahn, 1994; Chamarbagwala, 2006). Little attention is paid to whether heterogeneity in returns to education can create inequality through differential effects on different portions of the wage distribution.

The overall goal of this paper is to examine heterogeneity in the effects of education along men's and women's wage distributions in India, one of the largest and fastest growing developing countries in the world. To meet our overall goal, we have two specific objectives. First, we estimate the unconditional effect of education levels (i.e. primary, middle school, secondary, higher secondary and college/university) on the wage distributions of male and female employees. We overcome the methodological shortcomings of previous studies by using unconditional quantile regressions (Firpo et al., 2009), a recently developed tool to estimate the unconditional impacts of explanatory variables on distributions. Our second objective is to study the relationship between education and wage inequality. Using the results from objective 1, we conduct a simulation to examine how, *ceteris paribus*, at a single point in time, educational investments that increase completion rates of male and female students at different levels of education can affect wage inequality by compressing some parts of the wage distribution while expanding others. This simple exercise provides insights into how educational expansion may affect wage inequality as gender differences in educational endowments evolve during India's development.

The paper is organized as follows. In the next section, we provide a brief review of the returns to education literature, with a focus on India, and a description of labor markets in India's economy. We then introduce the data; a nationally representative survey conducted in 2005–2006 with information on more than 30,000 wage earners in India. Next, we present our empirical model and describe how the model is estimated with the unconditional quantile regression approach. We follow up with a discussion of the results. After discussing the results of the econometric analysis, we conclude with an emphasis on policy implications of our results.

2. Returns to education, labor markets and the developing economy in India

A review by Psacharopoulos and Patrinos (2004) documents the evolution of the returns to education literature as a series of

responses to changes in the global economy. A nascent literature on educational returns, underway in the 1950s, was revitalized during the 1980s and 1990s as many economies wrestled with rising wage inequality. Studies found that technical change in modes of production creates large shifts in demand for specific types of labor, thereby creating wage inequality over time. Methodological revolutions in the literature, led by Card (1999) and others, created a second wave of studies that examined the role of ability and other issues related to causality of education in earnings functions. While sometimes contentious, the findings of these studies yield two general outcomes. First, rates of return vary among high, medium and low income countries. While medium income countries (such as emerging Asian economies) have returns to education of approximately 10%, returns to in poorer countries (such as sub-Saharan Africa, Latin America and the Caribbean) are higher, and returns in OECD countries are lower. Second, private returns to education are significantly lower than social returns (the latter measured as the difference of private benefits and total private costs plus externalities).

Many studies have examined rates of return to education in formal wage employment in India (e.g. Kingdon, 1998; Self and Grabowski, 2004; Kingdon and Unni, 2001; Tilak, 2007). Some studies have used nationally representative samples of data (i.e. Duraisamy, 2002; Dutta, 2006; Kingdon and Theopold, 2008; Madheswaran and Attewell, 2007). In general, educational returns have been found to be increasing in education levels (e.g. Dutta, 2006). But most studies have not distinguished between male and female workers. An exception is Duraisamy (2002). Using 1993–1994 data (analyzed comparatively with data from 1983), he found that annual rates of return to primary, middle, secondary, higher secondary and graduate levels of education for men and women combined were 7.9, 7.4, 17.3, 9.3 and 11.7%, respectively. Disaggregated results showed female returns to be higher than male returns at all education levels.

Returns to education have also been found to be increasing over time (Kijima, 2006). During the 1990s there was a marked rise in returns to higher education and a sharp polarization of primary and graduate degree returns. Scholars attribute these changes to trade liberalization and a resulting shift in demand for skilled labor (Dutta, 2006; Chamarbagwala, 2010). Studies have also shown that returns are higher at the top of the wage distribution and lower at the bottom (Azam, 2012; Chamarbagwala, 2010). The latter findings are based on conditional quantile regressions that reflect wage inequality within education cohorts. These results are explained by the presence of unobserved abilities that complement education in contributing to differential wages.

The above review of returns to education in India all relate to the formal wage sector. But India has segmented labor markets with large numbers of people employed in casual wage markets. Returns to education in this market have not received much attention, though Dutta (2006) finds that unlike returns in the formal wage market, returns are constant across education levels.

Our choice of India as the subject for our case study is opportune. Over the last two decades, economic reforms successively transformed India's economy from a closed and centrally planned system into a market-based economy. By 2006, economic growth in India had accelerated to over 9%, making India the third largest economy and contributing nearly 7% of world GDP (World Bank, 2006). Associated with this rapid growth, off-farm wage work has become an increasingly important source of income and insurance in rural areas (Lanjouw and Shariff, 2004; Rose, 2001; Ito, 2009; Banerjee and Duflo, 2008).

However, agriculture still employs a large portion of the population, and the share of women engaged in agricultural wage employment has risen sharply and more rapidly than the share of men over the last four decades (OECD, 2007; World Bank, 2006).

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