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What Explains the Stagnation of Female Labor Force Participation in Urban India?

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ABSTRACT

What Explains the Stagnation of Female Labor Force Participation in Urban India?*

We study the surprisingly low level and stagnation of female labor force participation rates in urban India between 1987 and 2009. Despite rising growth, fertility decline, and rising wages and education levels, women's labor force participation stagnated at around 18%. Using five large cross-sectional micro surveys, we find that a combination of supply and demand effects have contributed to this stagnation. The main supply side factors were rising household incomes, husband's education, stigmas against educated women engaging in menial work, and falling selectivity of highly educated women. On the demand side, employment in sectors appropriate for educated women grew less than the supply of educated workers, leading many women to withdraw from the labor force.

JEL Classification: J20, J16, I25, O15

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I. Introduction

India's economy has grown fast over the past two decades, with the services sector accounting for a large share of growth (Bosworth and Collins, 2008; Shastry, 2012). India has also experienced a sizable fertility decline, a rapid education expansion and a decline in the education gender gap, while the labor market returns to education increased (Kijima, 2006; Pieters, 2010). Against this background, it is puzzling to see that the reported female labor force participation rate in urban India has stagnated around 18 per cent since the 1980s. One would expect a rising share of women to enter the labor force, especially in urban India where women have gotten much more educated and where white-collar jobs are concentrated.

The aim of this paper is to investigate why female labor force participation (henceforth FLFP) in urban India stagnated, despite rising education levels and rapid economic growth. Standard labor supply models and previous research on FLFP and economic development (Goldin, 1994; Mammen and Paxson, 2000; Blau and Kahn, 2007) suggest that rising household incomes could lead to a withdrawal of women from the labor market, while rising education and growth of white-collar services employment should draw more women into the labor force by increasing their earnings capacity and reducing social stigma against women's work. On the other hand, rising education has been associated with stronger preferences for white-collar jobs (Desai *et al.*, 2010), while these jobs tend to become scarce relative to the rapidly growing supply of educated workers (Boserup, 1970; Das and Desai, 2003).

Understanding the causes of stagnation in FLFP matters for several reasons. India currently has an advantageous age structure of the population with a large and growing share of working age people and relatively few dependents. Optimistic predictions for India's future growth often refer to this demographic dividend, which is alleged to have accounted for about a third of East Asia's high per capita growth rates in the period between 1965 and 1990 (Bloom and Williamson, 1998; Bloom, 2011). However, the benefits of a country's demographic dividend hinge on the productive employment of the working age population. High and rising female employment levels were in fact critical in sustaining East Asia's high economic growth (Klasen and Lamanna, 2009; Young, 1995).

Beyond women's contribution to growth, stagnation in FLFP has implications for the degree to which women benefit from growth. Employment and earnings are robust determinants of bargaining power, with impacts for female and children's well-being (Qian, 2008; Anderson and Eswaran, 2009; Afridi *et al.* 2012). If there are structural economic or cultural barriers preventing women's labor force participation, women are unable to capitalize on these opportunities.

In this paper, we estimate a simple model of female labor force participation using individual level cross-section data spanning the period 1987 to 2009. The model is estimated separately for each survey year allowing us to assess changes in behavior. We also run estimations for separate education groups to compare behavior between women with low and high educational attainment. Our estimation results provide a detailed account of the impact of various factors on women's labor force participation and their changes over time and show that women with low education appear to be boxed in by the necessity to work if household incomes are very low or income insecurity is high, and stigmas attached to working if they are somewhat more educated and in more secure economic environments. Highly educated women appear less constrained by family circumstances in their labor force participation decision.

The estimates are then used to decompose the stagnation of FLFP between 1987 and 2009 into contributions by different covariates and changes in behavior and unobservables (Fairlie, 2006). On the supply side, we find that rising male incomes and education contributed to a withdrawal of women from the labor force, showing that the classic income effect is at work in urban India. The effect of rising female education on female labor force participation is more complicated. A particular feature of women's work in India is a U-shaped relationship between education and labor force participation. Participation rates are relatively high for illiterate women, lower for women with low and intermediate education, and highest for post-secondary graduates. Our results suggest that the U-shape is related to strengthening preferences for white-collar jobs as women complete more education, with only the most highly educated having access to these types of jobs. Despite high growth rates, however, the economy has not produced enough employment of this kind to keep up with the growth of high-skilled labor supply. The share of white-collar services in urban employment fell from 19 per cent in 1987 to 17 per cent in 2009, while the proportion of graduates in the working age population increased from 11 to 21 per cent. As a result, we find strong crowding-out effects of the increased high-skilled labor supply on female labor force participation.

While this crowding out effect accounts for a substantial decline in FLFP especially among highly educated women, our estimates also show a large decline in the positive effect of secondary and graduate education on labor force participation – even when controlling for household income and wages. As a result, despite rising returns to education, the substantial increase in educational attainment of women contributed only moderately to FLFP growth. We provide suggestive evidence that the declining positive effect of secondary and graduate education is partly accounted for by an erosion of positive selection into higher education, i.e.

a declining correlation between determinants of higher educational attainment and unobserved determinants of labor force participation. Reasons for this could be the rapid expansion of education supply, but also rising marriage market returns to education, inducing women to pursue higher education regardless of their expected labor market returns. In line with the marriage market incentive, we show that women with low and intermediate education levels are much less likely to be matched with a 'high-quality' male in 2009 than in 1987.

The paper is organized as follows. Section II discusses the literature on female labor force participation determinants, focusing in particular on economic development and rising education levels. Section III describes patterns of FLFP, wages, education, and employment in urban India. Section IV presents our empirical FLFP model and estimation results, followed by the decomposition analysis in Section V. Section VI further investigates the relationship between women's education and labor force participation. Section VII concludes.

II. Development, education, and female labor force participation

Labor force participation decisions can be the outcome of individual preferences of the woman, her family circumstances, as well as labor demand conditions for jobs that women are particularly suited for, interested in, or where employment in these jobs is seen as socially acceptable. Education will play a key role in shaping these supply and demand conditions. We will discuss these issues in turn.

A common starting point for the analysis of female labor force participation is the basic static labor supply model (see Blundell and MaCurdy, 1999), in which an increase in the wage rate reduces demand for leisure as its opportunity cost rises, increasing labor supply. If leisure is a normal good, an increase in a person's income will increase the demand for leisure and thus reduce labor supply. These are the well-known substitution and income effects. For a person currently not working, an increase in the wage rate only has a substitution effect, increasing her incentive to work (i.e., one would always expect a positive own wage effect at the extensive margin). An increase in unearned income (non-labor income or labor income earned by other household members, particularly the husband) reduces the marginal utility of the woman's earnings and therefore reduces labor force participation.

In initial stages of economic development, education levels typically increase much more for men than for women. Women's wages and opportunities for work change relatively slowly while their husband's income rises fast, so the negative income effect is likely to dominate any positive substitution effect of rising female wages. This is what drives reductions in FLFP according to the so-called Feminization-U hypothesis (Boserup, 1970;

Goldin, 1994; Mammen and Paxson, 2000).[1] Participation is further reduced because of social stigma against women working outside of the home, especially in manufacturing, and the difficulty of combining household production with market work in non-agricultural occupations; these effects are held to be particularly strong for married women.

In later stages of development, women's education starts to catch up to men's, their earnings capacity increases and they gain access to socially acceptable types of work, especially if demand for white-collar workers increases with the expansion of the services sector. This will result in higher FLFP,[2] but country-specific labor demand conditions clearly play a role in this process. The increase in FLFP could depend on growth in employment opportunities of the kind preferred by (and deemed appropriate for) educated women, relative to growth in the educated working age population. If female labor mobility is limited, as is the case in India, the growth in desirable jobs relative to the educated population can generate local mismatches with impacts on female labor force participation rates.

One might further hypothesize that similar factors produce a U-shaped relationship between economic or educational status and women's labor force participation at a given point in time within a country – as is indeed observed in India. Among the poorest with no or very little education, women are forced to work to survive and can combine farm work with domestic duties, while among the very highly educated, high wages induce women to work and stigmas militating against female employment in white-collar jobs are low. Between these two groups, women face barriers to labor force participation related to both the absence of an urgent need to work (the income effect), and the presence of social stigmas associated with female employment.[3]

Besides education's effect through (spousal) income, wages, and access to socially acceptable jobs, education can affect labor force participation by changing women's own work-related preferences. Women are likely to become more labor market oriented with higher education, but education may also generate stronger preference for certain types of jobs (e.g. white-collar employment in the service sector, such as work in the education or

[1] Though the feminization-U is sometimes considered a stylized fact, the empirical evidence in support of it is mostly based on cross-country analysis, while panel analyses have produced mixed results (Tam, 2011; Gaddis and Klasen, 2012).

[2] Over the course of development, changes in circumstances may also be accompanied by changes in women's behavior, i.e. the degree to which wages, income, and social restrictions affect FLFP. As Goldin (1990) describes the history of women's work in the US, economic development is reflected in an increasing own wage effect while women's responsiveness to other family income declines. Blau and Kahn (2007) and Heim (2007) find similar evidence for women in the US.

[3] This would be consistent with a similar U-shape relationship in gender bias in mortality by education or income groups, where gender bias appears to be largest among the middle groups (e.g. Klasen and Wink, 2003; Drèze and Sen, 2002).

health sector or public administration) and reduce the willingness to do manual or other low-skilled work. If white-collar jobs are scarce, higher education can reduce labor force participation (this argument is also put forward by Desai et al., 2010). Boserup (1970) describes how the feminization of clerical jobs proceeds very slowly when the number of educated men is in excess of demand for clerical workers. In initial stages of educational expansion, those with some education feel entitled to a white-collar job, and this attitude can persist long after a majority of the population has reached higher education levels. Until industrial jobs become more acceptable for educated persons, there is likely to be considerable resistance against women's employment in white-collar jobs, as this would reduce the opportunities for men (Boserup, 1970: Chapter 7). How the education-labor force participation link evolves over time will thus depend on the structure of labor demand growth in the economy and the status associated with different types of work.

A positive link between education and labor force participation can appear when both are outcomes of unobserved preferences for work (related to family background, for example), such that women with a greater taste for work are more likely to attain higher education. Recent research has shown that primary and secondary school enrollment in India respond to the perceived returns to schooling, in particular the availability and awareness of job opportunities in business and IT-services (Oster and Millett Steinberg, 2013; Jensen, 2012; Shastry, 2012). These studies also show, however, that responses are limited to very local opportunities (Oster and Millett Steinberg, 2013) and in the experiment by Jensen (2012), girls' schooling is affected by active recruitment rather than the mere availability of jobs. It apparently takes more than growth and rising wages to raise awareness of labor market opportunities, and despite its fast growth, the business services sector still accounts for only a small share of total employment in India. Nonetheless, when analyzing the effect of education on labor force participation it is important to keep in mind the potential endogeneity of education through non-random selection into education.

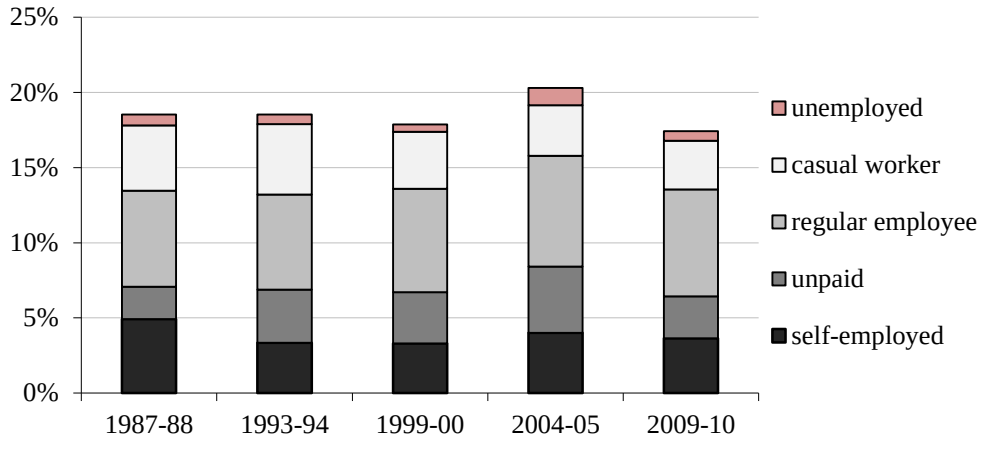
Education could be endogenous to labor force participation in the exact opposite direction as well. In India, social restrictions on the lifestyles of women tend to become more rigid as households move up in the caste hierarchy (Chen and Drèze, 1992). If education of women and restrictions on women's mobility and work both increase with families' social status, one would observe a negative correlation between education and labor force participation. Eswaran *et al*. (2011) find supporting evidence for this negative endogeneity channel in rural India (based on data for 1998-99), but Das and Desai (2003) find no support in a sample of rural and urban women in India in 1993-94.

III. Female labor force participation in urban India

This section describes patterns of FLFP, wages, education, and employment in urban India. The descriptions and empirical analysis in this paper are based on the NSS Employment and Unemployment Survey, waves 1987-88, 1993-94, 1999-2000, 2004-05, and 2009-10 (henceforth 1987, 1993, 1999, 2004, and 2009). This cross-sectional survey is the official source of nationally representative employment and earnings data used by the Government of India.

In urban India and for married women in the age group 25-54, the labor force participation rate fell slightly from 18.5% in 1987 to 17.4% in 2009.[4] Breaking down the labor force into different components, one can see in Figure 1 there has been little change in the different types of work and unemployment rates of married women, except for a peak in self-employment in 2004. Throughout the period, the labor force participation rate of married men in the same age group was slightly above 97 per cent and changed very little over time (not shown).

Figure 1: Urban female labor force participation rate



Note: Married women age 25-54. Self-employment includes employers and own account workers. Unpaid refers to unpaid family workers. Regular employees receive salary or wages on a regular basis. Casual workers receive a wage according to the terms of the daily or periodic work contract. *Source:* NSS Employment and Unemployment Survey

Female participation rates are calculated using women's reported usual status, which refers to a reference period of one year and where the principal activity is the activity in which the

[4] Marriage is almost universal in India, with average age at marriage around 19 in urban India in 2004-05 (Desai et al., 2010). According to the NSS survey data, 89.2 per cent of women aged 25-54 is married in 2009, which is slightly higher compared to 87.4 per cent in 1987. Because in the age group 20-24 the marriage rate declined over time as more women pursue higher education and postpone marriage, we focus our analysis on women age 25 and older. We also exclude the two per cent of all married women in this age group who report being head of their household.

respondent spent the majority of time. Subsidiary activity status is recorded as well but is not taken into account in our analysis, as it affects less than five percent of the adult urban female population and its definition is not consistent over time: before the 2004 survey, there was no lower bound on the number of hours spent on a particular activity to be considered as subsidiary activity, but in 2004 the minimum was set at 30 days of the reference year. Nonetheless, the pattern of female labor force participation is similar across different age groups, when including unmarried women, and when including labor force participation in both principal and subsidiary activities (see Appendix table A1).

One might worry that even though unpaid family workers and own account workers are considered part of the labor force, women's work is underreported. Survey respondents may be reluctant to report women's contributions to family businesses or may not consider a woman's work to be different from her general domestic duties. This type of underreporting will mainly affect participation rates in rural areas, where women spent much more time on farm activities that are unlikely to be considered as work, and will affect subsidiary status activities more than principal status activities because the former includes work done for only a few hours per day or during peak season only, etc. Principal status participation rates in urban India are arguably least affected by underreporting of women's work, but have the disadvantage that most women working part time will not considered as active in the labor force. This is important to keep in mind.

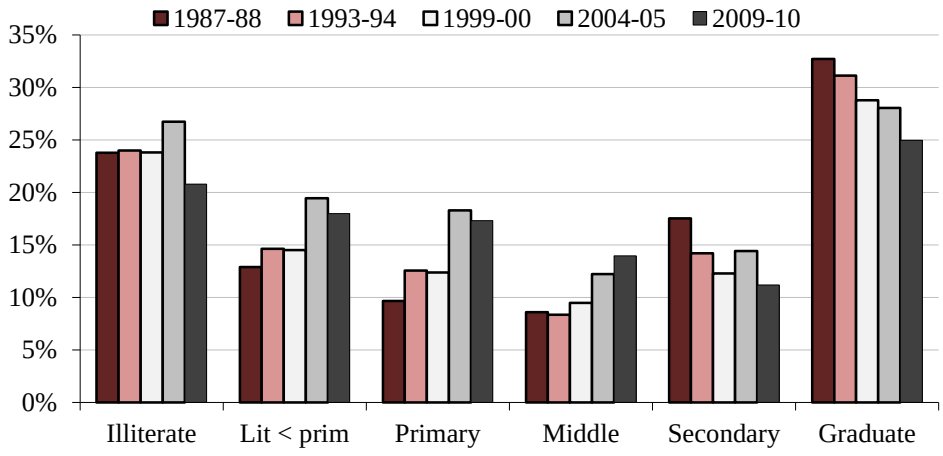
To provide some verification of participation rates from the NSS Employment and Unemployment Survey, we compare the 2004-05 numbers to the 2004-05 wave of the India Human Development Survey (Desai et al., 2009). There is no major time criterion to be considered as a worker in the IHDS survey, and there is considerably more probing as respondents are asked to specify each household member's contribution to each family business as well as any other activities earning an income or a wage.[5] For married women in urban India in the age group 25-54, the IHDS data show an employment rate (unemployment is not recorded) of 19.8 per cent, which is very close to 19.6 per cent based on the NSS data. The participation rate for married women in urban India is also very similar between the NSS 2004-05 wave (19.4%) and a survey done for a study on women's work in 2006 (19%; see Sudarshan and Bhattacharya, 2009).

Figure 2 shows that the urban FLFP rate hides a U-shaped relationship with education and the stagnation in FLFP hides a combination of rising participation among women with low

[5] See http://ihds.umd.edu/questionnaires.html for the IHDS household questionnaires.

education and a decline in participation rates of highly educated women.[6] As income, wages, and access to different types of jobs are likely to play an important role in these patterns, we now turn to a brief discussion of those.

Figure 2: Urban female labor force participation rate by education level



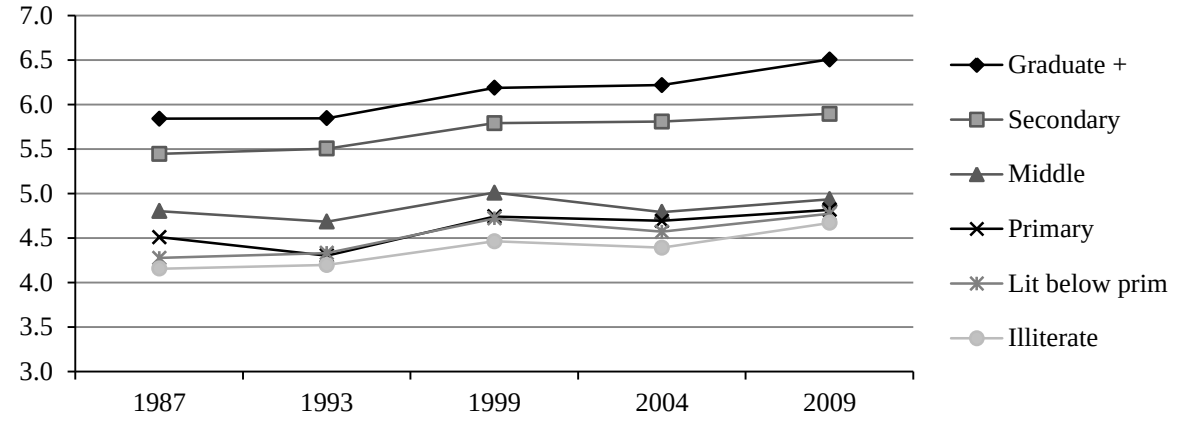
Note: Married women age 25-54. Education is the highest level completed. *Source*: NSS Employment and Unemployment Surveys.

In line with India's high growth rates, earnings data form the NSS survey show that real wages roughly doubled between 1987 and 2009 (Appendix Figure A1). In absolute terms, real wages increased almost equally for men and women, but the ratio of male to female average weekly earnings declined from 1.6 in 1987 to 1.3 in 2009. Given the very high participation rates of married men, one can safely assume than most women in urban India are secondary earners. Rising incomes of men most likely had a strong negative impact on female labor force participation.

With women's wages rising faster than men's, this should at least partly offset the negative impact of men's income. But patterns in the data suggest that women's wages do not have much of an impact of their labor force participation. Figure 3 shows women's real wages by education level. There clearly are high returns to secondary and graduate education, and real wages have grown most for women with secondary or graduate education – and illiterates. Going back to Figure 2, however, we see that this is exactly the group of women for which participation rates declined.[7]

[6] Appendix table A3 summarizes the definition of each education level.
[7] Note also that real earnings by education level increased much less than real earnings in total. This is of course related to the fact that the share of higher education groups have increased substantially.

Figure 3: Log real wages for women age 20-59 by education level, urban India



Note: Wages are average total weekly earnings for casual and regular employees. Earnings are spatially deflated and in 1987-88 Rupees, based on the Labour Bureau Consumer Price Index for Industrial Workers and Deaton (2003). *Source*: NSS Employment and Unemployment Survey

Wages may have little impact on FLFP, despite rising returns to education, if employment growth in the activities preferred by educated women is limited. It is well know that women in the labor force across the world tend to cluster in certain occupations, and particularly in the services sector (e.g. World Bank, 2011; Gaddis and Pieters, 2012). As shown in Figure 4, the distribution of female workers across industries changes substantially with education. The distribution is shown separately for women below secondary education and those with secondary or higher education. It is clear that access to white-collar services jobs is confined to women with at least secondary education. In 1987 the vast majority (almost 65%) of highly educated women worked in public administration and education, but this share declines to 45 per cent in 2009.[8] Although financial and business services increase their share, these still account for only a small fraction of female employment. Consequently, high-skilled women are increasingly working in typically less skilled industries such as textiles, wholesale and retail, and domestic services (included in 'other services').[9] For low-skilled women, employment has shifted from agriculture into textiles, construction, and domestic services.[10]

The changing industrial distribution of workers is consistent with Boserup's (1970) description of white-collar jobs becoming increasingly scarce when education levels are growing rapidly. The distribution of male workers (not shown) confirms that the share of

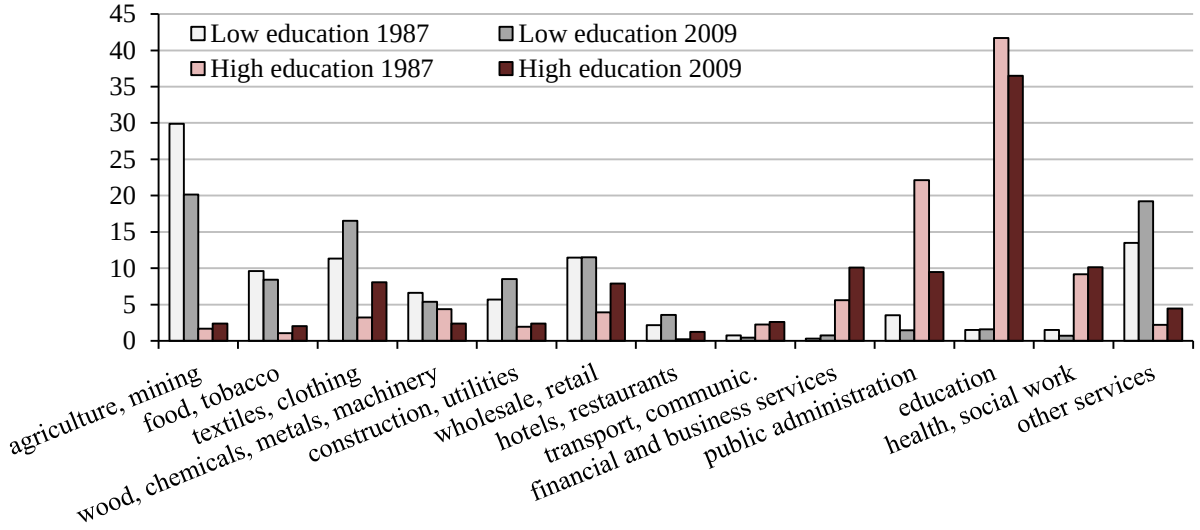
[8] The share of public administration and education also declined substantially among male workers.

[9] Across education levels, the increasing share of textiles in female employment is driven by self-employment in the wearing apparel industry. According to a study of the industry in Tiruppur, a city in South India, and in Delhi, the boom in garment exports in the 1990s attracted many women, who remain concentrated in the lowest paying activities and occupy an invisible part of the value chain as home-based workers. Home-based workers receive piece-rate payment and constitute an important buffer for demand fluctuations, thus facing huge income variations (Singh and Sapra, 2007).

[10] Domestic workers are typically not covered by existing legislation and are easy victims of exploitation due to their invisibility, lack of education and, often, migration background (Ramirez-Machado, 2003; NCEUS, 2007).

white-collar services employment has declined not just for women, but for the entire labor force. Employment growth has been concentrated largely in construction and retail. But educational attainment has indeed grown rapidly, with the share of highly educated women more than doubling (Appendix figure A2).

Figure 4: Distribution of female workforce across industries



Note: Distribution of female workers across industries, including employees, self-employed and unpaid family workers. Shares are in percentage of all female workers in the respective education group. Low education is below secondary schooling; high education is secondary or higher. *Source*: NSS Employment and Unemployment Survey.

Overall, the picture that emerges is that access to attractive white-collar jobs is mainly limited to highly educated women, but even among them it is declining. Employment growth in financial and business services is far from compensating the declining employment shares of public administration and education. Combined with rising incomes, this could be an important reason why participation rates among highly educated women have declined despite rising returns to education.

IV. Estimating the determinants of women's labor force participation

Using the NSS survey data, we test how different factors have contributed to the stagnation of FLFP in urban India. We first estimate the effect of education, income, and other variables on women's labor force participation in a reduced form labor supply model. In the next section, a decomposition analysis is used to show how changes in the explanatory variables and changes in coefficients and unobservables contributed to the stagnation of FLFP between 1987 and 2009.

The probability of woman *i* in year *t* (1987, 1999, 2004, and 2009)[11] being in the labor force (including self-employment, unpaid family work, regular and casual employment, and unemployment) is modeled as

$$P_{it} = F(\alpha_{st} + \sum_E \beta_t^E D_{it}^E + \beta_{Xt} X_{it} + \beta_{Zt} Z_{it}), \quad (1)$$

where *F* is the standard normal cumulative distribution function. The model is estimated separately for each year to allow for changes in behavior over time.

The first right-hand side term is a state fixed effect. Education is measured through dummies for the highest education level completed, D^E (E=2, …, 6), with illiterate (E=1) as the reference level. X_{it} is a vector of explanatory variables at the individual and household level, including the woman's wage, household income, education of the household head, and social group (indicators for scheduled caste and tribe – SCTS – Hindu, Muslim, and other households).[12] We also control for the security of household income, through the share of household income earned in regular salaried employment and through underemployment of men in the household (an indicator whether working men were without work at least one month during the reference year).[13] Further controls are age, age squared, number of children, and whether the woman is living with in-law parents, which might affect both care responsibilities of the woman as well as restrict her decision-making power.

Z_{it} is a vector of local labor demand and supply variables. It includes the district male unemployment rate; the district share of male workers in agriculture, industry, construction, white-collar services (consisting of regular employment in financial and business services, public administration, and education, health and social work), and other services; and the share of the district working age population with a graduate degree, to control for the local supply of high-skilled labor.

Identification of own-wage effects on labor force participation is challenging. To estimate the effect of wages on labor force participation it is necessary to use predicted wages for workers and non-workers, corrected for selection into employment and predicted based on at least one exogenous variable (for a discussion see Heim, 2007). Following leading studies in the literature, we estimate two different specifications to identify the own-wage effect. One

[11] Data for 1993 are not used in the econometric analysis because the 1993 data do not contain district identifiers, which are needed to construct district-level explanatory variables. Districts are administrative units at the sub-state level in India. Our sample covers 362 districts across India's 18 main states.

[12] Implicit in the empirical model is the assumption that women's participation decision is made conditional on men's: we do not consider joint utility maximization or bargaining within the household. Given the very high and unresponsive labor force participation rates of men, we believe that this assumption is warranted.

[13] The security of household income, as captured by underemployment and the share of income earned through regular employment, is included to control for labor market insecurity. Households, especially in developing countries, can use women's labor supply to deal with negative income shocks or uncertainty (Attanasio *et al.*, 2005; Bhalotra and Umaña-Aponte, 2010).

exploits wage variation across districts, the other exploits wage variation across state-age-education groups. The two sources of variation give very different estimates, which do not allow us to draw conclusions about the impact of wages on women's labor force participation. However, the estimated effects of other explanatory variables, including education, are robust to the different specifications and to excluding the own wage from the model.[14] Given the difficulties in identifying the own wage effect and the inability to include the self-employed in models that include own wages, we focus here on the results without including own-wage effects. But results for own wage estimates and more details of the estimation method are discussed in Appendix B.

Income is measured as total household earnings in the reference week excluding the woman's own earnings, as data on other income sources are not collected in the survey. For total household earnings, the earnings of self-employed household members are imputed based on the earnings of employees.[15] We use income per capita to control for differences in the number of people depending on that income. The education level of the household head is included to capture household wealth or permanent income beyond total earnings. If higher status leads to more restrictions on women and greater wealth reduces the need for women to work, the education level of the head should have a strong negative effect on participation.

Caste and religion dummies are included to capture direct impacts of culturally or religiously determined restrictions on women, which are expected to be strongest among Muslim and high-caste Hindu households (Chen and Drèze, 1992; Das and Desai, 2003). To allow these restrictions to operate via a stronger negative income effect, we include interaction terms with income. We also interact caste and religion with women's education to mitigate any downward endogeneity bias in the education effects that will be present if higher education and lower labor force participation are joint outcomes of social class.

District level demand and supply variables are included to capture the effect of the availability of attractive jobs. Sectoral employment shares are based on the district's male workforce, since female employment shares will be endogenous. We expect that female participation is higher in districts that are relatively specialized in white-collar services. With the declining employment share of these activities, this would contribute negatively to changes in FLFP. The relative supply of graduates in the district is expected to depress

[14] The level of the own education effects does change but in all specifications we find a strong U-shape and a large decline in the effect of secondary and graduate education over time.

[15] Although this is a fairly rough approximation, it appears this imputation serves the purpose of measuring household income well: results are very similar when households with at least one self-employed adult are excluded from the sample (not shown).

participation rates through a crowding out effect. These factors are expected to be particularly important for highly educated women.

To explore in detail the various channels through which education affects labor force participation, including through changing the impact of income, household socio-economic status, etc., equation (1) is also estimated separately for women with less than secondary education and women with secondary or graduate education. The estimates for the highly educated women will also be particularly important to shed more light on the factors accounting for their declining labor force participation.

Appendix Table A4 contains sample means for all variables, showing that the main changes over time appear in women's education levels and those of their household heads, increasing household income, and a rising population share with graduate level education.

A. Estimation results

Estimation results are reported here as average marginal effects, showing the change in the probability of being in the labor force associated with a unit change in the explanatory variable (for indicator variables it is the difference with the reference category).

First of all, the U-shape in education appears even stronger in the marginal effects than in the average unconditional participation rates in Figure 2. As discussed in Section 2, the effect of education can run through several channels. Since we control for income, we can rule out the income channel as an explanation for the negative effects of low and intermediate education. Another possible channel is negative endogeneity through caste or social status. If education and restrictions on women both increase with caste, one would expect the negative education effects to be driven by high-caste households. In line with Das and Desai (2003), however, we do not find evidence for this. When we interact education with caste and religion (not shown), we find that the U-shape is even somewhat stronger for SCST women than for non-SCST Hindus and Muslims.

A remaining channel - one we cannot capture in the control variables – is through education strengthening preferences for white-collar jobs, to which women with low and intermediate schooling levels have limited access. Conversely, the stigma associated with menial jobs in manufacturing and construction or in domestic service rises with intermediate levels of education. Our education sub-sample results below are in line with this channel, which can explain the negative effect of education up to secondary schooling.

The positive effect of graduate education could reflect higher wages, better access to white-collar jobs, but also a positive selection bias. Given the very similar estimates when

controlling for the own wage (see Appendix B), we think the own wage channel does not play an important role, despite high returns to education. Better access to white-collar jobs does play a role, as subsample results for the impact of local employment structure and supply of graduates indicate. In addition, it is quite plausible that the positive higher education effect partly reflects an upward bias due to endogenous selection into higher education of those with a greater labor market orientation. This selection effect is also consistent with the large decline in the positive effects of secondary and graduate education. If increasing educational attainment has been driven by increasing supply of education and possibly by marriage market motives, highly educated women in 1987 were more positively selected than those in 2009. This is not something we can test directly without modeling educational attainment itself, which is beyond the scope of this paper, but we provide suggestive evidence for a decline in positive selection in Section 6.

Moving down in Table 1, we find a negative income effect and a strong negative effect of education of the household head. The latter gets considerably weaker over time – the effects roughly halve between 1987 and 2009 – suggesting that women have become less responsive to permanent income, wealth, or overall socio-economic status of the household. The control variables for income insecurity have the expected signs, with more insecure household earnings and underemployment among household members associated with higher labor force participation, except in 2009 when the effects are not significantly different from zero.

Looking at the impact of caste and religion, we find that women in SCST households are most likely to work, but the low caste-high caste gap declined a little bit. The impact of religion appears stronger, with Muslim women nine percentage points less likely to work than Hindus (a difference close to half the participation rate). Interactions of caste and religion with income show that the income effect does not differ across SCST, Hindu, Muslim, and others (not shown).

Finally, an important result from the district level variables is that the graduate share of the district's working age population has a strong negative effect in 2009, corresponding to a 4.2 percentage point lower participation rate in districts with a 10 percentage point higher graduate share. The district male unemployment rate has no significant impact on FLFP. Overall, the declining importance of household head education and caste give some support to the idea that women's labor force attachment increases with the kind of economic development India has experienced. But the large crowding out effect of an increasing supply of high-skilled labor and the large decline in the positive effect of higher education seem to play an important role in the stagnation of female labor force participation.

Table 1: Estimation results (average marginal effects)

Pr(labor force)	1987	1999	2004	2009
Own education (Ref. = Illiterate)				
Literate below primary	-0.046***	-0.058***	-0.047***	-0.027**
	(0.009)	(0.011)	(0.013)	(0.014)
Primary	-0.065***	-0.068***	-0.057***	-0.022*
	(0.008)	(0.011)	(0.015)	(0.012)
Middle	-0.056***	-0.076***	-0.094***	-0.057***
	(0.011)	(0.009)	(0.012)	(0.012)
Secondary	0.106***	-0.006	-0.038***	-0.050***
	(0.013)	(0.011)	(0.013)	(0.014)
Graduate	0.357***	0.243***	0.159***	0.146***
	(0.020)	(0.019)	(0.021)	(0.020)
Log income	-0.032***	-0.017***	-0.031***	-0.026***
	(0.004)	(0.003)	(0.004)	(0.003)
Regular earnings share income	-0.022**	-0.031***	-0.019*	0.001
	(0.009)	(0.009)	(0.010)	(0.009)
Underemployed hh members		0.018*	0.044***	0.022
		(0.010)	(0.012)	(0.014)
Household head education (Ref. = Illiterate)				
Literate below primary	-0.070***	-0.045**	-0.040**	-0.028
	(0.013)	(0.021)	(0.017)	(0.018)
Primary	-0.114***	-0.083***	-0.053***	-0.039***
	(0.012)	(0.013)	(0.015)	(0.014)
Middle	-0.138***	-0.123***	-0.077***	-0.079***
	(0.013)	(0.011)	(0.014)	(0.015)
Secondary	-0.187***	-0.159***	-0.119***	-0.102***
	(0.014)	(0.013)	(0.014)	(0.015)
Graduate	-0.190***	-0.168***	-0.111***	-0.095***
	(0.016)	(0.015)	(0.020)	(0.018)
Social group (Ref. = Hindu non-SCST)				
SCST	0.085***	0.052***	0.034***	0.056***
	(0.010)	(0.011)	(0.013)	(0.014)
Muslim	-0.059***	-0.070***	-0.085***	-0.089***
	(0.010)	(0.010)	(0.014)	(0.012)
Other	0.023	0.014	0.006	0.022
	(0.015)	(0.016)	(0.013)	(0.015)
District male employment shares (Ref. = manufacturing)				
Agriculture	0.196***	0.253***	0.180**	-0.158**
	(0.065)	(0.073)	(0.089)	(0.079)
Construction	-0.079	0.073	0.026	-0.160*
	(0.118)	(0.087)	(0.099)	(0.090)
Services	-0.113**	0.010	0.009	-0.041
	(0.052)	(0.049)	(0.055)	(0.059)
White-collar services	-0.101*	0.087	0.029	0.068
	(0.056)	(0.070)	(0.090)	(0.104)

Table continues on next page

Table 1, continued

Pr(labor force)	1987	1999	2004	2009
District male unemp. rate	0.109	-0.227	-0.197	0.128
	(0.175)	(0.166)	(0.205)	(0.269)
District graduate pop. share	-0.002	-0.068	-0.018	-0.420***
	(0.112)	(0.079)	(0.109)	(0.094)
N	29032	32541	29513	27198
mean dependent variable	0.185	0.179	0.203	0.174

Note: Married women age 25-54. Further controls are state fixed effects, age, age squared, children age 0-4 and 5-14, and living with in-law parents. District-clustered standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.10.

Table 2 shows the 1987 and 2009 marginal effects from separate estimations on the low- and high-education subsamples. We find important differences between the two groups. First of all, highly educated women are less affected by household income and socio-economic status, especially in 2009. The negative income effect in the high-education sample halves between 1987 and 2009, as opposed to a slight increase in the low-education sample, and education of the household head has no impact on highly educated women. The Muslim-Hindu gap is smaller in the high-education sample. And while more secure household income from regular employment leads to labor force withdrawal of women with low education, it actually increases participation of highly educated women. This suggests that highly educated women are less constrained by family circumstances in their labor force participation decision, while those in the low education sample appear to be boxed in by necessity to work if household incomes are very low or income insecurity is high, and stigmas attached to working if they are more educated and in more secure economic environments.

Table 2: Estimation results (average marginal effects) by education subsample

	Below secondary education		Secondary education or higher	
Pr(labor force)	**1987**	**2009**	**1987**	**2009**
Illiterate	*Ref.*	*Ref.*	--	--
Literate below primary	-0.047***	-0.026*	--	--
	(0.010)	(0.015)		
Primary	-0.066***	-0.014	--	--
	(0.009)	(0.014)		
Middle	-0.050***	-0.046***	--	--
	(0.012)	(0.014)		
Secondary	--	--	*Ref.*	*Ref.*
Graduate	--	--	0.209***	0.163***
			(0.017)	(0.015)

Table continues on next page

Table 2, continued

	Below secondary education		Secondary education or higher	
Pr(labor force)	**1987**	**2009**	**1987**	**2009**
Log income	-0.029***	-0.035***	-0.044***	-0.018***
	(0.004)	(0.004)	(0.006)	(0.004)
Regular earnings share income	-0.050***	-0.029**	0.089***	0.035***
	(0.010)	(0.015)	(0.018)	(0.011)
Underemployed hh members		0.013		0.046
		(0.014)		(0.030)
Household head education (Ref. = Illiterate):				
Literate below primary	-0.059***	-0.028	0.030	0.021
	(0.012)	(0.018)	(0.080)	(0.042)
Primary	-0.103***	-0.046***	0.058	0.049
	(0.012)	(0.015)	(0.067)	(0.038)
Middle	-0.120***	-0.087***	0.003	0.026
	(0.014)	(0.017)	(0.057)	(0.031)
Secondary	-0.180***	-0.105***	-0.022	-0.009
	(0.014)	(0.018)	(0.056)	(0.027)
Graduate	-0.176***	-0.136***	-0.059	0.001
	(0.022)	(0.026)	(0.057)	(0.028)
Social group(Ref. = Hindu non-SCST):				
SCST	0.082***	0.059***	0.106**	0.049**
	(0.011)	(0.017)	(0.044)	(0.021)
Muslim	-0.060***	-0.102***	-0.043	-0.051***
	(0.010)	(0.014)	(0.028)	(0.020)
Other	0.009	0.009	0.059**	0.028
	(0.018)	(0.028)	(0.024)	(0.021)
District male employment shares (Ref. = manufacturing):				
Agriculture	0.164**	-0.180*	0.125	-0.160
	(0.068)	(0.099)	(0.113)	(0.100)
Construction	-0.143	-0.213*	0.093	-0.071
	(0.135)	(0.118)	(0.149)	(0.105)
Services	-0.119**	-0.111	-0.064	0.086
	(0.056)	(0.082)	(0.075)	(0.072)
White-collar services	-0.116*	-0.140	-0.073	0.333***
	(0.064)	(0.154)	(0.075)	(0.109)
District male unemp. rate	-0.095	-0.104	0.164	0.153
	(0.196)	(0.432)	(0.144)	(0.179)
District graduate pop. share	0.014	-0.302**	0.063	-0.531***
	(0.125)	(0.131)	(0.140)	(0.115)
N	22176	15807	6856	11391
mean dependent variable	0.174	0.179	0.224	0.167

Note: Married women age 25-54. Further controls are state fixed effects, age, age squared, children age 0-4 and 5-14, and living with in-law parents. District-clustered standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.10.

Second, district specialization in white-collar services has a large positive effect on labor force participation of highly educated women in 2009, but no effect in the low-education sample, consistent with access to white-collar jobs being limited to highly educated women.

The crowding out effect of graduates in the local labor market is stronger for highly educated women, but is significantly negative and large in the low-education sample as well. This indicates that to some extent, persons with low and high education compete for similar jobs, supporting the idea that preferences for white-collar jobs develop among women with low and intermediate education levels and their labor force participation is then constrained by growth in demand in these jobs relative to the supply of educated workers.

V. Decomposition analysis

We now turn to a decompositions analysis, using the probit estimates for 1987 and 2009 to quantify the contribution of different explanatory variables to the observed change - or lack thereof - in the female labor force participation rate. Following Fairlie (2006) we express the labor force participation equation (Eqn. 1) as $Y_i^t = F(X_i^t \beta^t)$, resulting in the following decomposition:

$$\bar{Y}^{09} - \bar{Y}^{87} = \left[\sum_i^{N^{09}} \frac{F(X_i^{09}\beta^{87})}{N^{09}} - \sum_i^{N^{87}} \frac{F(X_i^{87}\beta^{87})}{N^{87}}\right] - \left[\sum_i^{N^{09}} \frac{F(X_i^{09}\beta^{09})}{N^{09}} - \sum_i^{N^{09}} \frac{F(X_i^{09}\beta^{87})}{N^{09}}\right]. \quad (2)$$

The N^t are sample sizes and $\bar{Y}^t$ the sample average probability of being in the labor force. The first right-hand side term in (2) is the contribution of changes in covariates, evaluated at 1987 coefficients. They measure how changes in covariates would have translated into changes in FLFP in absence of any changes in behavior (coefficients) and unobservables. The second term is the remaining change, expressed as the contribution of coefficient changes and evaluated at 2009 covariates. This term also includes the contribution of unobserved characteristics.

To identify the contribution of a single explanatory variable, one needs to compute a counterfactual predicted participation rate by replacing only this particular variable, say X_{1i}^{87}, by its 2009 counterpart X_{1i}^{09}, while keeping all other variables at their 1987 values. This is done by drawing a 2009 subsample of size equal to the 1987 sample, matching women on their predicted probability of working (based on a pooled probit estimation), and assigning women in the 2009 subsample the value of X_1 observed for their 1987 match. The results we report are based on 1000 random subsamples, in which furthermore the order of variables is randomized to account for the fact the contribution of one variable depends on the value of other variables.[16]

We also report all covariate contributions evaluated at 2009 coefficients, following a slightly different expression for the decomposition:

[16] See Fairlie (2006) for a more detailed discussion of the method.

$$\bar{Y}^{09} - \bar{Y}^{87} = \left[\sum_i^{N^{09}} \frac{F(X_i^{09}\beta^{09})}{N^{09}} - \sum_i^{N^{87}} \frac{F(X_i^{87}\beta^{09})}{N^{87}}\right] - \left[\sum_i^{N^{87}} \frac{F(X_i^{87}\beta^{09})}{N^{87}} - \sum_i^{N^{87}} \frac{F(X_i^{87}\beta^{87})}{N^{87}}\right]. \quad (3)$$

The first right-hand side term measures how changes in covariates contributed to the change in FLFP, measured at their 2009 coefficients. The results from (2) and (3) will differ if coefficients change substantially, with the 'true' contribution of a particular covariate somewhere in between. One should further keep in mind that this decomposition is simply an accounting exercise and in reality, changes in covariates and changes in coefficients are interdependent.

Before turning to the decomposition results, note that a comparison of the covariate contributions measured at 1987 coefficients (equation 2) versus 2009 coefficients (equation 3) gives an indication of how covariate changes interacted with coefficient changes. The difference will be positive for covariates that increased while their coefficient increased as well and for covariates that declined while their coefficient declined. And vice versa, the difference will be negative for covariates that increased while their coefficient declined and for covariates that declined while their coefficient increased.

Table 3 shows decomposition results for the sample pooling women across all education levels. Between 1987 and 2009, the labor force participation rate declined by 1.1 percentage points. The column totals indicate that covariate changes contributed between -0.8 (at 1987 coefficients) and -7.6 percentage points (at 2009 coefficients), with the remaining change (-0.2 to 6.5 percentage points at 1987 and 2009 coefficients, respectively) accounted for by changing coefficients and unobservables.

Looking at the covariate contributions at 1987 coefficients, the main positive contribution comes from women's rising education levels, which would have translated into a 4.9 percentage point higher participation rate if coefficients had remained at their 1987 values. This increase, however, is completely offset by rising household income and household head education, and the total covariate contribution adds up to -0.8 percentage points. The contributions at 2009 coefficients add up to a larger decline in labor force participation: at 2009 coefficients the effect of rising education accounts for an increase of only one percentage point, while the growing population share of graduates in a district has a very large negative contribution. On top of that, rising incomes and household head education still contribute to a decline of almost 4 percentage points. On net, at 2009 coefficients, rising incomes and the expansion of education has thus served to reduce female labor force participation rates substantially.

The falling number of children has contributed to moderate increases in female participation of similar amounts in both decompositions; the increasing presence of in-laws

served to slightly depress participation rates. The economic structure of a district also matters, pointing to changes in the structure of labor demand as a factor affecting female labor force participation, but the contribution is sensitive to which coefficients are used.

Table 3: Decomposition of FLFP

Pr (labor force) 1987	0.185	(N=29032)
Pr (labor force) 2009	0.174	(N=27198)
Difference	-0.011	

	At 1987 coefficients		At 2009 coefficients		Difference
	Contribution	St. Err.	Contribution	St. Err.	2009-1987
Own education	0.049***	0.003	0.010***	0.003	-0.039
Log income	-0.026***	0.002	-0.023***	0.003	0.003
Regular share income	0.000*	0.000	0.000	0.000	0.000
Education household head	-0.027***	0.002	-0.016***	0.002	0.011
Caste and religion	0.002***	0.000	0.001*	0.001	-0.001
Age	0.001**	0.000	0.000	0.001	-0.001
Children	0.008***	0.001	0.010***	0.003	0.003
In-laws	-0.005***	0.001	-0.002**	0.001	0.003
District agriculture	-0.004***	0.001	0.003**	0.001	0.008
District construction	-0.004	0.003	-0.009***	0.003	-0.005
District white-collar serv.	0.002**	0.001	-0.002	0.002	-0.004
District other services	-0.004***	0.001	-0.002	0.002	0.003
District male unemp.	-0.003	0.003	-0.004	0.005	-0.001
District graduate share	0.000	0.007	-0.048***	0.008	-0.047
State dummies	0.003***	0.001	0.003***	0.001	0.001
Total covariate contribution	-0.008		-0.076		-0.068
Remaining	-0.002		0.065		

Note: *** p<0.01, ** p<0.05, * p<0.10

Decomposition results for the low- and high-education subsamples are reported in Tables 4 and 5. For women with less than secondary education, labor force participation increased by 0.5 percentage point, but the total covariate contribution is large negative both at 1987 and at 2009 coefficients. The bottom two rows show that participation would have declined by 3.4 to 6.6 percentage points – mainly due to rising education of women and their household heads, rising incomes, sectoral employment shifts towards construction, and growing supply of graduates – if there had been no change in coefficients and in unobservables. The largest difference between the 1987 and 2009 columns is in the contribution of the district graduate share, where the rising graduate shares of districts' working age population interacts with a declining coefficient.

Table 4: Decomposition of FLFP, low education sample

Pr (labor force) 1987	0.174	(N=22176)
Pr (labor force) 2009	0.179	(N=15807)
Difference	0.005	

	At 1987 coefficients		At 2009 coefficients		Difference
	Contribution	Std. Err.	Contribution	Std. Err.	2009-1987
Own education	-0.008***	0.001	-0.006***	0.002	0.001
Log income	-0.018***	0.002	-0.025***	0.003	-0.007
Regular share income	0.003***	0.001	0.003**	0.001	-0.001
Education household head	-0.010***	0.001	-0.008***	0.002	0.001
Caste and religion	0.002***	0.001	0.001	0.001	-0.001
Age	0.001	0.001	0.001	0.001	0.001
Children	0.005***	0.001	0.008**	0.003	0.002
In-laws	-0.002***	0.000	-0.001***	0.001	0.000
District agriculture	-0.003***	0.001	0.003**	0.001	0.007
District construction	-0.008**	0.004	-0.013***	0.004	-0.005
District white-collar serv.	0.003***	0.001	0.004	0.003	0.001
District other services	-0.005***	0.001	-0.005**	0.002	0.000
District male unemp.	0.002	0.002	0.002	0.007	0.000
District graduate share	0.001	0.007	-0.031***	0.009	-0.032
State dummies	0.001	0.001	0.000	0.001	-0.001
Total covariate contribution	-0.034		-0.066		-0.033
Remaining	0.038		0.071		

Note: Sample includes married women below secondary education. *** p<0.01, ** p<0.05, * p<0.10

Among highly educated women, labor force participation declined by 5.6 percentage points. The decomposition results show a slightly positive total covariate contribution at 1987 coefficients, driven by higher education and fewer children, and partly offset by rising household incomes. At 2009 coefficients, however, the total covariate contribution is negative and large. It is again the growing population share of graduates in a district that explains most of the negative contribution, but rising income and declining employment in white-collar services have significant negative contributions as well. The bottom row in Table 5 shows that coefficient changes and changes in unobservables also contributed negatively to the labor force participation of highly educated women, in contrast to the results for women below secondary education.

Overall, the results clearly show how a rising share of graduates in the working age population, combined with a strong crowding out effect of skill supply in districts in 2009, contributed negatively to the labor force participation rate of women at all education levels. Furthermore, rising household income and rising household head education reduced labor force participation, while rising educational attainment of women had limited impact on FLFP due to the declining positive effect of higher education. This declining coefficient is one of the more surprising developments, and is further explored in the next section.

Table 5: Decomposition of FLFP, high education sample

Pr (labor force) 1987	0.224	(N=6856)
Pr (labor force) 2009	0.167	(N=11391)
Difference	-0.056	

	At 1987 coefficients		At 2009 coefficients		Difference
	Contribution	Std. Err.	Contribution	Std. Err.	2009-1987
Own education	0.015***	0.002	0.015***	0.002	0.000
Log income	-0.023***	0.003	-0.011***	0.003	0.012
Regular share income	-0.009***	0.002	-0.003**	0.001	0.005
Education household head	-0.002	0.001	-0.001	0.001	0.001
Caste and religion	0.004	0.002	0.001	0.002	-0.003
Age	0.004**	0.002	0.001	0.002	-0.004
Children	0.015***	0.003	0.010***	0.003	-0.006
In-laws	-0.004***	0.001	0.000	0.001	0.004
District agriculture	-0.001	0.001	0.002	0.001	0.003
District construction	0.004	0.009	-0.004	0.005	-0.008
District white-collar serv.	0.002	0.002	-0.010***	0.003	-0.011
District other services	-0.003	0.004	0.004	0.003	0.007
District male unemp.	-0.006	0.005	-0.006	0.007	0.000
District graduate share	0.006	0.018	-0.058***	0.011	-0.064
State dummies	0.005**	0.002	0.005***	0.002	0.000
Total covariate contribution	0.009		-0.055		-0.063
Remaining	-0.065		-0.002		

Note: Sample includes married women with secondary or higher education. *** p<0.01, ** p<0.05, * p<0.10

VI. The declining effect of higher education on labor force participation

As discussed in Section 4.1, it is likely that the effect of higher education on women's labor force participation includes an upward selection bias, where completing education and joining the labor force are both outcomes of some unobservable determinants (for example, the education or labor force participation of mothers, influences of peers, or a more general labor market orientation that promotes both high education and female labor force participation). If the average woman completing secondary or higher education in 2009 is less positively selected than her 1987 counterpart, this could account for some of the decline in the coefficients on secondary and graduate education between 1987 and 2009.[17] A detailed analysis of the determinants of women's educational attainment would require data on women's parental background and on schooling supply and other characteristics of the location where they grew up. Unfortunately, those data are not available, as we only observe married women in their husband's household – which is often in a different area than where

[17] The decline could also be explained by a decline in the quality of education. Azam and Kingdon (2013) study gender bias in education expenditure and show that in the period 1993-2005, when girls' education caught up to boys', households still spent less on girls, primarily by sending girls to public schools and boys to private schools. Girls are thus likely to receive lower quality schooling than boys, even if they attain the same level of education. Unfortunately we do not observe the type of institution a woman attended or any other indicator of the quality of education in the NSS data.

they grew up - and have no information on their location of origin or on their parents' education and employment.[18]

Among the factors that could explain a declining positive selection into education are the increasing supply of education and rising marriage market returns to education: both would be reasons for women to pursue more education even in absence of expected labor market returns and unrelated to the unobservable propensity to join the labor force. Given the costs of education (even tuition-free public primary schooling involves costs of transport, school books, foregone earnings, etc.) one can hardly claim that expansion of schooling supply alone explains most of the increased educational attainment of Indian women, but given the high pace of expansion it is likely that highly educated women in 2009 are less 'positively selected' than highly educated women in 1987.[19] We cannot control for or further analyze selection into education without instruments for educational attainment, but the extreme case – assuming that the education effects capture endogenous selection only – can be used to estimate an upper bound on the contribution of changes in selection to changes in the estimated effects of education.

A. Selection

For simplicity, say there is one unobservable characteristic that determines labor force participation, and let us call this characteristic ability. Assume there is perfect sorting on ability into education and the ability distribution in the population is fixed. Further assume there are *k* different ability levels in the population, and for ease of illustration, take $k = 1, \ldots, 6$ (one could also think of a uniform distribution of ability, but the idea remains the same). We thus have six ability types with corresponding ability level a^k, increasing in *k*.

The average ability of women with education level *E* in year *t* can then be expressed as:

$$\alpha_t^E = \sum_{k=1}^{6} \lambda_t^{k,E} * a^k, \quad (4)$$

[18] The NSSO integrated the collection of migration data with the employment surveys in 1987-88 and 1999-2000, but not with those of 2004-05 or 2009-10. The most recent migration data were collected in 2007-08 and show that 46% of urban females were migrants. Of these, 40% migrated from within the same district and another 40% from another district but within the state. More than half the urban migrant women come from a rural area, and the main reason for female migration was marriage (NSSO, 2010).

[19] As discussed in Section 2 some recent studies show that (girls') enrollment responds to the growth of jobs in IT and IT enabled services (Oster and Millett Steinberg, 2013; Jensen, 2012; Shastry, 2012), but this is a very recent development and this sector still accounts for a very small share of employment. We are not aware of any research on the causal effect of education on women's labor force participation in India or on the impact of rapidly increasing schooling supply on women's educational attainment, other than evaluations of recent policies and programs for primary education (e.g. Chin, 2005; Kingdon, 2007) and a growing literature on higher education quota for low-caste men and women (e.g. Bertrand *et al*., 2010).

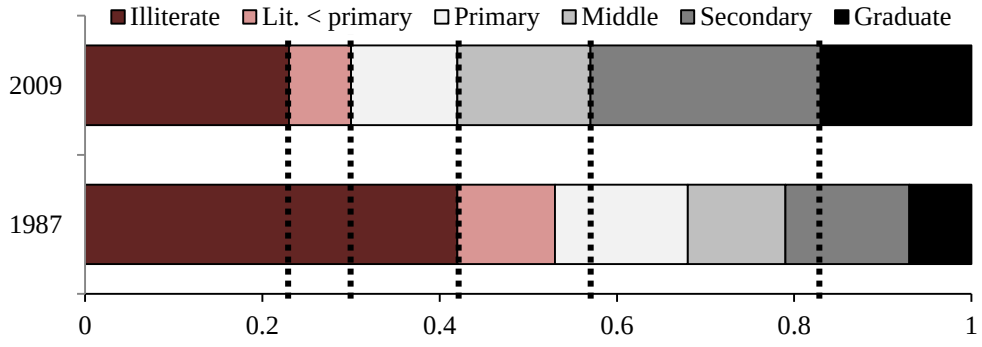
where $\lambda_t^{k,E}$ is the share of women with education level E who are of type k, such that $\sum_{k=1}^{6} \lambda_t^{k,E} = 1$. Taking 1987 as our benchmark year, the 1987 distribution of education corresponds one-to-one with the distribution of ability types in the female population, such that

$$\lambda_{87}^{k,E} = \begin{cases} 1, & E = k \\ 0, & E \neq k \end{cases}, \tag{5}$$

and consequently, $\alpha_{87}^{E} = a^{k}$ for $E = k$.

As the supply of education expands, women end up with increasingly higher educational attainment, but the average ability of women at education levels E>1 declines over time. In other words, between 1987 and 2009, low-ability types move into higher education levels. The shift is illustrated in Figure 5: by definition, illiterate women in 1987 are of ability level a^1, which is the ability level of the bottom 42 per cent of the distribution. Literate women below primary school in 1987 are of ability level a^2, women with primary schooling in 1987 are of ability level a^3, and so on. By 2009, all literate women without or with primary schooling are of ability level a^1, as they all fall within the bottom 42 per cent of the distribution. Similarly, all women with middle school completed in 1987 are of ability level a^4, but their 2009 counterparts are of ability levels a^2 and a^3, and so on for higher education levels. Thus average ability declines at all education levels above illiteracy.

Figure 5: Women's educational attainment in urban India



Note: distribution of married women age 25-54 across levels of educational attainment in 1987 and 2009.
Source: NSS Employment and Unemployment Survey

Now assume that the estimated marginal effects of education on women's labor force participation measure the pure ability-selection effect. The 1987 education effects β_{1987}^{E} quantify the effect of ability on labor force participation for each ability type k, since $\alpha_{87}^{E} =$

a^k for $E = k$. The education effects in other years should differ from those in 1987 only by the change in the ability composition of education groups:

$$\beta_t^E = \sum_{k=1}^{6} \lambda_t^{k,E} * \beta_{1987}^k. \quad (6)$$

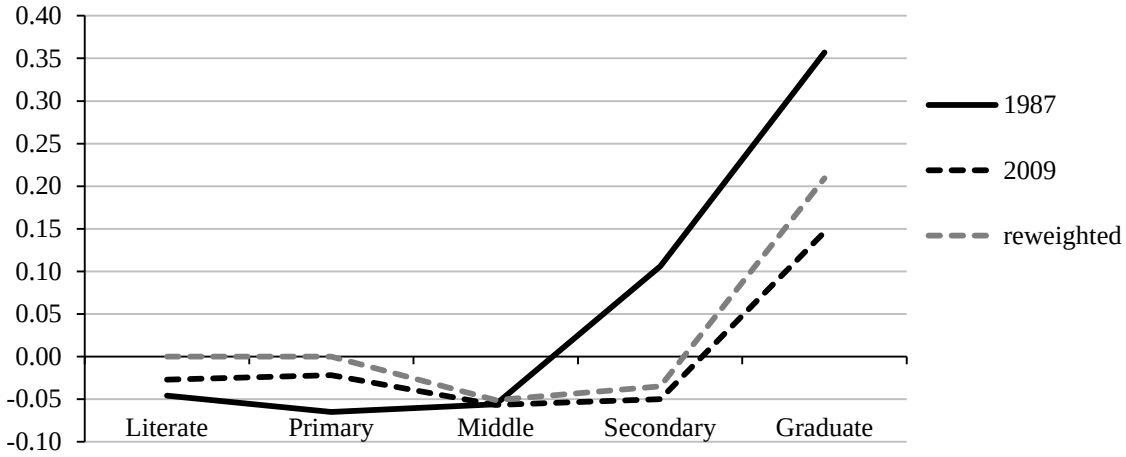
Table 6 shows the estimated marginal effects of education (from equation (1) and as reported in Table 1) in columns 1 – 4, and the reweighted effects for 1999, 2004, and 2009 in columns 5 – 7.[20]

Table 6: Estimated and reweighted effects of education

	Estimated marginal effects				Reweighted marginal effects		
	1987	**1999**	**2004**	**2009**	**1999**	**2004**	**2009**
Illiterate	0	0	0	0	0	0	0
Literate	-0.046	-0.058	-0.047	-0.027	0	0	0
Primary	-0.065	-0.068	-0.057	-0.022	-0.038	-0.021	0.000
Middle	-0.056	-0.076	-0.094	-0.057	-0.064	-0.059	-0.051
Secondary	0.106	-0.006	-0.038	-0.050	0.008	-0.006	-0.035
Graduate	0.357	0.243	0.159	0.146	0.241	0.232	0.209

Note: Estimated marginal effects from equation (1) in the main text. Reweighting according to equation (6) and using the education distribution as reported in Appendix table A4.

Figure 6: Estimated and reweighted effect of education, 1987 and 2009



Note: see footnote Table 5.

As shown in Table 6 and illustrated in Figure 6, the reweighting predicts the change in the marginal effects of education from 1987 to 2009 quite well. While this is by no means conclusive evidence that the education effects are largely driven by selection (if purely selection-driven, one would not find negative estimates at intermediate education levels), it does show that declining selection could potentially play a large role in the declining effect of

[20] Reweighting gives a zero marginal effect of literacy, because all literate women below primary school in 1999 and later years fall in the bottom ability group (the bottom 42 per cent), which is the reference group.

higher education on female labor force participation, where declining selection means that women's selection into education is increasingly based on characteristics that are not positively related to labor force participation.

B. Marriage market returns to education

Besides an expansion in the supply of education, rising marriage market returns to women's education could be driving women to pursue higher education. Marriage is of great importance in India, especially to women and their parents (Anderson, 2003), as women typically leave their parental household and migrate to live with their husband's family (see Rosenzweig and Stark, 1989; Duflo *et al.* 2009). Despite a growing literature on women's earnings capacity and their bargaining power within marriage in developing countries (e.g. Luke and Munshi, 2011), there is little evidence on the marriage market returns to women's education. According to Anderson (2003), the most important quality of women on the marriage market in India is a good appearance, while for men their ability to earn a living is most important. Data for India in Duflo *et al.* (2009) show both men and women have a preference for marrying a highly educated spouse, though their sample includes only educated persons from the urban middle-class in West Bengal. Rising labor market returns to education, which we do observe in India during the period we study, are an obvious reason why men could prefer more educated women. However, even in absence of labor market returns, women's education could contribute to husbands' social status directly and through higher productivity in status production (Eswaran *et al.*, 2009). Another important channel could be increased productivity of maternal time in the production of child human capital (Lam and Duryea, 1999), which raises the demand for educated wives if labor market returns to men's education increase (Behrman et al., 1999).

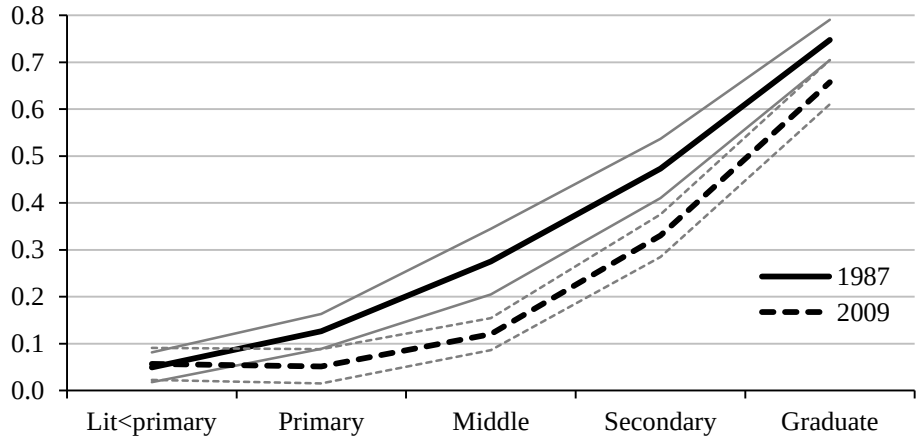
The following analysis aims to shed some light on the importance of women's education for marrying a 'high quality' spouse. Quality of a spouse is measured as the first principal component of his education level and weekly earnings.[21] A high quality spouse is then defined as a husband in the top quartile of the quality distribution within a given state and social group (distinguishing SCST, Hindu, Muslim, and other), which define the traditional boundaries of the marriage market for most women in India. We then estimate the probability that a woman has a high quality spouse as a function of her education, her age, the age gap between her and

[21] Weekly earnings for self-employed men are imputed based on earning of employees, using a selection-corrected Mincer type wage equation.

her spouse, and controlling for social group and state. The sample includes all married women age 30-39 in urban India.[22]

The estimated marginal effects of education for 1987 and 2009, with illiterate women as reference group, are plotted in Figure 7. The marriage market returns to education are actually lower in 2009 than in 1987, but also significantly more convex, with essentially flat returns up to middle school and then high returns to secondary and graduate education. This means that in 2009 women need at least secondary education to have reasonable chance of attracting a high-quality male. In contrast, in 1987, already primary school and certainly middle school generated reasonable odds to attract a high-quality spouse. This is consistent with our claim that at least some of the female education expansion is driven by expected marriage market returns rather than labor market returns.

Figure 7: Marriage market returns to education



Note: Estimated marginal effect of education on the probability of having a 'high quality' spouse, controlling for age, spouses' age gap, caste, and state. Grey lines show the 95% confidence intervals based on standard errors clustered by state-caste.

VII. Conclusions

In this paper, we investigate the very low and stagnating female labor force participation rates in urban India over the past 25 years. This stagnation is surprising given that it took place at a time of high GDP and earnings growth, a sizable fertility decline, a rapid expansion of female education, and rising returns to education. A combination of demand and supply side effects appear to have played a role in accounting for this stagnation. On the supply side,

[22] Results are similar if we take the entire age group 25-54; if we define high quality spouse as the top decile instead of the top quartile of husbands; or if we run a linear regression of the principal component of husbands' education and earnings on women's characteristics.

rising male incomes and education have reduced female labor force participation, showing that the classic income effect is at work in urban India. The effect of rising female education on female labor force participation is more complicated. While the pure shift towards increasing the proportion of women with graduate education has increased labor force participation, this effect is moderated and counteracted by range of opposing effects. First, the strong conditional U-shape pattern of the effect of education on labor force participation suggests that, particularly in the middle of the education distribution, other factors depress female labor force participation. This is partly driven by the preferences of educated women for white-collar service employment and stigmas for these women to be working other sectors. Second, the positive effect of secondary and graduate education on female labor force participation has fallen considerably. We show evidence that this is partly related to a declining effect of selection into higher education. As more women have increased their education, positive selection effects have been diluted, contributing to falling labor force participation rates among the highly educated. We further show that declining selection could be related to the higher educational attainment being driven by improved marriage rather than employment prospects: higher education improves marriage prospects in 2009 much more than in 1987.

But also demand-side effects, and their interaction with labor supply, have played a role. In particular, the supply of educated workers has far outpaced the demand for jobs that match their skills as well as their preferences for white-collar service occupations. As women's labor mobility is very low (and most migration of women happens for marriage reasons), local excess supply of educated workers causes many educated women to withdraw from the labor force. This is related to shifts in the sectoral employment structure towards employment that is less acceptable to educated women. Most employment growth occurred in construction and low-skilled services, while the expansion of employment in white-collar services has done too little to absorb a growing educated working-age population.

These results suggest that, if current trends and preferences persist, there is little likelihood that women will drastically increase their labor force participation rates in coming years. As a result, India is unlikely to fully reap the benefits of the demographic dividend associated with its high share of the working-age population. As such, the sustainability of India's high growth is very much in question if it fails to integrate educated women into the labor force. Also, rising education of women will not contribute much to their economic empowerment, which is typically associated with employment and earnings.

It is difficult to make any definitive judgments on welfare effects. To the extent women's labor force participation is decided by their families (particularly by husbands and in-laws) and does not reflect women's own preferences, or is constrained by their inability to migrate for employment, policy action to promote female employment would be warranted. But even if the main constraint is women's own preferences, the degree to which this impedes their labor force participation should be a concern to policy makers. Our findings point at the importance of mismatches between the sectoral structure of employment and women's preferences. Employment growth in urban India has been concentrated in construction and low-skilled services, but from the perspective of female labor force participation a different growth strategy would be warranted; a more female-intensive export-oriented growth strategy (as has been pursued in many East Asian economies as well as in neighboring Bangladesh) would substantially increase female employment opportunities for those in the middle of the education distribution. On the supply side, policies explicitly promoting the acceptability of female employment outside the public sector, policies to allow a greater compatibility of female employment with domestic responsibilities and policies to improve the safety of female workers in the private sector could also draw more women into the workforce.

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Appendix A

Table A1: Female labor force participation rates in urban India

	Age	Marital	1987-88	1993-94	1999-00	2004-05	2009-10
Principal status	25-54	All	22.9	23.0	22.0	24.8	21.3
		Married	18.5	18.5	17.9	20.3	17.4
	20-59	All	21.7	21.9	20.8	23.8	20.5
		Married	17.2	17.3	16.7	19.2	16.4
Principal and subsidiary status	25-54	All	28.4	28.9	25.7	29.6	24.3
		Married	24.4	24.7	21.8	25.4	20.6
	20-59	All	26.9	27.4	24.2	28.3	23.2
		Married	22.8	23.2	20.4	24.1	19.3

Source: NSS Employment and Unemployment Survey

Table A2: Labor force participation in Time Use and Employment Surveys

	Time use survey 1998-99		Employment survey 1999-00	
	male	female	male	female
Gujarat	98.9	14.8	97.3	20.7
Haryana	97.7	14.5	95.7	20.2
Madhya Pradesh	98.7	19.5	97.8	22.5
Meghalaya	98.6	31.3	99.3	26.7
Orissa	99.6	17.9	96.7	23.3
Tamil Nadu	97.6	15.6	97.7	32.3
Combined	98.4	16.3	97.4	25.3

Note: Reported numbers in this table include principal and subsidiary status labor force.
Source: NSS Time Use Survey and NSS Employment and Unemployment Survey

Table A3: Definition of education levels

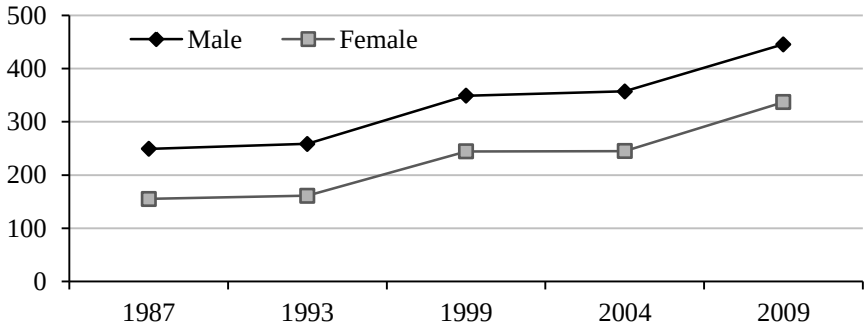
Illiterate below primary	Not literate
Literate	Literate without formal schooling or below primary level
Primary	Primary education
Middle	Middle school
Secondary	Secondary, higher secondary, or diploma/certificate course
Graduate	Graduate, post-graduate, and above

Table A4: sample means

	1987	1999	2004	2009
Labor force	0.18	0.18	0.20	0.17
Illiterate	0.42	0.32	0.28	0.23
Literate below primary	0.11	0.08	0.07	0.07
Primary	0.15	0.12	0.13	0.12
Middle	0.11	0.14	0.16	0.15
Secondary	0.14	0.20	0.22	0.26
Graduate	0.07	0.13	0.14	0.17
ln(Y)	3.63	3.99	4.08	4.39
Reg_share_Y	0.46	0.43	0.41	0.41
Underemployment	.	0.12	0.13	0.11
HH head Illiterate	0.21	0.18	0.16	0.15
HH head Literate < prim.	0.14	0.10	0.10	0.08
HH head Primary	0.17	0.12	0.13	0.11
HH head Middle	0.14	0.15	0.16	0.15
HH head Secondary	0.22	0.26	0.28	0.30
HH head Graduate	0.13	0.18	0.18	0.21
Hindu non-SCST	0.66	0.65	0.65	0.66
SCST	0.13	0.15	0.15	0.14
Muslim	0.15	0.14	0.14	0.14
Other social group	0.21	0.20	0.20	0.20
In-law parents	0.09	0.12	0.14	0.15
Age	35.6	36.1	36.6	36.7
Children 0-4	0.69	0.53	0.50	0.42
Children 5-14	1.59	1.37	1.20	1.05
Agriculture	0.07	0.06	0.05	0.05
Manufacturing	0.27	0.23	0.24	0.22
Construction	0.07	0.10	0.10	0.12
White-collar services	0.18	0.16	0.14	0.15
Other services	0.41	0.46	0.47	0.45
Male unemployment rate	0.05	0.04	0.04	0.02
Graduate share	0.11	0.16	0.17	0.21
N	29,072	32,543	29,551	27,240

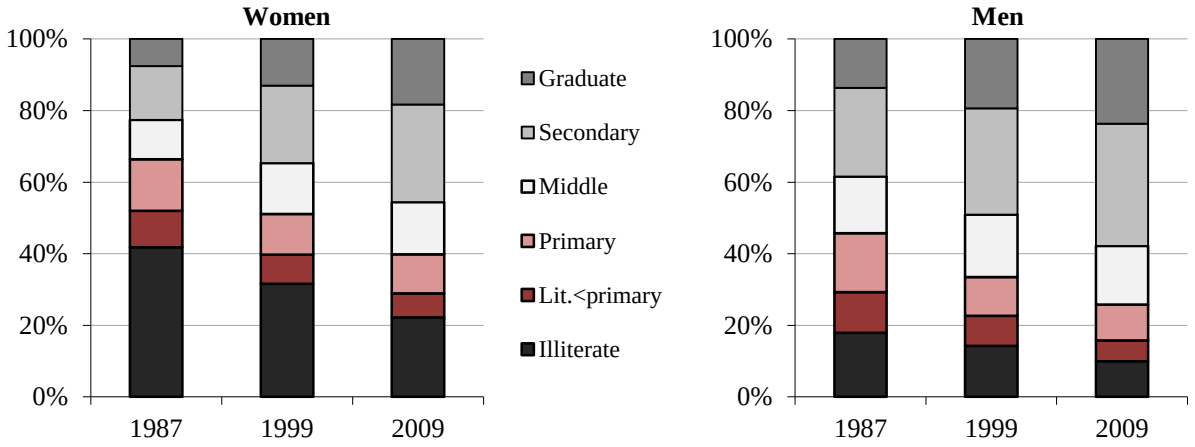
Note: Averages for married women age 25-54, calculated using sampling weights.
Source: NSS Employment and Unemployment Survey

Figure A1: Real weekly earnings, urban India 1987-2009



Note: Average total weekly earnings for casual and regular employees in the age group 25-54. Earnings are spatially deflated and in 1987-88 Rupees, based on the Labour Bureau Consumer Price Index for Industrial Workers and Deaton (2003). *Source*: NSS Employment and Unemployment Survey

Figure A2: Educational attainment, urban India 1987-2009



Note: distribution of highest education level completed for women and men age 20-59. *Source*: NSS Employment and Unemployment Survey

Appendix B: The effect of wages

To obtain estimates of the own-wage effects on fem.ae labor force participation, we estimate equation (1) in the main text, that is $P_{it} = F(\alpha_{st} + \sum_E \beta_t^E D_{it}^E + \beta_{Xt} X_{it} + \beta_{Zt} Z_{it})$, with the log wage included in X_{it}. Wages are observed only for employed women (regular employees and casual workers) and need to be imputed for all others. As is standard in the literature, this imputation will be based on a wage equation with human capital variables and a number of control variables, as will be explained below. We note, however, that self-employment income and especially the "earnings" of unpaid family workers are unlikely to be predicted well by this equation. The returns to education, for example, are likely to be different for employees versus self-employed workers, but the NSS surveys collect no income or earnings data for self-employed workers so we do not have the data to estimate activity-specific wage equations. In estimating own-wage effects, therefore, we focus on the probability of working for pay in a sample excluding self-employed and unpaid family workers.

We estimate a wage equation with Heckman selection bias correction (Heckman, 1979) separately for each year, regressing real weekly earnings on state, age, age squared, education level, social group, and a variable q_{it} that is further discussed below:

$$\ln w_{it} = \beta_{st} + \beta_{1t} X_{it}^W + \beta_{2t} q_{it} + \beta_{3t} \lambda_{it} + u_{it}\,, \qquad \text{(B1)}$$

where the vector X_{it}^W contains the variables listed above, and λ_{it} is the sample selection correction term. The latter is obtained (as the inverse Mills ratio) from a probit model for labor force participation. This selection equation is equal to equation (1) in the main text, except for the expected market wage that is replaced by q_{it}:

$$P_{it} = F(\alpha_{st} + \sum_E \beta_t^E D_{it}^E + \beta_{Xt} X_{it} + \beta_{Zt} Z_{it} + q_{it}). \qquad \text{(B2)}$$

The selection effect in equation (B1) is identified by the district variables vector Z_{it} and the variables in X_{it} that are not included in X_{it}^W, namely income, security of income, underemployment of household members, education of the household head, the number of children by age group, and the presence of in-law parents.

For all women in the sample, the predicted log wage $\ln \hat{w}_{it}$ used in the estimation of equation (1) is the linear prediction based on equation (B1) (excluding the sample selection term). The own wage effect is thus identified through the variable q_{it}. As Heim (2007) discusses, past studies have used a variety of methods to identify the own wage effect on female labor supply, but there is usually no truly exogenous source of variation in wages that can be used. Policy changes such as tax reforms have been used for difference-in-difference

estimations, but even if such reforms have taken place they do not allow for a comparison of own wage effects over time for a sample of women representative of the female working age population.

For lack of truly exogenous variation in wages, we compare own-wage effects identified from two different sources of variation.[23] First, we use interactions of state, education level, and age group dummies (age 25-29, 30-39, 40-49, and 50-54) to identify the own wage effect. This is related to grouped estimations of women's hours worked in Blau and Kahn (2007), which is equivalent to using group membership dummies as instrument for the wage in a linear labor supply model (Angrist, 1991). Second, we use spatial variation in wages, taking for q_{it} the average wage of other women in the same district. Reflecting the local labor market, the district average wage should be a good predictor of women's own wage. We also estimate the model without the own wage to check the robustness of other coefficients.

Results are summarized in Table B1 below, which reports the marginal effects of the own-wage, education, and household income. Estimates for other variables are not shown but are almost identical across the three specifications. Results for the specification excluding the own wage (columns 1-4) are furthermore very similar to the results in the main text, despite dropping self-employed women from the sample. The only difference between the two samples is that the regular earnings share (which we include to control for the security of household income) has a positive effect on paid employment, while it has a negative effect on total labor force participation. A plausible explanation is that having household members with regular employment provides the necessary network or information for women to find paid employment themselves. It could reduce entry barriers to paid employment through familiarity with employers, reducing families' safety concerns (Sudarshan and Bhattacharya, 2009), such that without a connection to employers, women are more likely to take up self-employment.

In columns 5-8 of Table B1, the own wage effect is identified by state-education-age group dummies. We find a positive own wage effect for all years except 1987, though the effect is economically small. A wage difference between state-education-age groups of 10 per cent (i.e. a difference of 0.1 in the log wage) corresponds to a difference of around 0.25 percentage points in labor force participation. In columns 9-12, where the own wage effect is identified on variation across district, we see a negative own wage effect (though not significant at the 5% level except for 1987), showing that FLFP tends to be lower in high-wage districts.

[23] Two recent studies on female labor supply in the US (Blau and Kahn, 2007; Heim, 2007) find own wage estimates and changes in estimates comparable across several specifications. Even though, arguably, none of those estimates is properly identified, the robustness across specifications gives credence to their findings.

As discussed above, in both specifications the exclusion restrictions are not necessarily satisfied, resulting in potentially biased estimates. For example, if district average wages capture general living standards beyond what we are able to control for with total household earnings and household head education, the estimates are biased downwards due to negative income effects. The group dummies, on the other hand, are more likely be correlated with human capital characteristics that are positively linked to labor force participation, as they capture variation across cohorts from the same state and with the same educational attainment. This could for example include the quality of education. Because the estimates are different in sign, we believe it is best not to draw any conclusion regarding the importance of wages for women's labor for participation in urban India.

Table B1: Estimated average marginal effects

	No wage				State-education-age group				District average wage			
Pr(emp)	**1987**	**1999**	**2004**	**2009**	**1987**	**1999**	**2004**	**2009**	**1987**	**1999**	**2004**	**2009**
Log wage					0.000	0.026***	0.027**	0.020***	-0.096***	-0.147*	-0.084	-0.034
					(0.008)	(0.008)	(0.012)	(0.007)	(0.032)	(0.079)	(0.056)	(0.039)
Own education (Ref. = Illiterate):												
Literate	-0.033***	-0.046***	-0.024**	-0.034***	-0.028***	-0.039***	-0.045***	-0.029**	-0.020***	-0.027***	-0.026***	-0.024***
	(0.007)	(0.010)	(0.011)	(0.010)	(0.008)	(0.009)	(0.013)	(0.011)	(0.005)	(0.005)	(0.009)	(0.007)
Primary	-0.052***	-0.052***	-0.044***	-0.025***	-0.048***	-0.054***	-0.065***	-0.025**	-0.034***	-0.046***	-0.044***	-0.022***
	(0.006)	(0.009)	(0.010)	(0.009)	(0.006)	(0.009)	(0.009)	(0.010)	(0.003)	(0.004)	(0.009)	(0.007)
Middle	-0.039***	-0.061***	-0.066***	-0.049***	-0.039***	-0.059***	-0.076***	-0.052***	-0.001	-0.047***	-0.051***	-0.041***
	(0.008)	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.011)	(0.009)	(0.014)	(0.004)	(0.010)	(0.008)
Secondary	0.124***	0.026**	0.006	-0.029***	0.104***	-0.002	-0.024	-0.037***	0.318***	0.269*	0.141	0.007
	(0.013)	(0.012)	(0.013)	(0.009)	(0.022)	(0.015)	(0.021)	(0.012)	(0.074)	(0.144)	(0.091)	(0.030)
Graduate	0.374***	0.260***	0.206***	0.177***	0.351***	0.177***	0.143***	0.143***	0.644***	0.665***	0.457***	0.316**
	(0.020)	(0.021)	(0.021)	(0.020)	(0.041)	(0.031)	(0.039)	(0.027)	(0.068)	(0.116)	(0.141)	(0.123)
Log income	-0.036***	-0.018***	-0.036***	-0.030***	-0.033***	-0.019***	-0.034***	-0.026***	-0.033***	-0.019***	-0.034***	-0.027***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
N	27123	30323	26953	25527	27123	30323	26953	25527	26686	29801	26593	24945
Mean Pr.	0.122	0.119	0.129	0.117	0.122	0.119	0.129	0.117	0.123	0.120	0.130	0.118

Note: Sample includes married women age 25-54 who are not self-employed or head of their household. Further control variables are listed in the main text. District-clustered standard errors (columns 1-4) or bootstrapped standard errors (columns 5-12) are in parentheses. *** p<0.01, ** p<0.05, * p<0.10.