

# The Impact of Education on Employment of Married Women in India

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# 1. Introduction

According to the World Bank's data from 2003 to 2011, India is the second-most populated country in the world. India had a population of 1.2 billion in the year 2011, which was very close to China's population of 1.3 billion, the most populated country in the world.

In order to describe females in India, statistics of China will be used as a comparison to illustrate the current education and employment situation for women. Although both India and China share many similar characteristics in terms of population, female education and labour market conditions are quite different.

Low levels of literacy and educational attainment, large gender disparity in school enrolment, completed education, and labour market participation are important features of the Indian economy (Duraismy 2002).

The ratio of female to male school enrollment gives a general idea of gender inequality in education.

From Table 1, the primary school enrollment ratio in India is very close to the ratio in China, and the enrolled population of male and female is almost the same. While the secondary school enrollment ratio in China remained constant at around 100% from 2003 to 2009, the ratio in India is significantly lower, at 80.53%, in 2003 and gradually increases to 91.33% in 2009. In tertiary school enrollment, the gap becomes even wider. The ratio of females receiving tertiary education to males in China grows from 82.89% to 106.61%, which means that the number of females pursuing tertiary education becomes larger than the male enrollment. However, in India, the ratio for tertiary education remains at around 70% over the same period, which means there are only 7 female enrollments for every 10 male enrollments.

Barcellos, Carvalho and Lleras-Muney(2013) show that Indian parents invest more in boys than girls and that this tendency is even greater when there is only one child in the household. This shows evidence of gender discrimination in education enrollment.

Furthermore, this is not the case only for India. Jensen (2010) also states that gender discrimination in education is a concern for a number of developing countries. Therefore, women in India are among the vulnerable groups to which attention needs to be paid.

This gender difference in educational attainment could be an explanation for the low literacy rate in Indian women. According to the World Bank online data, the literacy rate for adult females in India in 2001 was only 47.84%, while this indicator for China in 2000 was 86.53%.

Another consequence of the relatively low educational attainment of Indian women is its surprisingly low labour force representation. Again, a comparison between the female labour force percentages in India and China is quite interesting.

Table 2 reveals that women only form a very small proportion of the Indian labour force population.

Both the women's education ratio and the women's employment ratio in India are lower than the ones in China. Therefore, in this article, we are trying to find out whether the education for married women in India could impact their employment. Our data come from India's Third National Family Health Surveys (NFHS-3).

This paper is not the first one to investigate the link between education and labour market outcomes. Duraisamy (2002) found that higher levels of education could not only remarkably raise the probability of employment with a regular wage in India, but also could contribute to an increase in the private rate of return per year in education. Nunez and Livanos (2009) also found evidence that higher education increases the chance of employment in Europe. Furthermore, Riddell and Song (2011) found that education also significantly increases the probability of a rise in the re-employment rate in the US. Although much of the evidence is based on the whole labour force which included both men and women, we are expecting that the impact of education on employment for married Indian women would also be positive.

It is very interesting that our findings are quite different from the literature. As opposed

to the majority of authors, we found that, although education for married Indian women has a significant impact on their employment, the relationship is negative. The findings will be discussed in the following sections.

This article is organized as follows.

First, we will present a review of recent literature on the relationship between education and employment. We will then give a brief introduction to the Third National Family Health Surveys (NFHS-3), and present a description of the data for married women in India. In the following part, we will introduce four econometric models. The regression results of these models will be shown after that. The conclusions we get from the results will be discussed in the last section.

## 2. Literature Review

There are several articles discussing the relationship between education and employment. Duraisamy (2002) and Klasen and Pieters (2012) both focusing on the Indian labour market. Duraisamy's (2002) research is based on the whole labour force, and Klasen and Pieters (2012) pay special attention to the female labour force of India. Riddell and Song (2009) also study a similar topic with the U.S. labour force. Bratti (2003) gives a clear positive effect of education on employment with analyzing the female labour force in Italy.

Duraisamy (2002) estimates the monetary returns from schooling in India by gender, age cohort, and location, and evaluates the changes in returns over a decade. This research is based on two rounds of National Sample Surveys for 1983 and 1993/4 of employment and unemployment in India. Only workers in wage employment are considered in the analysis because the income information of self-employed workers was not collected. The results of this article could be stated in five aspects. First, higher education could raise the likelihood of entering into wage employment, especially with a college degree. Second, the annual private rate of return on education increases up to the

secondary level, and then declines. Third, the returns from an investment in education for women are larger than that of men at the middle, secondary and higher secondary levels of education. Fourth, younger groups, aged between 15 and 44 present a lower return for one additional year of education at primary, middle and secondary education when compared with older groups. Fifth, for primary and secondary levels, as well as technical diplomas, the people residing in rural areas have a higher return on education than those residing in urban areas. But, for higher secondary and college education, urban residents have a higher return. Women, no matter where they live, are offered higher returns with middle, secondary and higher secondary education than men. Lastly, the change between 1983 and 1993/4 in the returns on education is more significant for women than for men.

Klasen and Pieters (2012) also look into the female labour force participation for India. Their estimations are based on the National Sample Survey (NSS) on Employment and Unemployment for the years 1987-88, 1993-94, 1999-00, and 2004-5.

Some of their findings are quite different for low-educated women and high-educated women. Low-educated women, up to secondary education, are more driven by necessity and social status; the higher the head of the household's education, the lower the labour force participation of low-educated women. Also, for the high-educated women, there is no clear effect of heads' education. Here, heads are strictly men and women household heads are all dropped from the sample.

Klasen and Pieters (2012) also find a U-shaped relationship of women's own education effect on female labour force participation. Their labour force participation presents a downward slope in lower education and a positive effect on participation for higher education.

Women's decision to work is also negatively affected by the household members' income and employment. Only highly educated women will be attracted to the labor market by higher earnings.

The findings of Klasen and Pieters (2012) about the U-shaped relationship between

female education and female labour force participation are partially consistent with the findings of this paper.

Further supportive material that education could positively affect employment comes from Riddell and Song (2009).

Riddell and Song (2009) investigate whether education has a causal effect on labour market transitions, especially from unemployment to employment. This paper uses longitudinal data from the Current Population Survey (1980 - 2005) and the 1980 Census of the U.S. Compulsory schooling and child labour laws are used as IV as well as conscription risk in the Vietnam War period, to capture schooling. Based on the analysis, Riddell and Song find that education could be a significant factor to increase the probability of re-employed for those who are unemployed. This effect is quite large, showing that graduating from high school could increase the probability of re-employment by approximately 40 percentage points.

Besides the evidence for the entire labour force, there is also research particularly focusing on women.

Bratti (2003) discusses the role of education in both the women labour force participation and in marital fertility. The analysis is based on the 1993 survey of Household Income and Wealth, by the Bank of Italy. Based on the dynamic life-cycle models, Bratti uses a multinomial logit model trying to find the impact of women's education on women's labour force participation together with marital fertility. In the empirical model, Bratti included female education along with other relevant factors such as the role of a husband's income, job qualification, and branch of activity, child care and age. Since Bratti says that women's education might be an endogenous variable when analyzing marital fertility, Bratti uses a non-linear-instrumental-variables estimation strategy, where the instruments of education are a woman's parental wealth, her father's job, and the branch of activity. Bratti's findings suggest that women's education has a positive effect on raising the women's job attachment. In particular, more educated

women are also more likely to work even in the period of a birth event. Moreover, the more educated women are, the more likely they are to postpone fertility. This can be explained by the willingness of women to postpone marriage and fertility until after completing their full-time education.

There is no doubt that the results of Bratti (2003) have a very significant meaning on policy direction. It provides support for the then recent increasing in the duration of compulsory schooling in Italy raising the future female labour force participation. But there are also some points that can be improved.

In the data description, Bratti points out that, from the Survey of Household Income and Wealth of the Bank of Italy in 1993, women's education is only given by the highest educational qualification obtained. Bratti calculates the total number of years of education from the legal duration of different educational grades. This method rules out the possibility that the education system might vary in different areas and also the possibility of being educated without getting a degree. A much more specific result will be found if using the specific information for the details of the years of education these women obtained. Therefore in our analysis, we include both measures of education. As a result, we find a more specific and comprehensive relationship.

### 3. Data description

The data used in this paper are derived from the Third National Family Health Surveys (NFHS-3) which was conducted in 2005-2006. NFHS are nationwide surveys collecting data from a representative sample of households throughout India. The NFHS were launched by the Ministry of Health and Family Welfare and the Government of India so that a high quality of data for population and health could be provided. The two former surveys NFHS-1 and NFHS-2 were conducted in 1992-1993 and in 1998-1999. These three surveys were not necessarily the same. The range of the respondents of the survey expanded with each survey. Unlike NFHS-1 and NFHS-2 which only investigating ever

married women aged between 13 and 49, NFHS-3 included never married women aged 15-49 and both ever-married and never married men age 15-49 in addition to ever-married women age 15-49 to get the interviews. In total, NFHS-3 interviewed 124,385 women aged between 15 and 49 and 74,369 men aged between 15 and 54. We will only use data from NFHS-3 due to the discontinuity of the three surveys.

Considering that there is a potential important influence from the husbands, in that the husbands normally contribute a very significant part to the family wealth, and also considering the fact that 99.53% of the observations in the sample are married women, after dropping the missing values, we chose to analyze married women only.

86,542 observations are left after dropping all the missing observations.

Table 3 presents descriptive statistics of the data that will be analyzed in the following section. What we are interested in here is the employment of married women. From the data, 56,797 women are not currently working, which is 65.63% of all married women.

As for women's education, there were many ways to illustrate. In the NFHS-3, highest educational level and education in single years were both used to measure education. Highest educational level stands for the personal educational attainment. This indicator is similar to the one Bratti (2003) got directly from the Survey of Household Income and Wealth of the Bank of Italy in 1993. Education in single years displays the individual's real total years of education. This is much more specific than the calculation in Bratti (2003). The last two indicators will be used to measure education in our analysis.

The highest educational level is divided into four types. Among all these women, 38.6% receives no education, 15.37% have primary education, 37.12% have secondary education and 8.91% receives even higher education. Less than half of women receive at least a secondary education. The last three levels will be described using dummy variables, and the first type, no education, will be used as benchmark. Then we examine the employment rate for each educational level and find that the numbers are 44.41%, 34.45%, 23.84%, and 34.61% for no education, primary education, secondary education

and higher education, respectively. This actually indicates that the employment rate does not go up with education; in fact, the employment rate is actually decreasing with education.

The other measurement of education is education in single years. This number ranges from 0 to 23. Approximately one third of women were not educated at all. The average years of education is 5.326, with 75% of women received at most 9 years of education and 99% received 17 years.

The total number of children and the number of household members could also play vital roles in women's decision to work. Raising kids or supporting a big family would be a heavy burden for the women, and thus might push them to search for a job to collect enough funds to run the household.

The number of children ever born ranges from 0 to 16 with a mean value of 2.739 and standard deviation 1.92. The 75<sup>th</sup> and 99<sup>th</sup> percentiles are 4 and 9 kids, respectively.

The total number of household members varies from 1 to maximum 35. But most women do not live in such big families. Households have, on average, 5.989 members. The 95<sup>th</sup> percentile is 12 members. The standard deviation is 2.992.

The partner's education is also measured in a similar way to women's education. The difference is that the largest group is the secondary educational level. This group contains 48.22% of all married women's partners. 21.68% of partners have no formal education, 15.38% have a primary education only and 14.72% have received a higher education. This means that more than half of the married women's partners, at 62.94%, received at least a secondary education, which is very different from women. The distribution of the partner's years of education is very similar to women's. It ranges from 0 to 24 with a mean number of 7.352 which is a little bit more than the mean years of women's education, at 5.236. This coincides with the evidence that a larger proportion of men receive at least a secondary education.

The information on partner's employment status was not provided directly in the

NFHS-3. But the interviewees were asked to provide their partner's occupation. So we derive the partner's employment by considering those who did not work as not employed and all other occupation as been employed. Based on the occupation information, we create a dummy variable for partner's employment *pwork*. The mean of this dummy variable is the rate of employment of married women's partner which is quite high as 98.02%. Although the number is relatively large, it is very close to the husbands' employment rate of 96% in Bratti (2003). This might due to the men taking the main responsibility of raising a family.

Household income is not included in the analysis. This variable could be endogenous that it could affect the women's decision to work. Also women's income, which is closely related to the employment, contributes to their family wealth.

From Duraisamy (2002), we know that the place of residence of women (urban vs. rural) could also affect the employment because there is a difference of residing in rural or urban areas in the returns to education. The residence data for married women is shown at the bottom of Table 3. The numbers of women living in urban and rural areas are very close.

## 4. Empirical Strategy

The primary interest lies in whether more education for married women will increase the probability of their employment.

Therefore, the empirical method we are going to use is Ordinary Least Square with employment to be the dependent variable and education to be the independent variable. Other variables such as age will also be added into the models.

The analysis consists of two parts. First, we are going to regress married women's employment on their own education. Second, married women's employment will be regressed on both their own education and their partner's education.

As long as education has two ways to be measured, all the models will be expressed in

two ways.

The econometric models that we use in this paper are described as follows.

$$emp_i = \alpha_0 + \alpha_1 pri_i + \alpha_2 sec_i + \alpha_3 hi_i + \alpha_4 chi_i + \alpha_5 mem_i + \alpha_6 age_i + \alpha_7 age_i^2 + \varepsilon_i \quad (1)$$

$$emp_i = \beta_0 + \beta_1 educy_i + \beta_2 educy_i^2 + \beta_3 chi_i + \beta_4 mem_i + \beta_5 age_i + \beta_6 age_i^2 + \varepsilon_i \quad (2)$$

The dependent variable  $emp_i$  is a dummy variable representing the employment status of a woman. It is equal to “1” if she is employed, and “0” otherwise.

In equation (1),  $pri_i$ ,  $sec_i$ , and  $hi_i$  each represent a dummy variable that takes value “1” if this woman receives a highest educational level of primary school, secondary school or higher education, respectively. As is mentioned in the former section, “no education” is acting as a benchmark. In equation (2),  $educy_i$  is a variable stands for single years of education, and is introduced into the model to replace highest educational level. All other variables appearing in both equations are the same.

$Chi_i$  stands for total number of children ever born and  $mem_i$  stands for total number of household members. These two variables represent the size of the family of the married women.

The quadratic terms of age and years of education are added to capture a non-linear relationship.

Considering the potential influence of the women’s partners, we then include some variables representing their partner’s characteristics to find whether their marriage has an additional special effect.

$$emp_i = \gamma_0 + \gamma_1 pri_i + \gamma_2 sec_i + \gamma_3 hi_i + \gamma_4 chi_i + \gamma_5 mem_i + \gamma_6 age_i + \gamma_7 age_i^2 + \gamma_8 ppri_i + \gamma_9 psec_i + \gamma_{10} phi_i + \gamma_{11} pwork_i + \gamma_{12} page_i + \gamma_{13} page_i^2 + \varepsilon_i \quad (3)$$

$$emp_i = \delta_0 + \delta_1 educy_i + \delta_2 educy_i^2 + \delta_3 chi_i + \delta_4 mem_i + \delta_5 age_i + \delta_6 age_i^2 + \delta_7 peducy_i + \delta_8 peducy_i^2 + \delta_9 pwork_i + \delta_{10} page_i + \delta_{11} page_i^2 + \varepsilon_i \quad (4)$$

$Ppri_i$ ,  $psec_i$  and  $phi_i$  in equation (3) are the three highest educational levels of partners as primary, secondary and higher.  $Peducy_i$  in equation (4) stands for the education years of partners. In both models,  $pwork_i$  is a dummy variable representing the partner being employed as “1” and not being employed as “0”,  $page$  is a variable for partner’s age.

All the models will be estimated separately for women residing in urban and rural areas to compare the influence of the place of residence on the estimates of coefficients.

## 5. Results

### 5.1 Role of education and partners

The regression results presented in Table 4 are for the married women regardless of their residence.

The four columns in Table 4 correspond to the four equations in section 4. Estimates of coefficients of variables are presented in the first line of each unit and standard errors are in the brackets.

A surprising result appears in the regression of equation (1). Any level of education has a negative effect on married women’s employment. The estimates indicate that a (married) woman with a primary education would have a probability of employment 9.04 percentage points lower than a woman with no education. If she receives up to secondary education, the probability of her employment would decline by 19.07 percentage points. When she achieves higher education, her probability of employment would decrease by 10.48 percentage points. All the three educational levels are statistically significant at 1%. Nevertheless, the actual effects of the educational levels on married women’s employment are also very significant. This indicates that education would remarkably

hurt the chances of the women getting employed regardless of the level of the education they receive.

As expected, the number of children and the number of household members are both important determinants of women's employment in the models that exclude the impact of partners. They are both statistically significant at 1%. But the two indicators of the family size have totally different impacts. From the result of the regression, a woman will have her employment probability increased by 0.46 percentage points if she has one more child. But her employment probability will reduce by 0.88 percentage points if she has one more member in her family.

Besides the family size, a woman's employment would also be influenced by her age. Since both the quadratic term of age and age itself are statistically significant at 1%, her age and the probability of employment have a quadratic relation which reveals an inverted U-shaped relationship. We can find that the probability of a woman's employment will increase with her age until she is 37.4 and then start to decline.

The results based on years of education are partially in line with the results from using educational attainment dummies. Results from equation (2) suggest that years of education also have a U-shaped relationship with employment. The probability of a married woman's employment will decrease with the years of education until it reaches 9.86, and then start to increase thereafter. This is consistent with the findings by Klasen and Pieters (2012). But 9.86 is significantly higher than 5.326, the average of years of education.

The trend of employment probability with years of education is more reasonable, because the years of education captures more accurate and detailed changes in employment probability than educational levels. The estimated coefficient of education years is the change of the employment probability caused by one additional year of education. However, one additional year could be added to different educational levels without changing any observations in the data. The U-shape relationship will not be

found if the highest educational level is the only measurement that is used.

Using a different education measurement does not change the estimated effects of the other variables significantly. The estimated coefficient for the number of children ever born is now 0.0034; the coefficient estimate of the number of household members changes slightly to -0.0087; the coefficient estimate of women's age rises a little bit to 0.0375, and the estimate of age square remains the same, indicating that the relationship between her age and employment stays the same. Still, these variables are statistically significant at 1%.

The regression results from estimating equation (3) show that the impact of women's highest educational level changes when adding their partner's characteristics. Still, those women who receive primary, secondary and higher level of education tend to have a smaller chance to work than those women with no education. They are all statistically significant at 1%. But the probability of employment is reduced by smaller numbers. The coefficient estimate of primary education changes from -0.0904 to -0.0678; and the coefficient estimate of secondary education changes from -0.1907 to -0.1402. The coefficient estimate of higher education changes from -0.1048 to -0.0253.

The partner's educational levels also have statistically significant negative effects on women's employment. If a woman's partner has achieved a primary, secondary or higher education, the woman's probability of employment will be decreased by 2.13 percentage points, 9.33 percentage points and 13.54 percentage points, respectively.

One more child increases the women's employment by 0.2 percentage points but this is only statistically significant at 10%. One more family member decreases it by 0.8 percentage points. It still is statistically significant at 1%.

Women's ages and their employment have an inverted U-shape relationship as well. But the employment probability would increase until she is 42.6.

However, the coefficient estimate for the partner's age only reveals a linear relationship with woman's employment due to the insignificance of the quadratic term. It

reduces woman's employment probability by 0.38 percentage points when her partner becomes one year older. Once the women's partner is working, her probability of working will be smaller by 6.33 percentage points. The age and employment status of a woman's partner are both statistically significant.

The last column in Table 4 shows the results of the estimating equation (4), where both women's and their partners' educations are measured in years. A woman's education again shows a U-shaped relationship with her employment probability. Her employment probability decreases until her education years reach 8.02 (which is still much higher than average), and then increases. But the education of her partner only reveals a linear relationship with her employment. The coefficient estimate is -0.0108.

If her partner is employed, a woman's probability of employment will reduce by 6.52 percentage points, which is quite a large impact. If she has one more family member, her probability of employment would decrease by 0.78 percentage points. They both are statistically significant at 1%. Surprisingly, the number of children is no longer statistically significant.

Her own age presents a quadratic relationship with employment as well. Her probability of employment increases with her age until she is 42 and then declines. But again, the age of her partner is linear with her employment probability. The coefficient estimate is -0.0033 and it is statistically significant at 5%.

If we narrow the sample to women who are older than 25, who are quite likely to have finished school, the outcomes are similar to our current results with only one exception. Higher education of women in equation (3) is not statistically significant at all. This means that, when compared with no education, higher education for women older than 25 will not make a difference when they making the decision whether to work or not. The estimate of coefficient of higher education in equation (3) changes from -0.0253 to -0.0038. Number of children in the same model becomes statistically significant at 5% level instead of 10%. Beside these two points, the results of estimates for all the

equations only changes slightly. Years of education still presents a U-shaped relationship with employment. Possibility of employment decreases with education until 9.46 years in equation (2) and 7.6 years in equation (4) and then increases.

Then we exclude women with no education. Therefore, primary education is used as the benchmark. In the new results, estimate of coefficient of higher education in equation (1) is -0.0031 and is not statistically significant. This coefficient measures the difference of the employment possibility between primary education and higher education, which is still consistent with the original results. From the first column of Table 4, we can get the estimates of coefficients of primary education -0.0904 and higher education -0.1048; they are already very close. In estimates of equation (3), the estimate of coefficient of number of children becomes 4.5 times the original estimate, from 0.0020 to 0.0090. It is also statistically significant at 1% level instead of 10%, meaning that women with education are affected more by the number of children. Similarly, estimate of coefficient of number of children in equation (4) is also significant at 1% level. Coefficient changes from 0.0001 to 0.0077.

Although the findings are partially in line with Klasen and Pieters (2012), we find a very surprising relationship regarding the education and employment of married women in India. Opposite to Duraisamy's (2002) conclusion of a positive impact of education on employment in India, we find that the education of married Indian women has a negative impact on their probability of employment. This shocking finding could happen due to several reasons.

First, Duraisamy (2002) is analyzing the whole labour force in India, including both male and female, while we are only focusing on females in our article. Besides, Duraisamy (2002) narrows the research to employment with regular wages only. We take all the married women and their partners into the analysis, no matter whether they are employed or not. Our studies are based on different participants. This might lead to different results.

Second, there might be other determinants of the married women's employment probability that we do not include in our model. This could lead to bias regarding the estimates of the coefficients. In our model, the estimates of coefficients change after we introduce the impact of married women's partners. For example, experience is considered in the Duraisamy (2002) analysis. Due to the lack of information on experience, we cannot test the role of experience in the married women's employment probability.

The third reason is that the findings might be rooted in the special culture and society of India. India is a country with many religious beliefs. Hinduism is the most popular religion in India with the largest population from the surveys. About 80.5% of women and 81.9% of men were Hindu. This religion divides people into different social classes along with different social status. This might cause a significant influence on a large group of Indian people, and therefore might affect the choices of a majority of the population. Furthermore, the social status of women could also have a potential impact when analyzing women's employment in India. While social status is a factor that is hard to measure and is complicated to quantify, our analysis does not take it into consideration. Further research about this might help to find out more details about women's employment in India.

A fourth possibility could be measurement error in the surveys. This is a problem that could not be solved by any modifications. A more accurate survey and data could be used in the future to examine whether our finding is still true.

## 5.2 Impact of place of residence

Table 5 and Table 6 are the results of the four equations using urban and rural data separately. By comparing the estimates of the coefficients, we can find out whether the residences of the married women affect the relationship between their education and employment. We estimate the sample of urban and rural areas separately. Results are the same with using an urban/rural dummy making interaction terms of all the independent

variables in the original models. The estimates of coefficients of all the interaction terms are exactly the same with the difference between the estimates of coefficients of the two separate regressions. If we simply add an urban dummy that equals “1” if the woman is living in urban areas and “0” if she lives in rural areas, a very significant change could be found. The estimates of coefficients of the number of child in all four equations becomes much smaller, it actually is no longer statistically significant in estimates of equation (2), (3), and (4). At the same time, the absolute value of estimates of coefficients of number of family members becomes bigger, meaning that the estimates of coefficients are even more negative. When education is measured in levels, adding an urban dummy makes the estimates of coefficients of all the educational levels smaller than before. For equation (3) and (4), the age of partners are no longer significant, even the linear relationship on employment disappears.

From the estimates for equation (1), we can see that living in a rural area reduces the probability of married women’s employment even more than living in a urban area with each educational level. The higher educational level for urban married women is not even statistically significant anymore. This means that achieving higher education makes no difference to urban married women’s probability of employment. But the married women in rural areas with higher education will reduce the probability of her employment by 8.56 percentage points.

In the estimates of equation (2), the education years and married women’s probability of employment both show quadratic relationships. But the slight difference is, for women in urban areas, their probability of employment would decrease with education years until it reaches 8.31 and then increase, while for women in rural area, the decrease will go on for up to 9.92 years.

For both equations (1) and (2), we find that one more child will significantly increase the married women’s probability of employment, but only in rural areas. The number of children is not statistically significant for married women in urban areas. One more

member in the family will reduce the probability of employment less for married women in rural areas than for married women in urban areas.

The age of married women is still statistically significant and in a quadratic relationship with employment probability in either place. The difference between urban and rural areas is very small.

The estimates of equations (3) and (4) show that the impact of education for married women in urban and rural areas become much more complicated. Living in urban areas only reduces the extent of decline in married women's probability of employment for women with primary or secondary education. However, for married women with higher education in urban areas, the decline of their employment probability would be larger compared with women in rural areas. For each of the highest educational levels obtained by partners, married women in rural areas see less of a decline in the decrease of employment probability.

When education is measured in years, the difference between urban and rural areas from equations (3) and (4) is similar to the results from equations (1) and (2). For women in urban area, the probability of employment decreases with education years until it reaches 6.36 and then increases, while, for women in rural area, this critical value would be 8.75 years. Since both the quadratic forms of partner's education in years are not statistically significant, we simply compare the linear relation. Still, more educated partners for rural married women would decrease less their employment probability.

Since the number of children in either model is statistically significant or only significant at 10%, this impact is not worth discussing here. As we have discussed before, one more member in the family will reduce less the probability of employment for married women in rural areas. Unlike the situation with equations (1) and (2) of the age of married women, the turning point of probability increasing in urban areas is larger than in rural areas, though the differences are still very small.

But the negative impact from the employment of married women's partners, the

education years of partners, and the age of partners is less for women in rural areas than in urban areas.

## 6. Conclusion

In this article, we initially explore whether the education of married Indian women has an impact on the probability of their employment. We use the data from the Third National Family Health Surveys of India conducted in 2005/2006.

The result of the regression successfully verified that married women's education does impact employment. Nevertheless, we also find that education of women's partners also affects women's employment. Surprisingly, when measured in education level attainments, both the education of women and their partners negatively influence women's employment, which is opposite from the expectations judged by common sense and from a large body of literature; only one paper finds a similar outcome. Before the analysis, we were expecting that the more education a woman achieves, the more it could contribute something better to their employment. This negative relationship does need further research to find out whether it is only a special case for Indian women, or if this happens to women throughout the world. Some possible reasons are discussed at the end of section 5.1. When education is measured in years, our finding of U-shaped relationship between education and employment is similar with Klasen and Pieters (2012). The possibility of employment for married women in India first decreased with education and then after reaching some specific number of years of education, it starts to increase.

Beside the impact of education, other factors also present a statistical effect on married women's employment. Having more kids encourages married women to work. On the contrary, having more family members discourages them. The employment probability of married women increases with their age to around 40, and then starts to decrease. The employment probability of married women always decreases with their partners getting older. If their partners are working, their probability of employment will also decrease.

Living in different places can affect the relationship between married women's employment probability and other factors. In general, the employment probability of married women residing in urban areas tends to be less influenced by children and their own education, but more influenced by their partner's education, employment, and age, compared with married women in rural area. Nevertheless, they are also influenced more by additional family members compared with married women in rural areas. Their own age does not present a very significant difference for both urban and rural married women.

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## Appendix A Tables and outcomes

Table 1 Ratio of female to male enrollment for different levels of education in India and China (%). *Data source: World Bank*

		2003	2004	2005	2006	2007	2008	2009
Primary	China	103.34	-	-	103.66	103.45	103.24	103.33
	India	96.36	96.35	95.95	95.31	96.83	99.99	-
Secondary	China	96.76	-	-	102.61	103.73	105.29	106.82
	India	80.53	80.70	82.25	83.32	85.74	87.97	91.33
Tertiary	China	82.89	88.97	91.09	95.68	99.56	103.96	106.61
	India	67.77	67.09	70.62	72.11	69.79	-	68.47

Some numbers are missing because they are unavailable from the World Bank.

Table 2 Percentage of female in labor force. *Data source: World Bank*

%	2003	2004	2005	2006	2007	2008	2009	2010
China	44.93	44.86	44.78	44.77	44.81	44.72	44.64	44.61
India	28.80	29.08	29.48	28.66	27.76	26.96	26.16	25.33

Table 3 Descriptive statistics for variables

	mean	standard deviation	min	max
employment	0.344	0.475	0	1
highest educational level				
no education	0.386	0.487	0	1
primary	0.154	0.361	0	1
secondary	0.371	0.483	0	1
higher	0.089	0.285	0	1
single years of education	5.326	5.192	0	23
number of child	2.739	1.920	0	16
number of household members	5.989	2.993	1	35
age	32.003	8.413	15	49
partner's highest educational level				
no education	0.217	0.412	0	1
primary	0.154	0.361	0	1
secondary	0.482	0.500	0	1
higher	0.147	0.354	0	1
partner's single year of education	7.352	5.189	0	24
partner's employment	0.980	0.139	0	1
partner's age	37.651	9.484	10	95
<hr/>				
Type of place of residence				
Urban	37881			
Rural	48661			
<hr/>				
Number of observation	86542			

Note: This table shows the basic information of the sample data we are going to analyze for married women. Single year of education counts for the real total years of education that an individual receives.

Table 4 OLS Regression Results

	Employment			
	(1)	(2)	(3)	(4)
Constant	-0.1763*** (0.0238)	-0.1684*** (0.0238)	-0.0799*** (0.0273)	-0.0676** (0.0273)
Primary	-0.0904*** (0.0048)		-0.0678*** (0.0049)	
Secondary	-0.1907*** (0.0039)		-0.1402*** (0.0044)	
Higher	-0.1048*** (0.0063)		-0.0253*** (0.0076)	
Educ year		-0.0414*** (0.0009)		-0.0353*** (0.0010)
(Educ year) <sup>2</sup>		0.0021*** (0.0001)		0.0022*** (0.0001)
Number of Children	0.0046*** (0.0011)	0.0034*** (0.0011)	0.0020* (0.0011)	0.0010 (0.0011)
Number of family members	-0.0088*** (0.0006)	-0.0087*** (0.0006)	-0.0080*** (0.0006)	-0.0078*** (0.0006)
Age	0.0374*** (0.0015)	0.0375*** (0.0015)	0.0426*** (0.0020)	0.0420*** (0.0020)
(Age) <sup>2</sup>	-0.0005*** (0.0000)	-0.0005*** (0.0000)	-0.0005*** (0.0000)	-0.0005*** (0.0000)
Partner primary			-0.0213*** (0.0053)	
Partner secondary			-0.0933*** (0.0046)	
Partner higher			-0.1354*** (0.0068)	
Partner educ year				-0.0108*** (0.0010)
(Partner educ year) <sup>2</sup>				0.0000 (0.0000)
Partner work			-0.0633*** (0.0113)	-0.0652*** (0.0113)
Partner age			-0.0038** (0.0016)	-0.0033** (0.0016)
(Partner age) <sup>2</sup>			0.0000 (0.0000)	0.0000 (0.0000)

observation	86542	86542	86542	86542
R-square	0.0547	0.0570	0.0619	0.0654

\*  $p < 0.1$ , the variable is statistically significant at 10% level. \*\*  $p < 0.05$ , the variable is statistically significant at 5% level. \*\*\*  $p < 0.01$ , the variable is statistically significant at 1% level.

Table 5 Regression Results of equation 1 & 2 for different residence

	(1)		(2)	
	Urban	Rural	Urban	Rural
Constant	-0.4074*** (0.0364)	-0.1692*** (0.0314)	-0.3769*** (0.0364)	-0.1704*** (0.0314)
Primary	-0.0566*** (0.0077)	-0.0856*** (0.0061)		
Secondary	-0.1236*** (0.0059)	-0.1733*** (0.0053)		
Higher	-0.0079 (0.0078)	-0.0856*** (0.0135)		
Educ year			-0.0349*** (0.0013)	-0.0357*** (0.0014)
(Educ year) <sup>2</sup>			0.0021*** (0.0001)	0.0018*** (0.0001)
Number of Children	0.0003 (0.0017)	0.0040*** (0.0014)	0.0000 (0.0017)	0.0029** (0.0014)
Number of family members	-0.0122*** (0.0008)	-0.0078*** (0.0007)	-0.0122*** (0.0008)	-0.0076*** (0.0007)
Age	0.0450*** (0.0023)	0.0389*** (0.0020)	0.0441*** (0.0023)	0.0394*** (0.0020)
(Age) <sup>2</sup>	-0.0006*** (0.0000)	-0.0005*** (0.0000)	-0.0006*** (0.0000)	-0.0005*** (0.0000)
observation	37881	48661	37881	48661
R-square	0.0475	0.0529	0.0511	0.054

\*  $p < 0.1$ , the variable is statistically significant at 10% level. \*\*  $p < 0.05$ , the variable is statistically significant at 5% level. \*\*\*  $p < 0.01$ , the variable is statistically significant at 1% level.

Table 6 Regression Results of equation 3 &amp; 4 for different residence

	(3)		(4)	
	Urban	Rural	Urban	Rural
Constant	-0.2425*** (0.0415)	-0.1281*** (0.0364)	-0.2150*** (0.0413)	-0.1235*** (0.0364)
Primary	-0.0327*** (0.0078)	-0.0699*** (0.0063)		
Secondary	-0.0706*** (0.0066)	-0.1391*** (0.0060)		
Higher	0.0708*** (0.0095)	-0.0343** (0.0148)		
Educ year			-0.0280*** (0.0014)	-0.0315*** (0.0015)
(Educ year) <sup>2</sup>			0.0022*** (0.0001)	0.0018*** (0.0001)
Number of Children	-0.0026 (0.0017)	0.0024* (0.0014)	-0.0029* (0.0017)	0.0013 (0.0014)
Number of family members	-0.0118*** (0.0008)	-0.0070*** (0.0007)	-0.0117*** (0.0008)	-0.0067*** (0.0007)
Age	0.0525*** (0.0030)	0.0402*** (0.0026)	0.0505*** (0.0030)	0.0403*** (0.0026)
(Age) <sup>2</sup>	-0.0006*** (0.0000)	-0.0005*** (0.0000)	-0.0006*** (0.0000)	-0.0005*** (0.0000)
Partner primary	-0.0293*** (0.0090)	-0.0112* (0.0066)		
Partner secondary	-0.1096*** (0.0077)	-0.0659*** (0.0059)		
Partner higher	-0.1474*** (0.0096)	-0.0907*** (0.0104)		
Partner educ year			-0.0142*** (0.0015)	-0.0073*** (0.0014)
(Partner educ year) <sup>2</sup>			0.0001 (0.0001)	0.0000 (0.0001)
Partner work	-0.1119*** (0.0152)	-0.0322** (0.0163)	-0.1111*** (0.0152)	-0.0362** (0.0163)
Partner age	0.0060** (0.0025)	0.0000 (0.0020)	-0.0049* (0.0025)	0.0003 (0.0020)
(Partner age) <sup>2</sup>	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
observation	37881	48661	37881	48661

R-square	0.0576	0.0566	0.0639	0.0582
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\*  $p < 0.1$ , the variable is statistically significant at 10% level. \*\*  $p < 0.05$ , the variable is statistically significant at 5% level. \*\*\*  $p < 0.01$ , the variable is statistically significant at 1% level.

## Appendix B Design of the Surveys and the data

Demographic and Health Surveys (DHS) collect and recode the data gathered from the Third National Family Health Surveys (NFHS-3). The designs of the data and the questionnaire regarding women and their partner's personal information, personal education and employment are described as follows.

- V012 Current age in complete years reported by the respondent.
- V025 *De facto* place of residence. (It refers to the place respondents sleeping at the night before interviewed)  
Respondents need to choose from  
1 = Urban  
2 = Rural
- V106 Highest educational level attended.  
The NFHS-3 questionnaire does not collect information on educational level. Whenever education information was asked, the response was collected only in number of years. Standard DHS recode variable for education categories based on the NFHS-3 as follows.  
0 = No education  
1 = Primary 1 to 5 years of education  
2 = Secondary 6 to 12 years of education  
3 = Higher more than 12 years of education
- V133 Education in single years.
- V136 Total number of household members.
- V201 Total number of children ever born.  
This variable contains the real number of children that the respondents answered even when it exceeds 20.
- V501 Current marital status of the respondent. We choose only married women from:  
0 = Never married  
1 = Married (including women living with a partner)  
Formerly married including  
3 = Widowed

4 = divorced  
5 = not living with partner

- V701 The current or most recent husband or partner's highest level of education attended. See V106.  
BASE: Ever-married women (V501≠0)
- V705 Standardized partner's occupation groups.  
BASE: Ever-married women (V501≠0)  
We derive the employment status of partners from the categories below.  
0 = Did not work  
1 = Professional, Technical, Managerial  
2 = Clerical  
3 = Sales  
4 = Agri-self employed  
5 = Agri-employed  
6 = Household & domestic  
7 = Services  
8 = Skilled & unskilled manual  
9 = [for NFHS-3 skilled and unskilled manual combined] Unskilled Manual  
98 = Don't know  
99 = Missing
- V714 Whether respondent is currently working.  
Answers are chosen from  
0 = No  
1 = Yes  
9 Recoded for missing by DHS
- V715 Most recent husband or partner's education in single years. See V133.  
BASE: Ever-married women (V501≠0)
- V730 Age of the respondent's husband or partner.  
BASE: Ever-married women (V502=1)  
(V502 categorizes women into never married, married and formerly married groups. V501 and V502 are the same for married women.)