To Work or Not To Work? Male Earnings and Female Labor Force Participation in India

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Abstract

Despite economic growth, fertility reductions, and increases in female educational attainment, overall female labor force participation in India declined from 35 percent to 27 percent between 1999 and 2012. I examine the degree to which this puzzling decline can be attributed to an increase in earnings of married males. I first show that between 1999 and 2012, districts that experience a relatively large increase in earnings of married males also experience a large decrease in married female labor supply. Then, I use the within-district variation in earnings between different male labor markets to estimate the relationship between married male earnings and labor supply of married females over time. In addition to the district-level analysis, I also estimate this cross-price elasticity of female labor supply from a household-level fixed effects model using the Indian Human Development Survey. All three sources of variation in male earnings generate robust and negative estimates of the relationship between married male earnings and labor force participation of married females in India. The estimated elasticity ranges between -0.53 and -1.7. I also find that apart from married females, there is a reallocation of labor for other secondary workers in the household. Moreover, I find no relationship between labor supply of unmarried females and earnings of married males, which is suggestive of an income effect driving the observed relationship. Back-of-the-envelope calculations suggest that increase in married male earnings during 1999-2012 may explain over forty percent of the recent decline in labor force participation rates of married females.

Keywords: Female Labor Force Participation, Income Effect, India, Secondary Labor Supply

JEL Codes: J 160, J 210, J 220, J 010

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1 Introduction

The period since the beginning of the twenty-first century in India has witnessed substantial declines in fertility and advancements in female education along with an overall positive economic growth of the economy.[1] These demographic changes are known to be associated with increases in female labor force participation in several other contexts.[2] However, despite these three economic phenomena moving in a direction that is associated with an increase in female labor supply, the past decade has witnessed a significant decline in female labor force participation rates in India. The female labor force participation rate decreased by eight percentage points between 1999 and 2012 according to the National Sample Survey. As per the 2001 census, the labor force participation rate for females aged 15-59 years was 40.02 percent. In the 2011 census, this rate fell to 37.4 percent.[3] According to the Demographic and Health survey, the percentage of women who reported to work for pay in the reference year declined by 4 percentage points in the last two rounds of the survey: in 2005-06, 28.6 percent of women were engaged in a paid labor market activity, while in 2015-16 only 24.6 percent reported to be doing so. This puzzle calls for a closer investigation of the factors that determine women's decisions to engage in the labor market.

At the same time, there has also been an increase in the real earnings of males, and this paper links those changes in married male earnings with the changes in married female labor force participation, to understand the overall decline in female labor force participation. Goldin (1994) and Mammen and Paxson (2000) show a U-shaped relationship between female labor force participation rates and GDP per capita at a cross-country level, where economic growth could lead to falling female labor supply if the income effect from higher household income dominates the substitution effect of increasing opportunities cost of time. Standard household decision making models offer a prediction that when the relative wage offers to men are higher than those to women, households could optimize total utility by increasing or maintaining male labor supply levels while the wealth effect from husband's increased income decreases female labor supply. Hence, as household income improves, female labor supply and labor force participation may decrease because the income effect from higher non-labor earnings of the household or husband's earnings may overpower the substitution effect from higher wages for women and men in the labor market.

If women's time spent within the household, engaged in home production or leisure, is perceived as valuable, then a wealth effect can potentially explain women opting-out of the labor force. Suggestive evidence for this hypothesis is shown in figures 1 and 2 below. Figure 1 shows the time-series of earnings of

[1] The fertility rate decreased from 3.14 in 2000 to 2.5 in 2012, the primary education completion rate increased from 60% in 1999 to 99% in 2014, and the average growth rate of GDP per capita was 5.4% between 1999-2012 (Source: World Bank). As per Kumar and Subramanian (2011), income per capita grew by 6.1% per annum.

[2] For example: Angrist and Evans (1998); Rosenzweig and Wolpin (1980); Cruces and Galiani (2007); Tzannatos (1999); Heath and Jayachandran (2016)

[3] These numbers were calculated by the author using B series of the census economic tables. Note that this is overall and not married female labor supply figure as the available data is for all females and not for married females. Also, the measure of labor force participation is different in the Census as compared to other sample surveys.

married males and the labor force participation of secondary workers including married females between the age of 18-55 years. Between 1999 and 2012, earnings of married males increased by about fifty percent in India and the labor force participation of married females declined by eight percentage points.[4] In figure 2, I show a scatter plot of districts depicting changes in labor force participation of married females on the y-axis and changes in earnings of married males on the x-axis between 1999-2005, 2005-2012, and 1999-2012. The scatter plots illustrate a negative correlation between the two variables, which is especially pronounced between 2000-2005.

To examine the relationship between earnings of married males and labor force participation of married females in detail, I employ three different and complementary spatial-temporal comparisons - across district-year aggregate outcomes; within districts, across labor market-year aggregate outcomes; and within individual households over time. First, using the National Sample Survey (NSS), I build a panel of districts covering the years 1999-2012. I use the temporal variation in district-level male earnings in a district fixed effects model and find a negative correlation between married female labor force participation and earnings of married males. A 10 percent increase in earnings of married males is associated with a 0.8 percentage points decline in married female labor force participation.

However, there could be several omitted variables at the district level, correlated with married female labor supply and married male earnings in the above across-district comparison that can bias the relationship. To rule out such omitted variables that are common for a district and time, I exploit dissimilarities between changes in the earnings of married males in different labor markets, defined by male education levels *within* each district. I observe that for a large proportion of the districts, different labor markets in the same district experience different growth in married male earnings. Exploiting this variation, which is different than the over time variation across districts, I compare changes in labor supply of married females between labor markets in a district over time. Evidence from within-district methodology reinforces the results found in the across-district comparison. From 1999 to 2012, a 10 percent increase in earnings of married males is associated with a 0.7 percentage points decline in married female labor force participation. The resulting cross-income elasticity of married female labor force participation is -1.7.

After showing the aggregate-level relationship, I further extend the analysis using intertemporal variation at the household-level. Using the longitudinal data set from the Indian Human Development Survey, I estimate the relationship between changes in earnings of husbands over time and the labor supply of their wives between 2005 and 2012. The advantage of this data is that I can observe changes for the same household over time and use a household-level fixed effect panel model. Results from this analysis corroborate the findings of the district-level analysis. Between 2005 and 2012, a 10 percent increase in husband's earnings is associated with a 0.2 percentage points decline in the probability of wife engaging

[4] Author's calculations using the National Sample Survey. The changes in married female labor force participation between 1999-2012 are similar for different demographic groups defined by education, age, or caste. Even though the levels of labor force participation differ between groups with women belonging to socio-economically disadvantaged groups being the most active in the market, there is a ubiquitous decline over time among all groups.

in labor market work. The elasticity estimated in the household-level analysis is -0.53. This is a third of what I find from the district-level analysis; and a part of the reason is that, it is estimated for a selected sample which is relatively better off with higher female education.

All the above empirical strategies rely on different sources of variation in married male earnings and have distinct strengths and caveats associated with them. A prime benefit of the district-level analysis is that I can conduct a falsification exercise by checking if a similar relationship exists for currently unmarried females of the same age group. I find no association between married male earnings and labor force participation of unmarried women. This suggests that women who face similar labor market changes as married women and belong to the same age group, but who do not experience a change in earnings from husbands, experience no negative effect through that channel.

There are potential threats to identification in the district-level analysis and some of them are addressed in the intertemporal household-level exercise. Even though the within-district exercise at labor market level accounts for district-year unobservables flexibly, which are not captured by controls in the across district comparison over time, it leaves out unobserved variables at the labor market level that could bias the estimates. The third analysis, at the household level, captures a different source of variation in married males' earnings. It copes with both the aggregate-level unobservables in the across and within district analysis, and time-invariant household-level omitted variables. It is also closest to the responsiveness in female labor market behavior when her own husband's earnings change. However, it does not deal with time varying household-level unobserved variables that affect husband's earnings and wife's labor supply, which is not a concern for the previous two analyses. Hence, the sources of bias in each of the estimation methods are not the same. Altogether, the three pieces of this analysis allow me to leverage the strengths of different research designs and datasets, to find a compelling evidence for negative income effect from husband's earnings to wife's labor supply.

Several other empirical checks further support the findings above. I find that an increase in married male earnings is associated with a decrease in labor force participation for teenagers and the elderly, suggesting that a negative effect exists for other secondary workers in the household as well. Simultaneously, there is also a positive response in the school enrollment of teenagers. The substitution of market work of secondary workers with other activities that may be valuable to the household, combined with the absence of any responsiveness in labor supply of unmarried females with respect to earnings of married males, adds support for an income effect mechanism driving the relationship. To mitigate potential threats to identification posed by measurement error in the key variable of interest and omitted variables that are correlated with both married male earnings and female labor supply, I perform extensive robustness checks. For instance, I verify that changing fertility and marriage rates are not driving the results. The results are also robust to district time trends, different sample restrictions, and changes in male employment trends.

India accounts for 17 percent of the world population. According to IMF chief Christine Lagarde, 217 million women are missing from the Indian labor force and if women and men were equally represented in the labor force, it would boost India's economy by 27 percent. In light of these large-scale demographic changes, analysis of household decision making is important to understand the overall macroeconomic shifts in the labor force. A few studies have mentioned the potential role of an income effect in the context of declining female labor force participation of Indian women (Neff et al., 2012; Klasen and Pieters, 2015). This paper adds to that debate by showing a robust empirical evidence at a more disaggregated level over a longer period, which is missing in the extant literature. Further, the paper contributes to the broader literature on the added-worker effect, on which there is limited empirical literature in developing countries. The results in this paper present new evidence of reallocation of secondary labor when the economic environment of the household changes in a low to middle-income scenario.

In summary, this work empirically shows a negative relationship between earnings of married males and the probability of married females participating in the labor market. Further, I provide suggestive evidence for the income effect as a mechanism behind this association. The results in this paper offer support for a quantitatively important channel behind the puzzling decline of female labor force participation in India, which may be useful in understanding the declines in female labor supply observed in other settings with similar socio-economic contexts.[5] The next section describes the related literature with a focus on India.

2 Related Literature

In recent research on the topic, several explanations have been put forward to understand the phenomenon of falling female labor force participation rates in India. Using parametric and non-parametric decomposition methods, Afridi et al. (2016) illustrate that rising education levels among females is an important factor that influences female labor force participation rate. They argue that the productivity of women in household activities, such as child rearing, increases when they attain some education (primary level) and the returns in the labor market have not kept pace with the high returns in home production. Consequently, more women are choosing to opt out of the workforce. Second, limited growth of jobs for females during economic development in last decade is discussed as a demand-side reason for the lack of females joining the labor force (Klasen and Pieters, 2015; Chatterjee et al., 2015; Rodgers, 2012).

Some studies have mentioned previously that rising household incomes can be a contributing factor for the downward trend in female labor supply. Klasen and Pieters (2015) discuss rising household incomes as a factor in determining female labor force participation rate. In a cross-sectional framework, they perform a parametric decomposition to identify various supply and demand side factors for the

[5] For instance, Bangladesh, which is also experiencing a decline in female labor supply, although from a much higher level (54% in 2000) as compared to India.

stagnating female labor supply. However, their focus is only for the urban population in one time period. Neff et al. (2012) is an exploratory study using 2004-05 and 2009-10 rounds of NSS and they probe four potential reasons for changes in female labor supply: higher enrollment in educational institutions, income effect, lack of employment opportunities, and socio-cultural norms. They don't find evidence in support of the education or employment opportunities-based explanations. They do, however, find some descriptive evidence in support of the income effect hypothesis by analyzing the overall changes in mean male wages and female labor supply between 2004 and 2012 for different income groups. While all the above studies present interesting insights into female labor supply and other factors, this paper goes beyond such largely descriptive literature and attempts to establish a pathway from earnings of husbands to labor force participation of the wives, in order to understand the declining female labor force participation in India.

3 Conceptual Framework

Consider the case of a household as a single decision-making unit in one time-period.[6] Let one spouse be the primary earner and other the secondary worker in the household. Given the high level of division in home production activities and market labor between males and females in developing countries, I use the subscript m for primary worker (male primary earner) and subscript s for the other secondary workers which represents the wife.[7] The household maximizes a single utility function composed of household-level consumption good (C), and the amount of leisure consumed by each individual (L_m, L_s):

$$U = U(C, L_m, L_s)$$

subject to the full income constraint:

$$PC + W_m H_m + W_s H_s = Y + W_m T_m + W_s T_s$$

where $T_i = L_i + H_i$ is the total amount of time available and H_i is the time spent in leisure activities for i=m, s. W_m, W_s and P are the prices of male labor, secondary labor, and consumption good respectively, and Y is non-labor income. $Y + w_m T_m + w_s T_s$ is the full income of the household.

Leisure can be both true leisure or time spent in household production activities performed by family members. The assumption here is that household utility increases when home production increases. Examples of activities that can fall in the category of home production and are valuable to the household include child care, instilling good behavioral traits in children, attending to elderly household members, engaging in social and religious practices, and preparing nutritious meals. As argued earlier in the liter-

[6] This abstracts away from the bargaining aspect between different members. In the Indian scenario, however, households are likely to make decisions collectively and pool their incomes.

[7] Other secondary workers can be children, or the elderly in the household.

ature, some of these activities may not be completely delegable and require personal attention (Eswaran et al., 2013; Papanek, 1979).[8]

An increase in male wages (W_m) has a substitution effect making leisure more expensive and will increase labor supply of the male member. As income earned for each hour increases, it will also have an income effect lowering his labor supply. The outcome for male labor supply will depend on the strengths of these two effects and is ambiguous a priori. A similar prediction exists for the female member when W_f increases.

When husband's wages (W_m) increase, all else constant, a direct income effect from his earnings will push the female member to substitute her market work with non-market time, assuming non-market time is a normal good.[9] Additionally, when husband's wages increase, it will also exert a cross-substitution effect. As his time becomes more valuable in the market, it can lead to substitution by wife for husband's time in home production activities. While the latter effect is relevant in other developed country scenarios, in the Indian case it is likely to be muted given that home production activities are mostly a function of only female time spent at home. Eswaran et al. (2013) show that Indian rural households engage in 'status' production (a household good), which is especially intensive in female's time spent at home but not in male's time. Other empirical evidence in the literature also suggests that household production activities are largely accomplished by female members (Choudhary et al., 2009; Jain, 2007; Sudarshan and Bhattacharya, 2009).[10] An empirically testable prediction that emerges out of this simple comparative static exercise is that, as husband's wages increase, wife's labor supply will decrease. Similar theoretical prediction exists for other secondary workers in the household including children and the elderly.

4 Empirical Framework

Districts are the sub-national units with important administrative and political autonomy in India.[11] Many policy implementation decisions are made at the level of districts and these are well-defined geographic areas that reflect local labor markets (Duflo and Pande, 2007; Topalova, 2007). The first method uses the differential changes in married male earnings experienced across districts over time. I estimate

[8] In 2004-05, for married females who are not part of the labor force and are 'required' to engage in domestic duties, 19 percent say it is because of social and religious reasons, 7 percent say cannot afford hired help, 55 percent say no member to carry domestic duties, and rest say other reasons. Out of those who are 'not required' to engage in domestic duties, 50 percent say they do so by preference, 15 percent say no work available, and rest say other reasons. While purely suggestive these numbers hint that both leisure and domestic production are important to households. The figures are author's calculations using the NSS.

[9] At very high levels of wealth, home production can become inferior good as households may be able to hire domestic help in which case leisure will only represent true leisure.

[10] It is also possible that leisure of the husband and the wife are complimentary in nature. In that case, as husband's wages increase, and he works more (own substitution effect dominates own income effect), wife's actual leisure will decrease and her labor supply will increase through the cross-substitution effect channel. If the income effect from his own increased wages dominates leading him to work less, then wife's labor supply may reduce as her leisure increases. However, as I mention later in the data section, male labor supply in the sample is stable across years reducing the importance of the cross-substitution effect channel from husband's earning on wife's labor supply.

[11] India is divided into 28 states, 7 union territories and 640 districts.

change in the average labor force participation of married females associated with a change in the average earnings of married males in a district over time using the *across-district* specification below:

$$FLFP_{dt} = \beta LogMarriedMaleEarnings_{dt} + \eta_d + \rho_t + X_{dt} + \epsilon_{dt} \quad (1)$$

In equation (1), $FLFP_{dt}$ is the average female labor force participation rate of married females in district d in time t. $LogMarriedMaleEarning_{dt}$ is the log of average earnings of married males in district d at time t. η_d are the district fixed effects to control for time-invariant unobservables at the district level and ρ_t is the survey year fixed effect to control for any time specific unobservable that is common across all districts. X_{dt} are time-varying demographic controls at the district level. These include age of females and males in a district, and education of married females. To control flexibly for the age composition of different districts, I use proportion of married males and married females in the following age-groups for each district: 18-25, 26-33, 34-40, 41-47, and 48-55 years old. For education, I control using the proportion of married females in the district with no education at all, below primary education, with primary education, with middle school education, with secondary education, with higher secondary education, and with college education.[12] Standard errors are clustered at the district level.

An obvious concern with this estimation strategy relates to unobserved omitted variables which might be correlated with both male earnings and female labor force participation. Any competing story that could bias the relationship of interest should simultaneously increase married male earnings and decrease labor supply of married females. This assumption cannot be tested or defended completely since there is no experimental variation in the current framework. However, most of the (unobserved) variables that lead to an increase in male earnings for a labor market will also, a priori, increase employment opportunities for females and other individuals in the secondary labor force. For example, if the economy improves or a factory opens and there are new labor market opportunities leading to higher wages, it will increase employment opportunities for both males and females. Hence, to some degree, omitted variable bias is less of a concern in this scenario. Even so, a major weakness of the above approach is that the changes in earnings of married males are not exogenous. The empirical approach adopted above can result in biased estimates if the unobserved variables that increase the earnings of married males also somehow lead to lower labor force participation of married females. For example, districts may face changes in political scenarios (for example, lower female representativeness in village councils) that leads to higher economic growth and lower female labor supply, is a problematic issue. In such cases, a negative relationship between rising male incomes and declining female labor supply could be misinterpreted as a pure income effect at household level. To account for these concerns, I complement the analysis by

[12] Individual education is reported as the following categories in NSS: not literate, literate without formal school, EGS/NFEC/AEC, TLC, below primary, primary, middle, secondary, higher secondary, diploma/certificate course, graduate, and postgraduate. I combine the first four categories to form the no education variable and the last three to form the college education variable

utilizing the within district variation in male earnings giving me a second source of variation in married male earnings.

I exploit changes in married male earnings between male labor markets in a district, where labor markets are defined based on the education criterion for males. If the male has primary or less than primary education, then he belongs to the low educated labor market; otherwise to the highly educated labor market. Because I cannot connect each secondary worker to her spouse or father in the dataset, I use household head's education to categorize these secondary workers into different labor markets. If household head has primary or below primary education, secondary workers in the household belong to the low educated labor market.[13] This method hinges on the residual variation in male earnings between labor markets in a district over time. In figure 3, I provide evidence for the presence of a number of districts in which the two labor markets experience differential changes in married male earnings. This figure displays a scatter plot of changes in log male earnings from 1999 to 2012 between high and low educated labor markets for each district. There are many districts where one labor market had a large increase in married male earnings as compared to the other labor market. The magnitude of changes for two labor market in the same district also differs even though it is in the same direction for a sizable number of districts. Hence, there is potential variation in married male earnings left within a district between different labor markets that can be exploited.[14] The advantage of using this methodology is that it allows me to control for 'district and time' specific unobserved variables that were not captured by district specific linear time trends in the previous section. The *within-district* specification is the following:

$$FLFP_{edt} = \beta LogMarriedMaleEarnings_{edt} + X_{edt} + \omega_{dt} + \pi_{et} + \gamma_{ed} + \epsilon_{edt} \tag{2}$$

γ_{ed} are the labor market fixed effect. Recall that a labor market is defined by education group and district and hence represented as γ_{ed}. This variable captures all time invariant unobserved factors that affect labor force participation for all workers in a labor market. π_{et} are the education group by time fixed effects, to pick up factors that affect an education group in a time-period. These do not vary by district and hence they control for country-wide unobserved factors common to education groups in a time period. For instance, if primary educated workers became more productive due to a skill program by the government and that program correlates with female labor supply by killing certain jobs that were intensive in female labor. Such confounding variables will be subsumed in the education by time dummy.

The final fixed effects at the level of district and time is represented by ω_{dt}. These fixed effects net out

[13] Median years of schooling for married males in the sample corresponds to primary level education.

[14] 34 districts were dropped for analysis in this section as they had less than 15 observations of either males or females regardless of their marital status for at least one labor market. Additionally, I also dropped Phulbani district from analysis in this section because the change in male earning for high educated labor market was more than 300 percent. The results are robust to keeping these districts.

any common unobserved shock that affects both the labor markets in a district and time. Examples of such unobserved variables include common shock such as weather or if a district obtains a new government that affects both earnings of males and labor supply of secondary workers. A district which experiences equal growth in male earnings for both the labor markets does not contribute to the identifying variation in this case.

The demographic controls included here are represented by X_{edt}. As before, these include proportion of married males and married females in different age groups in a labor market ed and time t. I also control for proportion of married females in different education categories for a labor market. As before, the age-groups are 18-25, 26-33, 34-40, 41-47, 48-55 years old and education categories are no education at all, below primary education, with primary education, with middle school education, with secondary education, with higher secondary education, and with college education. Standard errors are clustered at the labor market level. β is the coefficient of interest and it can be interpreted in the following way: by how much does the relative difference in the female labor force participation rates between low and high educated labor markets change when the relative difference in the earnings of married males between the two labor market changes by a certain percent?

For this approach to be convincing, sufficient assortative mating in the sample would be required; i.e., the education levels of male and female family members should be correlated. Since the current survey reports only relationship to the household head, the individual level data has been aggregated to conduct analysis at an aggregate level. If married men are not being matched to their wives in these labor markets, that will lead to measurement error in measured earnings since I will be unsuccessful in observing changes in female labor supply due to changes in earnings of their own husbands leading to the problem of attenuation bias. To be convinced that married males are being matched to their wives in the labor market, I check for assortative mating in India using the Indian Human Development Survey. Years of education of husbands and wives are strongly correlated. This suggests that during aggregation of the data, I have been able to match husbands and their wives in the same labor markets.

In addition to married females, I estimate equation 1 and 2 for three other groups- teenagers, the elderly, and unmarried females. Teenagers and elderly are secondary workers in the household like married females. If there is reallocation of labor by wives, the negative wealth effect is likely to be present for other secondary workers also, when earnings of the primary male worker rise. For adult unmarried females of the same age-group, however, the negative wealth effect is likely to be zero or low as they do not have spouses. It is possible that they may be affected as some of them will be daughters of currently married fathers, or divorced women who receive alimony. If not perfectly absent, the household level wealth effect is likely to be much lower for this group as compared to married women, while other changes over time at the district level or labor market level are expected to be similar for all women regardless of their marital status. Essentially, this group will serve as the main falsification test. In the empirical analysis, women

who report being never-married, widowed, divorced, and separated and between age of 18-55 years are included in this sample.

Extending the above analysis, I analyze the relationship between change in a husband's earning and change in labor force participation of his wife over time using the Indian Human Development Survey. Questions on labor force participation and earnings are asked in a distinct manner in this survey as compared to the NSS. If a similar relationship is found here, it will strengthen the hypothesis above. Although the data only spans seven years, there are three advantages of this analysis. First, in this data I can connect all females to their husbands. This reduces the measurement error in key independent variable as I am able to match couples perfectly.[15] Another benefit of this analysis is that I can use household fixed effects, which allows me to control for all time-invariant unobserved dimensions at the household level that may influence both earnings of the husband and labor supply of the wife. Finally, IHDS has more detailed survey questions on labor force participation and earnings. This allows for studying several aspects of labor force participation and estimation of the relationship using different and more comprehensive definition of earnings and labor force participation.

For the household-level analysis, I estimate the effect of a change in husband's earnings on the labor force participation of the wife between 2012 and 2005. The *household-level* specification of interest is the following:

$$WLFP_{iht} = \beta LogHusbandEarning_{iht} + \eta_h + \rho_t + \phi X_{iht} + \epsilon_{iht} \tag{3}$$

where $WLFP_{iht}$ is the measure of labor force participation for wife i belonging to household h in time period t.[16] The primary variable of interest is $LogHusbandEarning_{iht}$ which is the log earning of the husband of wife i in household h in time t. η_h and ρ_t are the household and survey year fixed effects, respectively. X_{iht} is a set of time-varying controls for female i in household h. It is likely that households that get wealthier may increase their fertility as they are able to afford more children, and this may reduce the labor supply of the women. To capture changes in fertility that could result due to change in income of the husband over time and affect wife's labor supply, I control for changes in the number of children below the age of 5 years. I control flexibly for any changes in household size by including controls for the number of children between 6 and 14 years, family size between 15-59 years and above the age of 59 years. To control for changes in the household structure over time due to deaths or other reasons, such as migration of household members, I control for highest education among the adult members in the family. Standard errors are clustered at the primary sampling unit level which is a cluster of 150-200 households in a district.

[15] Recall that NSS analysis was conducted on averages at district and labor market level.
[16] A household consists of a couple.

5 Data

5.1 District-Level Data

I obtain data from the household-level repeated cross-sections of the Employment-Unemployment survey conducted by the National Sample Survey Organization (NSSO). NSSO is the primary source of information on various indicators of labor and employment in the country. These surveys are conducted every year, but every five years NSSO conducts the large sample survey round administered all over India with a sample size of about 100,000-120,000 households.[17] The four large sample survey rounds used in this paper are from years 1999-2000 (55th), 2004-05 (61st), 2009-10 (66th), and 2011-12 (68th). In the regression analysis, I pool the last two rounds together since they were conducted in a very short time, and it is unlikely to show big changes in income and employment. I run my regressions without pooling the last rounds as well, and it doesn't change my results.[18] [19]

I measure labor force participation using the official definition used by NSS. This definition is used for annual estimates of labor supply by NSS and is used in most of the research on labor in India. It is the union of the Usual Principal Activity Status and Subsidiary Economic Activity Status (UPSS). The activity status in which the person spent the most time during the past 365 days preceding the survey is the usual principal activity status. After the principal activity status has been determined, the activity in which the person spent 30 days or more in last 365 days is the subsidiary activity status. I define an individual as part of the labor force if she is working according to at least one of the two definitions. To be considered as part of the labor force, the activity reported for the individual should be one of the following: own account worker, employer, worked as a helper in household enterprise (unpaid family labor), worked as regular salaried/ wage employee, worked as casual wage labor in public works, worked as casual wage labor in other types of work, and did not work but was seeking work. If the person reports one of these activities in either usual principal status or subsidiary status, she is part of the labor force.

5.1.1 Sample Description

Various districts were partitioned during the time under study. I adjust for district boundaries by returning all child districts to the parent districts in 1999-2000.[20] I retain a total of 514 districts for the four rounds pooled together after this matching exercise. Following the literature, I exclude the following small states from my analysis: Andaman and Nicobar Islands, Arunachal Pradesh, Goa, Lakshwadeep, Manipur, Meghalaya, Mizoram, Nagaland, Puducherry, Tripura, Dadra and Nagar Haveli, Daman and

[17] These large sample survey rounds are also referred to as thick rounds.
[18] The last round is a large sample round even though it was conducted in less than 5 years of time.
[19] NSS considers district sample size to be inadequate for reporting district-level estimates. However, as Duflo and Pande (2007) point out it does not affect the analysis, if we are not drawing inference about any specific district and report regression results for many districts.
[20] I referred to District boundary information from http://www.statoids.com/yin.html . I also thank Stephen O'Connell for generously sharing the matching of district boundaries which was a helpful resource in checking my matching.

Diu. These states are small and have few observations in the dataset.[21] After dropping the above states, I retain 463 districts. The next level of sample restriction is on the age and marital status.

I restrict the sample to females aged 18-55 years old. The sample of males consists of those aged 18-57 years and married. The average difference between the age of married males and females is 2 years in the sample. Hence, I choose the upper bound for men to be 2 years greater than 55 years, which is the upper bound for the sample of women.[22] The survey instrument reports the marital status of an individual as one of the following: never-married, currently married, widowed, and divorced/separated. For main results, I restrict to those who report their marital status as 'currently married'.

To calculate averages male earnings at the district level, I include married males who are qualified to answer the earning module in the NSS. Weekly earnings are collected for individuals who were engaged in an economic activity, except for those who were self-employed (own business, unpaid family worker) during the reference period of one week.[23] This restriction ignores information on all those who are engaged in economic work such as subsistence agriculture and didn't get paid during the last week. If there was data on hours reported or the industry composition of those who are not interviewed on the earnings module, there was a possibility of imputing the earnings of those men. However, the present data does not allow me to impute earnings of these individuals.[24] I adjust earnings for inflation using the consumer price index accessed from the World Bank website.

I group the data by district and survey round using sample survey weights. While aggregating the data at district level, there are some districts with too few observations to generate reliable averages and may lead to measurement error. Classical measurement error in the dependent variable leads to inflated standard errors. However, it is measurement error in the key dependent variable that is worrisome. Measurement error in married male earnings will lead to attenuation bias in the coefficient of interest. Hence, I keep districts with at least 15 males and at least 15 females to minimize this issue. Finally, I keep districts that are present in all three periods and run my results on a balanced panel of districts. All results hold when I use the unbalanced panel of districts.[25] After the above two additional restrictions, the final number of districts used for this analysis is 446.

I show changes in variables of interest in table 1. Column 1 in table 1 displays descriptive statistics for all districts. Column 2 and 3 divide the districts based on whether they experienced a change in male

[21] The results are robust to including these small states.

[22] I also use the sample of 21-60 years old of married males since the legal age of marriage in India for males is 21 for males and my results don't change with this different sample. In practice, legal age is not strictly enforced, especially in rural parts of the country. Plus, 8 percent of males between the age 18-21 years are married.

[23] In the NSS, the earning information is collected only for those who report working for pay (codes: 31,41,42,51,71,72) in the past 7 days. Hence, to calculate the average, I only keep males who report working for pay.

[24] Recognizing that in the current context there is a major proportion of population engaged in economic activity and not reporting their earnings, I check for the robustness of my results after controlling for the proportion of married males working for pay in the results section.

[25] The results are robust to including districts with less than 15 married males or females, and also if I chose the cut-off as 20. Three additional districts -Shivpuri, Deogarh, and Uttar Kashi were dropped due to small sample size for other demographic groups used in the robustness section. The main results for married females are robust to including these districts as well.

earnings above or below the median change between 1999-2012. The decline in married female labor supply is higher for districts that experience a change in married male earnings above the median as compared to districts that experience a change below it. Districts with above median changes in married male earnings also gain 0.6 more years of female schooling than the remaining districts in column 3. Fertility and marriage rates also respond to earnings of married males. Changes in fertility and marriage rates are similar across the two set of districts in column 2 and 3. Male labor force participation rates are quite high, at 98 percent for both kinds of districts and there are no changes over time in this variable. The proportion of married males working for pay shows very little change over time and across columns. A big change in this variable may misrepresent the changes in average earnings of married males. If many subsistence agricultural workers change to daily wage workers (unskilled) and start reporting earnings, this may reflect as a drop of earnings instead of a zero change. No change in this variable reassures that there are no big changes in the proportion of married males who report earnings in the data. Nevertheless, I will check for robustness of my results by including a control for this variable in my specifications.

Next, I show the top four industries for married males coded at 1-digit level. In column 2, districts that experienced above median change for earnings of married males have a greater percentage of married males working in agricultural activities and slightly lower share of males in mining, construction, and manufacturing in 1999-00. These districts also face a larger reduction in their agricultural male workforce and a lower reduction in manufacturing between 1999-2012. Hence, the type of districts that experience higher or lower change in married male earnings differ in their industrial composition.[26]

5.2 Household-Level Data

The Indian Human Development Survey (IHDS) was conducted in 2004-05 (henceforth 2005), and 2011-12 (henceforth 2012). It is a panel data set of 41,554 households.[27]

In IHDS, the labor force participation indicator is constructed separately for various work categories. The work categories are the following: work on family farm, agriculture wage labor, non-agriculture wage labor, salaried position, and family business work. IHDS-2 added work in National Rural Employment Guarantee Program (NREGA) wage labor and work in non NREGA wage labor as separate categories and these are counted as work for 2012. For every individual in the household, labor force participation

[26] An obvious choice here would be to use the shift-share approach to create an instrument for the earnings of married males based on Bartik (1991) The instrument is constructed using the industry shares in a base period and interacting these shares with wage growth of the industries over time. For this methodology to work, I would require the constructed instrument to be correlated with realized earnings of married males and not with the earnings of females in the first stage. However, the instrument constructed using the shares of industries in the base period (two base years used 2000 and 1991) was found to be correlated with both married male and female earnings. This violates the exclusion restriction that needs to be satisfied for this method. In the current scenario, there is a large share of male and female population that is engaged in agriculture and related activities and this could be one reason such an instrument did not work in this case.

[27] 6,911 households were lost due to attrition between 2005 and 2012. The sample was refreshed by randomly selecting a household in the same neighborhood for urban blocks and rural northeastern states, resulting in 2,134 new households being included in the second wave.

in a specific category is given a value 1 if the individual spent 240 or more hours in that activity in the past one year. I define my labor force participation measure as 1 if individual worked for at least 240 hours in past one year in any of the above work categories. This definition maintains comparability to the NSS definition of labor force participation of working at least 30 days in the reference year.

NSS collects information on labor force participation by asking respondents the activity in which they spent most of their time in past 365 days (major time criterion). Then, the labor supply measure is constructed if the individual worked as per the major or the minor time criterion (at least 30 days). Contrary to this approach in NSS, IHDS asks the main household respondent about the level of participation of household members in each economic activity that the household is engaged in. After that, the labor force participation measure is constructed for each of these work categories based on an hourly criterion. If the individual spent at least 240 hours in a specific work category, then the individual is part of the labor force. Apart from work for wage, unpaid family farm work and work in household business is counted as work in both NSS and IHDS. I exclude animal work from the definition of work in IHDS, since it is not clear if it is included as work in NSS. Another discrepancy in the definition of LFP is that 'seeking work is included as LFP in NSS but not in IHDS. Including livestock rearing in IHDS or excluding 'seeking work from the NSS does not change the main results.

5.2.1 Sample Description

I restrict the IHDS sample to make it as comparable to the NSS sample as possible. Since I exploit changes over time, I perform my analysis on a balanced panel of females who are married in first time-period and are 18-48 years old in 2005. This gives me a sample of 30,856 women. There are 2,837 women who are married in period 1 but are not married in period 2 or have missing spouse identifiers. I exclude these women from my sample. I also exclude another 154 women who have same spouse identifiers in the same household. I do so because it is either a data coding error or these are polygamous households. In the latter case, it is hard to distinguish the share of each wife in the husband's earnings. This leaves me with 27,865 women.[28]

The main explanatory variable in the analysis is husband's earning. In the survey data, annual earnings at the individual level is recorded for all members of the household. Deflator provided in the IHDS data has been used to deflate 2012 earnings. However, there is a large proportion of married males in the data with no recorded earnings at an individual level even when they work and have total household-level income reported. There is data for household income from all economic activities; such as, income from farm work and household businesses. But, I cannot be perfectly certain about the individual contribution of husband to the household income pool, which is why I exclude wives with husbands who

[28] Not including women with no husbands in period 2 (widows/separated/spouse absent) will underestimate my results since absence of the spouse leads to an increase in labor force participation of women in the data over time. I run my analysis including these women as well, and it does not change my analysis. Also, Results are consistent if I keep presumably polygamous households.

have no individual level earnings reported in any one period.[29] Additionally, I drop 736 women who have husbands with age greater than 57 years in the second period to keep the age band comparable to what was used in NSS. This generates a panel of 12,890 women who are married in both time periods and have earnings information available for their husband in both time periods. This is the final working sample for this analysis.

Table 2 presents the descriptive statistics of the working sample. Column 1 shows the summary of all observables used in the analysis in 2005 (base period) and the change in those variables between 2012 and 2005 for the full sample. In columns 2 and 3, I split the sample depending on if the woman experienced an increase or a decrease in the earning of her husband. First, the overall female labor force participation increased, and it increased more for females who face a decline in their husband's earnings in the sample. For other variables, the changes are similar across the three columns. Number of children between the age of 6-14 years declined by .03 for households where husband's earnings decreased and it rises by .08 where husband's income rises. Importantly, the change in fertility for 0-5 years old children between these two groups is comparable over this period. The number of children between the age of 0 to 5 years decreased by 0.2 in all columns. There is no difference for changes in household size for age groups 15-59 years. Husbands who experience an increase in income are more educated and more likely to reside in urban areas.

6 Results

6.1 Across and Within-District Results

Table 3 provides estimates from the across-district specification in equation 1 for the sample of married females. Column 1 includes district and survey-time fixed effects. Column 2 is with a parsimonious set of demographic controls (male and female age and female education) in addition to the district and time fixed effects. I find a significant negative effect of an increase in married male earnings on married female labor force participation in a district. A 10 percent increase in earnings of married males is associated with a 0.7 percentage point decline in the labor supply of married females. This is approximately a 16

[29] Since I have hours worked available at an individual level, I do an exercise by assigning share of household income to the husband based on his number of hours. This imputation exercise leads me to retain the dropped sample that is excluded based on 'non-zero reported earning' condition for husband. The regression coefficient is much higher when imputed earnings are used to retain the lost sample. A possible reason behind this may be that husbands who have individual level earnings reported must be working in formal markets which pays higher wages. The wives of such men are less likely to be working and hence have less elastic labor supply. In the data, wives of husbands with missing earning have labor force participation rate of 46% as compared to 43% for wives who have non-missing earnings. But this imputation exercise is not perfect and suffers from a mechanical bias. A reduction in wife's hours automatically increases husband's share of household income. Hence, to refrain from such measurement error, I continue with dropping wives of husbands who have no individual level earnings available. This restriction leads me to drop 14,239 women. It must be kept in mind that these results are not representative since the sample is biased towards those who are more likely to report earnings and is economically a better-off sample.

percent decline over the mean labor force participation rate.[30] There are likely to be several sources of bias in this analysis such as selection into the marriage market, shifts in male employment, and changes in fertility levels. In what follows, I explain some of these concerns and check for the robustness of my results to various confounding factors.

First, I address the problem introduced by selection into marriage. Changing income levels of males are likely to affect marriage rates in a district. It is reasonable to expect that males with higher earnings are also more likely to get married because they become more attractive in the marriage market (Becker, 1973; Nakosteen and Zimmer, 1997; Ginther and Zavodny, 2001). For females, the decision regarding when and whom to marry may be determined together with her taste for work. If overall wages increase in a district at a fast pace for both males and females, then women who have a taste for work may delay marriage if marriage and working are not perfectly compatible. This would lead to a sample of married females with a lower taste for work and hence less attached to the labor market. To control for the bias introduced by marriage selection, I control for marriage rates of males and females in each district in column 3 of table 3. The estimated coefficient does not change after controlling for these variables, which helps address concerns due to selection into marriage.

It was mentioned previously in section 5.1 that the earnings module of the questionnaire was skipped for self-employed people and that may be a problem. Changes in earnings which is my main independent variable could be confounded because of the changes in the proportion of people who report earnings. A perceived change in the average earnings of a district may be due to a fraction of married men moving from self-employed status to a wage-earner status or the other way around. Overall changes in male employment rates in the district can also bias the results as they may be correlated with female employment. Column 4 of table 3 confronts this issue by showing estimates after controlling for unemployment rates of males in the district, and the percentage of married males who work-for-pay in the district. I find that the point estimate is not sensitive to such male employment controls. This is further supported by the observation that there are no noticeable changes in the proportion of married males who report working for pay across groups and over time for the population in table 1.

Another major cause for concern is the response of fertility levels to changes in married male income. There is a bulk of evidence showing that fertility changes with economic growth (Black et al., 2013; Currie and Schwandt, 2014), and that female labor supply responds to changes in fertility (Cruces and Galiani, 2007; Bailey, 2006; Angrist and Evans, 1998; Cristia, 2008). The concern here is that with higher income, households can afford more children, and higher fertility levels would reduce female labor supply since females are the primary care givers for children. To account for such as bias, I control for fertility

[30] I also conduct analysis where I use year-specific population of the districts to weight each district in the regressions. I use population data obtained from the Census. The population at a district-level for each year was extrapolated by using the growth rate of population between 2001 and 2011 censuses and then applying that growth rate for every year. All results in this paper hold when using these population weights. The results are also robust to using only work-for-pay as an outcome.

in column 5 by including three variables: children in the age group 0-2 years, 3-5 years, and 6-8 years since different aged children can affect work decisions in different ways (Blau and Kahn, 2007). Again, I find that the estimated coefficients are robust to fertility controls and the magnitude of the coefficient is stable. These checks add further evidence that the coefficient estimating changes in female labor supply reflects changes in male earnings that is not working through a response in fertility or selection into marriage channel, but is rather consistent with an income effect hypothesis.

In a similar way, table 4 shows results for the sample of married females using the within district specification in equation 2. Column 1 includes all pair-wise fixed effects and column 2 includes demographic controls. Examining the coefficient in column 2 reveals that, a 10 percent increase over time in the difference between married male earnings is associated with a significant decline of 0.7 percentage points in the difference between the married female labor force participation of the two groups. This is a 17.5 percent decrease over the baseline FLFP rate of 40 percent. This estimate is almost equal to that which utilized across-district variation.

I also check for the robustness of the coefficient to the inclusion of controls related to marriage market, male employment, and fertility in columns 3 through 5, respectively. I find that the results are not sensitive to the inclusion of the three sets of controls. These controls are defined at the labor market level and not at the district level as before. The estimated coefficient stays the same in magnitude throughout different model specifications.

I present results for other demographic groups with my preferred specification that includes marriage controls, fertility controls, and male employment controls separately for the across-district and within district specification. Tables 5 and 6 show the coefficients for the sample of teenagers between ages of 13-17, the elderly, and unmarried women for across-district and within-district comparison respectively. Results show that married male earnings have no effect on the labor supply of unmarried females for age group 18-55 years old.[31] Women in this group belong to the same age-group, and face the same labor market changes over time as the group of married females. However, they do not experience a change in the earnings of their husbands; therefore, no negative effect exists through that channel. So, the effect of married male earnings ought to be much lower for this sample, which is confirmed here. This serves as my falsification check.

Further, I find that an increase in the earnings of married males leads to a significant negative decline in the labor force participation of teenagers. In the within-district results, a 10 percent increase in the earnings of married males is associated with a 0.35 percentage point decline in the average labor supply of teenagers.[32] This corresponds to a decline of 20.5 percent over mean labor force participation rate. The

[31] Results hold if I trim the sample to 21-55 year old unmarried women. Younger women are more likely to stay with their parents and could be more affected by their father's earnings. The results also hold if I only exclude divorced, separated and widows.

[32] The sample of teenagers used in this specification includes all teenagers in the district and do not have to necessarily belong to households with a married male member. It is illegal for children to work below the age of 14 years. Although this law is not perfectly enforced, the labor force participation rates are quite low for younger children and increase after

marginal estimates are lower for teenagers as compared to married adult females, which could be a result of low average labor force participation rates for teenagers to begin with. I also find a positive effect of an increase in married male earnings on enrollment ratios in the district suggesting that teenagers are substituting away from labor market work to school in response to an increase in the earnings of prime age male workers, although the point estimate is not estimated precisely in the within-district specification (table 7). For the elderly population between the age of 60-75 years, the across-district specification shows a small negative coefficient, but the within-district specification finds no association.[33] Figures 4 and 5 summarize results for all the groups for the across-district and within-district specification respectively using the preferred specification with controls for male employment, fertility, and marriage.

Using the estimated marginal effect of married male earnings from the above analysis, I can make some back-of-the-envelope calculations about the role of male earnings in explaining the declining female labor supply. In the NSS data, as mentioned in figure 1, I find that between 1999-2012, average married male earnings grew by 50 percent. Using the estimated coefficient of 0.7 percentage points, we can say that rising male earnings explain about 3.5 percentage points of the decline in female labor supply- 44 percent of the entire change between 1999-2012.

6.2 Household-Level Fixed Effect Results

In column 1 of table 8, I show results from a regression with the two rounds pooled together without household fixed effects. This will capture the between-person differences. The estimate on the pooled regression indicates a significant negative effect of husband's earnings on female labor force participation. However, this regression does not consider the with-in person variation. The main individual-level results for married females presented in last two columns of table 8 confirm a significant negative relationship between change in husband's earnings and a change in wife's labor force participation. Column 3 presents results after controlling for time-variant covariates. A 10 percent increase in earning of the spouse leads to a 0.2 percentage point decline in wife's labor supply, which is a 5.3 percent decrease over mean labor force participation, giving an elasticity of -0.53. The above elasticity is almost a third in magnitude of what I found in the previous analysis. Although the directional interpretation of the effect of male earnings on married female labor supply is the same in both the datasets, the magnitude of the estimates from this sample cannot be directly compared to the district-level results since the period of analysis, variation used in estimating the coefficient, and characteristics of the sample are different in these two empirical analyses. It should be noted that the estimate here is not representative of the overall population as the IHDS sample ends up being a wealthier and better educated due to the nature of sample restrictions.[34]

13 years of age in the sample, hence I restrict the age group 13-17 years.

[33] Unlike other specifications, for the regression on elderly, I restrict to non-household heads old population as they may not be secondary workers. The results do not change if I do not put this restriction.

[34] A separate analysis of the covariates of the two sample suggests that in the working sample from IHDS, women have higher education levels as compared to an average woman in the NSS sample and males have a higher probability of

The longitudinal nature of the IHDS data makes it hard to examine the effect of married male earnings on the labor force participation of teenagers as was examined in the NSS. A seven-year difference between the two rounds does not allow me to follow the same teenager in the window of 13-17 years. Thus, I perform a slightly modified analysis at the household level. I calculate the fraction of total teenagers (13-17 years old) in the household who are engaged in labor market. I regress this ratio on household characteristics and the earnings of the husband in household. To be included in this regression, a household needs to have at least one teenager in both the periods. Table 9 presents the results of this regression. I do not find any significant effect on this sub-group as was found in the previous two sets of analyses. It is important to remember when interpreting these results that because of falling fertility levels, the sample of 13-17-year-old teenagers shrinks with time, making the sample of working teenagers very small. Additionally, this is a relatively better off sample as compared to the NSS sample and hence labor force participation rates of teenagers are low to start with.

As in the previous section, I perform the analysis on the subsample of elderly between the age of 60-75 years. I find a significant negative effect of married male household earnings on labor supply of the proportion of old individuals in the household working. Results in table 9 show a 10 percent increase in married male earnings is associated with a 0.7 percentage point decline in the labor supply of elderly individuals. Over the mean labor force participation of this sub-group, it is a change of 28 percent, which is much higher than what was found in the NSS results. One possibility for this observation could be that in the household analysis, elderly must co-reside in the household to be in the sample. In the district level analysis, this condition did not have to hold. The income effect is likely to be stronger when secondary workers live in the same household. Overall, the results suggest that changes in the earnings of married males affect the labor supply of secondary workers in the household.

7 Robustness Checks and Other Concerns

District-Level Analysis

In the previous section, I describe how changes in marriage rates can bias the estimates and provide results after controlling for the changing marriage rates for males and females over time. As an additional check, I test for the effect of earnings of *all* males (and not only married) on married female labor supply. Since the arguably exogenous changes in earnings of males over time at the district level should affect adult married and unmarried males in the same way, I should find a similar effect of the district-level changes in male earnings on the labor supply of married females. In tables 10 and 11, I show the effect of earnings of *all* males in the district on the labor supply of married females for the across district and within district strategies. Reassuringly, I find the same effect of all-male earnings on the labor supply of married females.

working in the formal sector.

To alleviate the problem of measurement error in the independent variable arising from a certain fraction of males who do not report their earnings, I control for the changing share of married males who work for pay in the results section. Another way to check if the earnings variable used here is indeed a reasonable measure of the actual changes in earnings, is by dropping those districts which have a very low share of married males who worked for pay or a very high share of married males who report engaged in self-employed jobs. Recall that males in such districts are less likely to report earnings; hence, introducing measurement error in the average earnings variable. I exclude districts (or labor markets in the case of within district specification) where the share of married males working for pay is less than 30 percent. This is about 15 percent of the districts. Regression results obtained after this restriction are shown in tables 12 and 13 for the across district and within district specifications respectively. The results remain consistent to this additional check.

I also check for robustness of my results to the inclusion of district specific time trends in the across-district specification. The estimation of the coefficient after the inclusion of time trends depends on the variation in male earnings from a linear parametric trend and it is usually hard to retain much variation after including them. Despite these drawbacks, in column 6, I find that the estimated coefficient is stable in magnitude, and is significant at 10 percent level.

An additional concern in the within-district analysis pertains to the selection of married male being in a specific labor market. Some districts may experience a systematic increase in the share of highly educated married males that correlates with female labor force participation over time. In column 6 of table 4, I control for the share of highly educated married males in a district that changes over time. The point estimates are robust to including this variable.

There is an additional concern related to migration of individuals between districts. If males are selectively migrating to better-off districts in response to more rewarding jobs, it could potentially bias the results in various ways. If females are migrating with men and finding work in other districts, then my results would be underestimated. If females are staying behind and taking over activities like farm work, then female labor supply would rise in districts with low economic growth, and my results would be overestimated. However, cross-district migration in India is very low. Using the Rural Economic Development Survey, Munshi and Rosenzweig (2009) find low rural spatial mobility despite increases in economic growth and inequality. Topalova (2007) reports that only 3.6 percent of the rural population in 1999-2000 changed districts. Pathania (2007) finds that very small proportion of rural women migrate to districts different from their birth districts in the Indian census. Between 1991 and 2001, only one-fifth of the growth in urban population from 1991 to 2001 can be attributed to migration (Munshi and Rosenzweig, 2009). Thus, migration is less concerning as a confounding factor.

It may also be argued that if the wife devotes her time to only household activities instead of working, it increases productivity of the husband and time spent in the labor market leading to higher earnings

(Benham, 1974). However, for the context at hand, it seems unlikely that this will be a cause for bias as most of the household activities in India are primarily done by women (Choudhary et al., 2009; Jain, 2007; Sudarshan and Bhattacharya, 2009). Moreover, when a woman works, there is usually support from her family and relatives, such as the mother and/or father-in-law who co-reside and share the burden of household activities.

Household-Level Analysis

One of the time-varying household-level variables that correlates with wife's labor supply and husband's income is husband's health. Husband's health can affect both his earnings and the labor supply of the wife. It may increase if she is compensating for the loss in income by working more or because the marginal utility of money increases. It may decrease if she is spending more time taking care of him by substituting from market work. In column 1 of table 14, an indicator for husband's health is included to check if results are biased due to any major morbidity of husband.[35] The point estimate remains unchanged to inclusion of the morbidity variable, which helps eliminate the alternative channel of health that may introduce bias in the results.

Since women who work fewer hours to begin with are less attached to the labor force, their labor supply ought to be the more elastic with respect to their husband's earnings. One way to check this is by constructing an alternate definition of labor force participation. For this, I define my outcome variable as 'any work at all', i.e., I relax the restriction of working at least 240 hours in the past one year and define labor force participation as having worked non-zero number of hours in the past one year. Column 2 of 14 presents results of this robustness check. The point estimates in table 14 show that the elasticity is indeed higher in this case. A 10 percent increase in husband's earnings leads to an increase in the probability of the wife working by 0.4 percentage points.

8 Comparison with Previous Studies

A useful comparison is to contrast the elasticity estimated in other countries with those found in this paper. For developed countries, the evidence on added worker effect suggests small effects. For the United States, a general trend has been a decline in the responsiveness of married women's labor supply to their husband's income. Estimates of cross-income elasticities for married women in the United States range from -0.09 to -0.4 (Devereux, 2004; Bradbury and Katz, 2008; Blau and Kahn, 2007; Juhn and Murphy, 1997). The estimated cross-income elasticity in this paper was -1.7 in the district-level specification, and

[35] A dummy variable for long term morbidity equals 1 if husband suffers from any of the following: cataract, tuberculosis, high BP, heart disease, diabetes, leprosy, cancer, asthma, polio, paralysis, epilepsy, mental illness, STD/ AIDS, or other long term illness.

-0.53 in the household-level specification, both of which are greater than what has been estimated in the United States.

In the developing country context, Bhalotra and Umana-Aponte (2010) merge Demographic and Health Surveys with a country by year panel of GDP to estimate responsiveness of female labor supply to GDP. Overall, for Asia, Latin America, and Africa, the authors find an elasticity of -1.5.[36] Cerrutti (2000) studies the relationship between employment instability of the household head and female labor supply using panel data in Argentina. The author finds that females, in households where the head changed employment status, were twice as likely to enter the labor force as compared to those who had a household head always employed. For urban Mexico, Parker and Skoufias (2004) finds that when household head becomes unemployed, adult females are 16 percent more likely to obtain employment relative to households where male did not experience unemployment.

The findings also resonate with some previous observations for the case of India in the literature. Rosenzweig (1980) estimates the responsiveness of married female labor supply with respect to husband's earning to lie between -1.4 and -2. Heyer (2010) studies the Dalit community in the Tiruppur region in south India over 1980-2009. The author finds a similar phenomenon of women retreating from the labor force to become housewives as the community overcomes extreme poverty and the well-paid employment opportunities for women remain limited. Srivastava and Srivastava (2010) argue that female labor supply is more of an insurance mechanism in India based on the analysis of average labor force participation of different demographic groups across income deciles. The estimated elasticities in this paper are comparable in magnitude with findings of previous researchers for India and developing countries.

Comparison of developed and developing countries shows that the responsiveness in labor supply of married females seems to be higher in developing than in developed countries. This has also been previously noted in the literature. In low-income settings, a large fraction of the population is dependent on agriculture and other informal employment making households prone to income shocks. Moreover, credit constraints are common and formal safety nets are rare, which limit household's ability to smooth consumption over time. Combined with a higher division of labor in the household, this would lead to a higher responsiveness of female labor supply as compared to other developed countries with relatively fewer income shocks and unemployment insurance in place. For the case of India, status concerns may lead to an even higher elasticity of women's labor supply with respect to husband's wage rate.

[36] See table 3 of the paper. The elasticity was calculated using the coefficient of 0.74. Interpreting their table a 10 percent increase in GDP per capita is associated with 0.74 percentage point decline in female labor supply and the mean labor force participation rate reported is 0.49 in table notes.

9 Conclusion

Historically, females in India have shown low labor force participation rates as compared to other developing nations. Higher income, higher education, and higher caste is associated with relatively lower female labor force participation rates. The low female labor force participation has declined even further during the last decade. This is observed among all demographic groups defined by class, caste, education, and age. In the light of falling fertility and rising female education levels, the steep decline in female labor force participation has presented a puzzle to economists and policy-makers.

This paper addresses this issue by linking female labor force participation decision to their husband's earnings. The empirical investigation in this paper reveals a negative relationship between husband's earnings and wife's labor supply between 1999 and 2012. This finding remains consistent across specifications using different sources of variation in earnings of married males. I perform several robustness checks to mitigate potential threats to identification posed by omitted variables and measurement error in the key independent variable. Furthermore, I find that earnings of married males do not impact the labor supply of adult unmarried females, but a negative relationship is observed for the labor force participation of other secondary workers in the household, specifically for teenagers and the elderly. This is in line with standard predictions of labor reallocation of secondary workers when earning increases for primary worker. These results are suggestive of a household level income effect driving this relationship.

The welfare effects of these changes remain less clear. There is plenty of evidence that women's market work is associated with improved socio-economic outcomes for women and their children (Blau and Grossberg, 1990; Jensen, 2012; Antman, 2014; Afridi et al., 2012). At the same time, higher household incomes can buy more leisure for females and relieve them of working in poor conditions. Research also shows that increased time spent at home by married females adds positively to the human capital of children in India (Shah and Steinberg, 2013). This may contribute to growth of the economy and higher equality of income in the long term. There may be resulting implications for decisions on fertility and investment in children that requires further empirical investigation.

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10 Figures and Tables

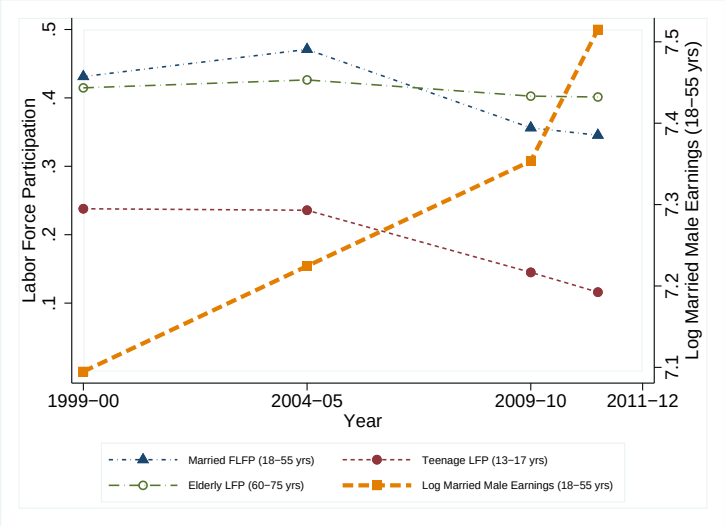

Figure 1: Changes in Labor Force Participation and Married Male Earnings Over Time

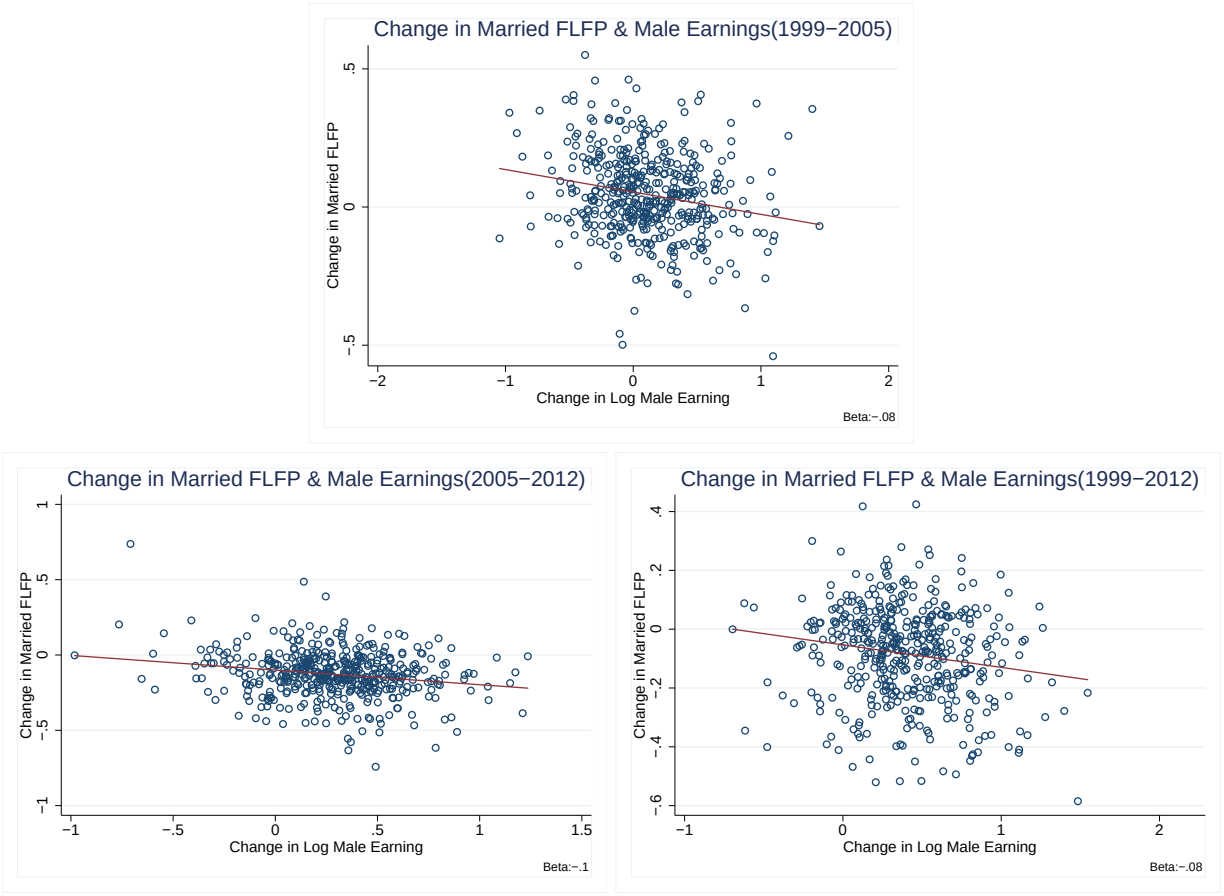

Figure 2: Changes in Married Female Labor Force Participation and Married Male Earnings at District Level

Figure 3: Change in District-Level Male Earnings for High and Low Educated Labor Markets

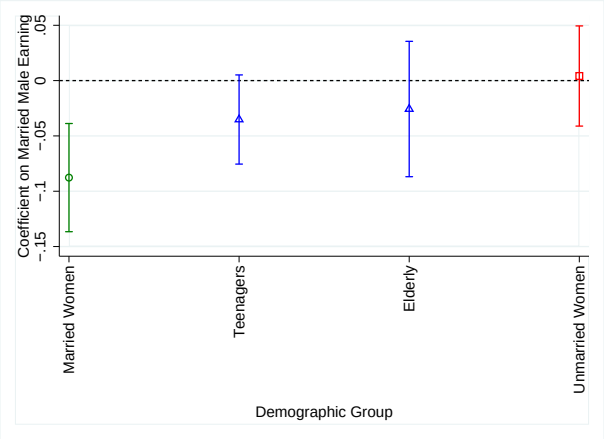

Figure 4: Effect of Married Male Earnings on Labor Force Participation of Different Groups (Across-District)

Note: The coefficients for different sub-groups are derived from equation 1 with the following controls- married female age, married male age, married female education, percent males and females married in age group 18-55 years age-group, male unemployment rate, percent male working for pay, and fertility for 0-3, 3-5, and 6-8 age group. The top and the bottom of the whiskers display the 95-percent confidence interval.

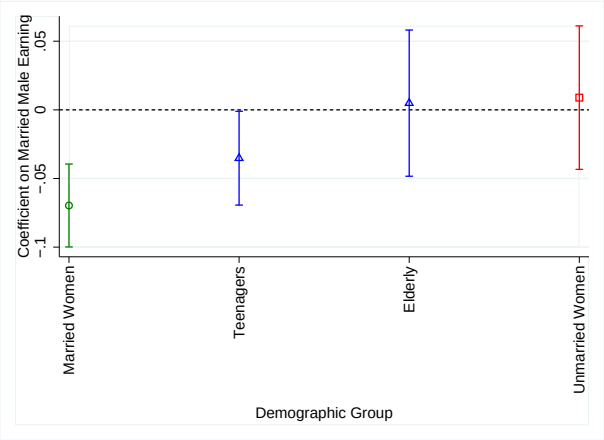

Figure 5: Effect of Married Male Earnings on Labor Force Participation of Different Groups (Within-District)

Note: The coefficients for different sub-groups are derived from equation 2 with the following controls- married female age, married male age, married female education, percent males and females married in age group 18-55 years age-group, male unemployment rate, percent male working for pay, and fertility for 0-3, 3-5, and 6-8 age group. The top and the bottom of the whiskers display the 95-percent confidence interval.

Table 1: Summary Statistics at District Level

Variables	Full Sample	Change in Male Earnings above median change	Change in male Earnings below median change
	(1)	(2)	(3)
	mean/sd	mean/sd	mean/sd
Change in log	0.399	0.668	0.121
married male earnings	(0.35)	(0.23)	(0.20)
Log married male	6.812	6.614	7.018
earning in 99-00	(0.47)	(0.48)	(0.37)
Change in married	-0.083	-0.101	-0.063
FLFP(18-55 years)	(0.16)	(0.17)	(0.16)
Married FLFP in	0.450	0.469	0.431
99-00(18-55 years)	(0.23)	(0.23)	(0.23)
Change in married	1.579	1.873	1.274
female years of school	(0.94)	(0.84)	(0.94)
Married female years	2.774	2.663	2.889
of school in 99-00	(1.62)	(1.79)	(1.43)
Change in female	-0.017	-0.017	-0.016
marriage rate*	(0.06)	(0.05)	(0.06)
Female marriage rate	0.843	0.844	0.843
in 99-00	(0.07)	(0.07)	(0.06)
Change in	-0.094	-0.093	-0.095
children(0-2yrs)	(0.07)	(0.07)	(0.07)
Children(0-2yrs) in	0.305	0.298	0.312
99-00	(0.10)	(0.10)	(0.10)
Change in	-0.108	-0.107	-0.109
children(3-5 yrs)	(0.08)	(0.08)	(0.08)
Children(3-5 yrs) in	0.396	0.385	0.407
99-00	(0.13)	(0.13)	(0.13)
Change in male LFP	0.004	0.003	0.005
(18-57 years)	(0.02)	(0.02)	(0.02)
Male LFP in 99-00	0.980	0.981	0.980
	(0.02)	(0.02)	(0.02)
Change in percent	-0.005	0.008	-0.019
married male working for pay	(0.12)	(0.12)	(0.12)
Percent male working	0.547	0.528	0.567
for pay in 99-00	(0.13)	(0.13)	(0.13)
Change in percent	-0.015	-0.017	-0.014
males married*	(0.07)	(0.07)	(0.07)
Percent males	0.741	0.743	0.739

married in 99-00	(0.08)	(0.08)	(0.08)
Change in percent	-0.290	-0.345	-0.232
married male in agriculture	(0.20)	(0.21)	(0.17)
Percent married	0.472	0.526	0.416
males in agriculture in 99-00	(0.25)	(0.27)	(0.21)
Change in percent	-0.006	-0.006	-0.007
married male in mining	(0.04)	(0.03)	(0.05)
Percent married	0.015	0.014	0.016
males in mining in 99-00	(0.04)	(0.04)	(0.05)
Change in percent	0.013	0.013	0.014
married male in construction	(0.12)	(0.12)	(0.11)
Percent married	0.096	0.094	0.098
males in construction in 99-00	(0.11)	(0.11)	(0.11)
Change in percent	-0.046	-0.043	-0.050
married male in manufacturing	(0.09)	(0.09)	(0.09)
Percent married	0.094	0.091	0.097
males in manufacturing in 99-00	(0.11)	(0.11)	(0.11)
Observations	446	227	219

Note: * indicates that the variable was constructed on the whole available data instead of the working sample as used for other variables.

Table 2: Descriptive Statistics of the IHDS Sample

	Full Sample	Husband's income rises	Husband's income falls	Difference
Change in log male earnings	0.256	0.739	-0.723	
	(0.94)	(0.58)	(0.73)	
				1.42***
Log male earning in 2005	10.226	10.123	10.437	
	(1.01)	(1.05)	(0.91)	
				-0.29***
Change in percent females working	0.065	0.053	0.091	
	(0.55)	(0.55)	(0.55)	
				-0.03***
Female Labor Force Participation in 2005	0.434	0.420	0.461	
	(0.50)	(0.49)	(0.50)	
				-0.03**
Change in number of children 0-5 years	-0.198	-0.199	-0.195	
	(1.30)	(1.30)	(1.29)	
				0.01
Number of children 0-5 years in 2005	0.866	0.874	0.851	
	(1.01)	(1.02)	(0.98)	
				0.04
Change in children 6-14 years	0.046	0.086	-0.035	
	(1.67)	(1.67)	(1.65)	
				0.13***
Number of children 6-14 years in 2005	1.331	1.297	1.400	
	(1.27)	(1.25)	(1.30)	
				-0.10***
Change in number of persons 15-59 years	0.517	0.504	0.545	
	(1.36)	(1.37)	(1.34)	
				-0.03
Number of person 15-59 years in 2005	3.318	3.344	3.265	
	(1.66)	(1.68)	(1.62)	
				0.10**
Female age in 2005	30.728	30.455	31.280	
	(7.29)	(7.27)	(7.32)	
				-0.64***
Husband's age in 2005	35.570	35.359	35.996	
	(7.83)	(7.82)	(7.85)	
				-0.48***
Husband's education in 2005	5.579	5.761	5.211	
	(4.76)	(4.81)	(4.65)	
				0.48***
Percent high caste households	0.138	0.137	0.139	
	(0.34)	(0.34)	(0.35)	
				0.00
Percent urban households	0.257	0.268	0.235	
	(0.44)	(0.44)	(0.42)	
				0.03***
Observations	12890	8682	4208	12890

Table 3: Across District Regression with Full Controls
Dependent Variable: Married Female Labor Force Participation

	(1)	(2)	(3)	(4)	(5)	(6)
Log married male earnings	-0.075***	-0.073***	-0.076***	-0.082***	-0.081***	-0.083*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
Percent females married			-0.167	-0.198	-0.187	-0.186
			(0.13)	(0.13)	(0.13)	(0.23)
Percent males married			0.276***	0.265**	0.277***	0.170
			(0.11)	(0.11)	(0.10)	(0.19)
Male unemployment rate				-0.155	-0.113	0.065
				(0.32)	(0.32)	(0.56)
Percent males working for pay				0.101*	0.101*	0.133
				(0.06)	(0.06)	(0.12)
Fertility (0-2)					0.262**	0.229
					(0.13)	(0.22)
Fertility (3-5)					-0.123	-0.160
					(0.10)	(0.20)
Fertility (6-8)					-0.048	0.103
					(0.10)	(0.18)
District Fixed Effect	Y	Y	Y	Y	Y	Y
Time Fixed Effect	Y	Y	Y	Y	Y	Y
Demographic Controls	N	Y	Y	Y	Y	Y
District Time Trend	N	N	N	N	N	Y
N	1338	1338	1338	1338	1338	1338
R^2	0.84	0.85	0.85	0.85	0.85	0.93
Y-mean	0.44	0.44	0.44	0.44	0.44	0.44
Number of districts	446	446	446	446	446	446

Clustered standard errors statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Demographic controls include proportion of married males and females in different age-groups and proportion of married females in different education categories.

Table 4: Within-District Regression with Full Controls
Dependent Variable: Married Female Labor Force Participation

	(1)	(2)	(3)	(4)	(5)	(6)
Log married male earnings	-0.073***	-0.069***	-0.069***	-0.070***	-0.070***	-0.070***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Percent females married			0.053	0.053	0.066	0.066
			(0.08)	(0.08)	(0.08)	(0.08)
Pct males married			-0.016	-0.013	-0.012	-0.012
			(0.06)	(0.06)	(0.07)	(0.07)
Male unemployment rate				-0.091	-0.090	-0.090
				(0.18)	(0.18)	(0.18)
Percent males working for pay				0.038	0.042	0.042
				(0.05)	(0.05)	(0.05)
Fertility (0-2)					-0.042	-0.042
					(0.06)	(0.06)
Fertility (3-5)					-0.043	-0.043
					(0.06)	(0.06)
Fertility (6-8)					-0.007	-0.007
					(0.06)	(0.06)
Share of high educated males						-0.061
						(1.40)
EducationxTime Fixed Effect	Y	Y	Y	Y	Y	Y
DistrictxTime Fixed Effect	Y	Y	Y	Y	Y	Y
Labor Market(DistrictxEducation) Fixed Effect	Y	Y	Y	Y	Y	Y
Demographic Controls	N	Y	Y	Y	Y	Y
N	2472	2472	2472	2472	2472	2472
R^2	0.96	0.96	0.96	0.96	0.96	0.96
Y-mean	0.40	0.40	0.40	0.40	0.40	0.40
Number of Labor Markets	824	824	824	824	824	824

Clustered standard errors statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Demographic controls include proportion of married males and females in different age-groups and proportion of married females in different education categories.

Table 5: Across-District Regression with Full Controls
Dependent Variable: Labor Force Participation of Other Workers

	Teenagers	Elderly	Unmarried Females (Placebo Group)
Log married male earnings	-0.035* (0.02)	-0.026 (0.03)	0.004 (0.02)
District Fixed Effect	Y	Y	Y
Time Fixed Effect	Y	Y	Y
Demographic Controls	Y	Y	Y
Marriage Controls	Y	Y	Y
Male Employment Controls	Y	Y	Y
Fertility	Y	Y	Y
N	1338	1338	1338
R^2	0.72	0.58	0.72
Y-mean	0.20	0.20	0.44
Number of districts	446	446	446

Clustered standard errors statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Demographic controls include proportion of married males and females in different age-groups and proportion of married females in different education categories. Marriage controls include percent of males and females in age-group 18-55 married. Male employment controls include percent of males who report working for pay and male unemployment rate. Fertility controls includes average number of children in age group 0-2, 3-5, and 6-8 years.

Table 6: Within-District Regression with Full Controls
Dependent Variable: Labor Force Participation of Other Workers

	Teenagers	Elderly	Unmarried Females (Placebo Group)
Log married male earnings	-0.036* (0.02)	0.005 (0.03)	0.009 (0.03)
EducationxTime Fixed Effect	Y	Y	Y
DistrictxTime Fixed Effect	Y	Y	Y
Labor Market(DistrictxEducation) Fixed Effect	Y	Y	Y
Demographic Controls	Y	Y	Y
Marriage Controls	Y	Y	Y
Male Employment Controls	Y	Y	Y
Fertility	Y	Y	Y
N	2472	2472	2472
R^2	0.90	0.82	0.89
Y-mean	0.17	0.20	0.40
Number of Labor Markets	824	824	824

Clustered standard errors statistics in parentheses.*** p<0.01, ** p<0.05, * p<0.1. Demographic controls include proportion of married males and females in different age-groups and proportion of married females in different education categories. Marriage controls include percent of males and females in age-group 18-55 married. Male employment controls include percent of males who report working for pay and male unemployment rate. Fertility controls includes average number of children in age group 0-2, 3-5, and 6-8 years.

Table 7: Dependent Variable: Enrollment of Teenagers

	Across-District	Within-District
Log Married Male Earning	0.054***	0.038
	(0.02)	(0.02)
Demographic Controls	Y	Y
Marriage Controls	Y	Y
Male Employment Controls	Y	Y
Fertility	Y	Y
N	1338	2472
R-square	0.83	0.92
Y-Mean	0.68	0.73
Number of Districts/ Labor Markets	446	824

Clustered standard errors statistics in parentheses.*** p<0.01, ** p<0.05, * p<0.1. Column 1 has district fixed effects and time fixed effect. Column 2 has labor market fixed effect, education by time fixed effect, and district by time fixed effect. Demographic controls include proportion of married males and females in different age-groups and proportion of married females in different education categories. Marriage controls include percent of males and females in age-group 18-55 married. Male employment controls include percent of males who report working for pay and male unemployment rate. Fertility controls includes average number of children in age group 0-2, 3-5, and 6-8 years.

Table 8: Household-Level Regression
Dependent Variable: Wife's Labor Force Participation

	(1)	(2)	(3)
Log husband earning	-0.128***	-0.021*	-0.023**
	(0.01)	(0.01)	(0.01)
N	25,780	25,780	25,780
R^2	0.13	0.02	0.02
Y-mean	.43	.43	.43
Household Fixed Effect	N	Y	Y
Controls	Y	N	Y

Clustered SE statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Controls include number of children aged 0-5 years, number of children 6-14 years, number of household between 15-59 years, number of household members above 59 years old, and highest adult education.

Table 9: Household-Level Regression
Dependent Variable: Labor Force Participation of Other Secondary Workers

	Teenagers		Elderly	
	(1)	(2)	(3)	(4)
Log husband earning	-0.010	-0.006	-0.083**	-0.072**
	(0.01)	(0.01)	(0.04)	(0.03)
N	6,413	6,413	1,672	1,672
R^2	0.01	0.04	0.04	0.15
Y-mean	.14	.14	.25	.25
Controls	N	Y	N	Y

Clustered SE statistics in parentheses.*** p<0.01, ** p<0.05, * p<0.1. Controls include number of children aged 0-5 years, number of children 6-14 years, number of household members above 59 years old, highest adult education, age of elderly. Outcome variable is the proportion of household members between ages 60-75 years (or 13-17 years for teenagers) working. Sample consists the subsample of households used in female regressions with atleast one elderly between ages 60-75 years (or 13-17 years for teenagers). Fixed effect at household level included in all columns.

Table 10: Across District Regression using *all* Male Earnings and with Full Controls (Robustness)
Dependent Variable: Married Female Labor Force Participation

	(1)	(2)	(3)	(4)	(5)	(6)
Log all male earnings	-0.079*** (0.02)	-0.076*** (0.03)	-0.083*** (0.02)	-0.088*** (0.02)	-0.088*** (0.02)	-0.083* (0.05)
District Fixed Effect	Y	Y	Y	Y	Y	Y
Time Fixed Effect	Y	Y	Y	Y	Y	Y
Demographic Controls	N	Y	Y	Y	Y	Y
Marriage Controls	N	N	Y	Y	Y	Y
Male Employment Controls	N	N	N	Y	Y	Y
Fertility	N	N	N	N	Y	Y
District Time Trend	N	N	N	N	N	Y
N	1338	1338	1338	1338	1338	1338
R^2	0.84	0.85	0.85	0.85	0.85	0.93
Y-mean	0.44	0.44	0.44	0.44	0.44	0.44
Number of districts	446	446	446	446	446	446

Clustered standard errors statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Demographic controls include proportion of married males and females in different age-groups and proportion of married females in different education categories. Marriage controls include percent of males and females in age-group 18-55 married. Male employment controls include percent of males who report working for pay and male unemployment rate. Fertility controls includes average number of children in age group 0-2, 3-5, and 6-8 years.

Table 11: Within District Regression using *all* Male Earnings and with Full Controls (Robustness)
Dependent Variable: Married Female Labor Force Participation

	(1)	(2)	(3)	(4)	(5)
Log all male earnings	-0.073*** (0.02)	-0.068*** (0.02)	-0.068*** (0.02)	-0.068*** (0.02)	-0.068*** (0.02)
EducationxTime Fixed Effect	Y	Y	Y	Y	Y
DistrictxTime Fixed Effect	Y	Y	Y	Y	Y
Labor Market(DistrictxEducation) Fixed Effect	Y	Y	Y	Y	Y
Demographic Controls	N	Y	Y	Y	Y
Marriage Controls	N	N	Y	Y	Y
Male Employment Controls	N	N	N	Y	Y
Fertility	N	N	N	N	Y
N	2472	2472	2472	2472	2472
R^2	0.96	0.96	0.96	0.96	0.96
Y-mean	0.40	0.40	0.40	0.40	0.40
Number of Labor Markets	824	824	824	824	824

Clustered standard errors statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Demographic controls include proportion of married males and females in different age-groups and proportion of married females in different education categories. Marriage controls include percent of males and females in age-group 18-55 married. Male employment controls include percent of males who report working for pay and male unemployment rate. Fertility controls includes average number of children in age group 0-2, 3-5, and 6-8 years.

Table 12: Across District Regression with Full Controls using Limited Districts (Robustness)
Dependent Variable: Married Female Labor Force Participation

	(1)	(2)	(3)	(4)	(5)	(6)
Log married male earnings	-0.082*** (0.02)	-0.088*** (0.03)	-0.089*** (0.03)	-0.092*** (0.03)	-0.093*** (0.03)	-0.122** (0.06)
District Fixed Effect	Y	Y	Y	Y	Y	Y
Time Fixed Effect	Y	Y	Y	Y	Y	Y
Demographic Controls	N	Y	Y	Y	Y	Y
Marriage Controls	N	N	Y	Y	Y	Y
Male Employment Controls	N	N	N	Y	Y	Y
Fertility	N	N	N	N	Y	Y
District Time Trend	N	N	N	N	N	Y
N	1120	1120	1120	1120	1120	1120
R^2	0.87	0.87	0.87	0.88	0.88	0.96
Y-mean	0.44	0.44	0.44	0.44	0.44	0.44
Number of districts	427	427	427	427	427	427

Clustered standard errors statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Demographic controls include proportion of married males and females in different age-groups and proportion of married females in different education categories. Districts with share of married males working for pay > 0.7 excluded. Marriage controls include percent of males and females in age-group 18-55 married. Male employment controls include percent of males who report working for pay and male unemployment rate. Fertility controls includes average number of children in age group 0-2, 3-5, and 6-8 years.

Table 13: Within District Regression with Full Controls using Limited Districts (Robustness)
Dependent Variable: Married Female Labor Force Participation

	(1)	(2)	(3)	(4)	(5)
Log married male earnings	-0.074*** (0.02)	-0.070*** (0.03)	-0.070*** (0.03)	-0.068*** (0.03)	-0.073*** (0.03)
EducationxTime Fixed Effect	Y	Y	Y	Y	Y
DistrictxTime Fixed Effect	Y	Y	Y	Y	Y
Labor Market(DistrictxEducation) Fixed Effect	Y	Y	Y	Y	Y
Demographic Controls	N	Y	Y	Y	Y
Marriage Controls	N	N	Y	Y	Y
Male Employment Controls	N	N	N	Y	Y
Fertility	N	N	N	N	Y
N	2011	2011	2011	2011	2011
R^2	0.97	0.97	0.97	0.97	0.97
Y-mean	0.42	0.42	0.42	0.42	0.42
Number of Labor Markets	776	776	776	776	776

Clustered standard errors statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Demographic controls include proportion of married males and females in different age-groups and proportion of married females in different education categories. Labor markets with share of married males working for pay > 0.7 excluded. Marriage controls include percent of males and females in age-group 18-55 married. Male employment controls include percent of males who report working for pay and male unemployment rate. Fertility controls includes average number of children in age group 0-2, 3-5, and 6-8 years.

Table 14: Household-Level Regression
Robustness Checks

	WLFP (Dependent Variable: 1 if >240 Hours)	WLFP (Dependent Variable: 1 if >0 Hours)
Log husband earning	-0.023**	-0.041***
	(0.01)	(0.01)
N	25,780	25,780
R^2	0.02	0.05
Y-mean	.43	.48
Controls	Y	Y
Husband's Health	Y	N

SE statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at PSU level. Controls include number of children aged 0-5 years, number of children 6-14 years, number of household between 15-59 years, number of household members above 59 years old, and highest adult education. Husband's health is a dummy variable for long term morbidity that takes value 1 if husband suffers from any of the following: cataract, tuberculosis, high BP, heart disease, diabetes, leprosy, cancer, asthma, polio, paralysis, epilepsy, mental illness, STD/ AIDS, or other long term illness. Fixed effect at household level.