Reproductive burden and its impact on female labor market outcomes in India: Evidence from longitudinal analyses

By

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Abstract

We use nationally representative data from two waves of the Indian Human Development Survey to provide causal evidence on the role of inter-temporal changes in fertility behaviour in influencing female labor market outcomes. Our multivariate regression estimates show that an increase in the number of children reduces labor force participation and earnings. We further investigated the impact of fertility changes on transitions from the labor market. The results show that women who had more than three children in both rounds of the survey had a 3.5 percentage points higher probability of exiting from the labor market. Disaggregated analyses by caste, economic status and region show regional heterogeneity, and the probability of dropping-out of the labor market due to fertility changes is greater for non-poor women and those from socially disadvantaged castes.

Keywords: Reproductive burden, Female labor-force participation, India

JEL Codes: J13, J16, J22

1. Introduction

Economists and demographers have long hypothesized a negative relationship between reproductive burden and female workforce participation (Adair, Guilkey, Bisgrove, & Gultiano, 2002; Cruces & Galiani, 2007; Bloom, Canning, Fink, & Finlay, 2009), arguing that higher fertility decreases the probability that a woman works, otherwise termed as the '*motherhood penalty,* (Correll and Benard, 2007; Miller, 2010; Francavilla & Giannelli, 2011). However, previous research particularly in the context of low- and middle-income countries (LMI), show that such a relationship may not necessarily hold. Interestingly, in some countries, women's labor supply increases in response to an increase in children ever born (Heath, 2017). In LMI countries, despite the expansion of education, job opportunities for women, and fertility decline, the female labor force participation rate (FLFPR) has either been stagnant or falling over time (Kuhn, Milasi and Yoon, 2018; Bongaarts, Blanc, & McCarthy, 2019; Sarkar, Sahoo and Klasen, 2019).

India presents a good case in this regard. Despite a significant fall in fertility levels accompanied by an increase in real economic growth and rising female education in the last two decades, India's Female Labor Force Participation Rate (FLFPR) has declined from approximately 40 per cent in

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1993-94 to 20.33 per cent in 2019 (Chaudhary & Verick, 2014; Desai & Joshi, 2019; International Labor Organization [ILO], 2020). This decline in the FLFPR coincides with a period when India is in the midst of a favourable demographic phase. According to the latest Census (2011) estimates, 60.1 per cent of India's population is in the working-age group (15-64 years), and this is projected to remain at around 58 per cent in 2050 (Report of the Technical Group on Population Projections, 2019). As women constitute almost half of the Indian population, a declining FLFPR may inhibit economic growth and development, and adversely affect the prospects of reaping the demographic dividend (James and Goli, 2016).

However, does decline in reproductive burden as a result of fertility decline has been helping or will help in improving labor market outcomes is so far not studied in India using panel data. Previous research has attributed this low or falling FLFP in India to factors such as lack of availability of appropriate data (Hirway & Jose, 2011), low levels of education and the informal nature of female work (Sethuraman, 1998; Thomas, 2012); low wages and discrimination in labor markets (Srivastava & Srivastava, 2010; Thomas, 2012; Kapsos, Bourmpoula, & Silberman, 2014); and household and individual-specific factors (Chaudhary & Verick, 2014; Sonali Das, Jain-Chandra, Kochhar, & Kumar, 2015; Afridi, Dinkelman, & Mahajan, 2017; Sarkar, Sahoo and Klasen, 2019). However, this literature does not specifically explain whether reducing the reproductive burden helping women to have better labor market-outcomes that our study is able to address.

Firstly, the low female labor force participation and the decline or stagnation in female labor force participation in India is a puzzle that the current literature has been unable to explain, mainly due to a lack of appropriate data. Against this backdrop, although, we are not aiming to entirely demystify the decline of FLFP, attempting to unlock the causal relationship between change in reproductive burden and FLFP. Thus, our paper aims to examine 'the causal relationship between fertility and FLFP' using data from two waves of the nationally representative panel dataset, the Indian Human Development Survey (IHDS) conducted in 2004-05 and 2011-12. This dataset allows us to conduct a more nuanced analysis of the dynamics of FLFP of the same women over 5 years, and explicitly investigate the role of reproductive burden in influencing these labor market transitions net of other factors. In particular, we estimate the rates of female entry and exit from the labor market, in response to changes in their reproductive burden and heterogeneity across caste, economic status and regional backgrounds. We measure reproductive burden by the number of children ever born and pregnancy status at the time of the survey in both rounds.

Secondly, although Sarkar, Sahoo and Klasen (2019) and Dhanaraj & Mahambare (2019) have investigated female entry and exit from employment using the same panel dataset used in our study, their focus is not specifically on the relationship between fertility change and employment dynamics. A crucial distinction of our study from other related studies is that we explicitly consider inter-temporal changes in reproductive burden and its impact on women's labor supply decisions, i.e. the decision to enter or exit out of employment, reduce or increase hours of work and its impact on earnings. By estimating distinct probabilities of entry and exit out of employment in response to fertility change, we provide more nuanced evidence on the role played by fertility changes on FLFP.

Thirdly, the role of fertility and subsequent reproductive burden on female labor supply decisions appears to have received relatively little attention in studies from India. Fewer children may improve the overall well-being of women and increase their opportunity to engage in the labor market and earnings (Adair et al., 2002). Early marriage and childbearing are often found to be associated with higher fertility levels and lower education, thus depressing FLFP (Jensen, 2012; Goli, 2016; Yount & Cheong, 2018; Selwaness & Krafft, 2020). However, there is a dearth of causal evidence from India on the links between the motherhood penalty and FLFP. For example, Das & Žumbytė's (2017) study using pooled National Sample Survey urban data from 1983-2011, finds that having a young child is negatively associated with FLFP. This may be because when they

include children/pregnancy status as an explanatory variable, they are only observing women at a point in time, and are unable to analyze the dynamic impact of fertility behaviour on her labor force participation. By incorporating the dynamics of fertility behaviour and pregnancy status explicitly in the analysis, we are able to provide a more nuanced explanation of the role of children on female labor force participation than is provided by current literature. While studies such as Sarkar, Sahoo and Klasen (2019) and Dhanaraj & Mahambare (2019) also study FLFP using the same panel dataset as ours, their focus is on the role of culture, income, family structure and education.

Fourthly, while existing studies (Agüero & Marks, 2011; Francavilla & Giannelli, 2011; Miller, 2020) have attempted to capture the impact of fertility on FLFP using binary information (working/not working), they did not assess the role of fertility changes on the intensity of labor force participation. As observed by Heath (2017), an examination of the impact of fertility change on the full spectrum of labor market outcomes can provide greater insights for more nuanced policy intervention. Our study considers the full spectrum of labor supply decisions by incorporating information on hours of work, and wage earnings besides labor market participation. Studies using the macro-level or cross-sectional association between fertility levels and FLFP fail to capture inter-temporal transitions or dynamics in labor supply decisions (Klasen & Pieters, 2015; Das & Žumbytė, 2017; Joona, 2017; Boggarts, Blanc and McCarth, 2019). Using disaggregated analyses by caste, economic status and region, we specifically assess the sensitiveness of the relationship between reproductive burden and labor market outcomes to woman's socio-economic background and regions.

Our main results may be summarized as follows. We show that women who had additional children during the period, 2004-2012 or became pregnant by the second wave of the survey, are relatively more likely to have dropped out of the labor market, worked fewer hours and earned less than respondents with no changes in their fertility levels. We further show that reproductive burden has differential implications for women from different regions and socio-economic grounds.

The rest of the paper is organised as follows. Section 2 provides a literature review of the relationship between fertility and labor force participation and background context. Section 3 describes the data sources, variables considered in our analysis and the empirical strategy adopted. Section 4 reports the results from the econometric analysis. The concluding section discusses the key findings and the policy imperatives arising from this study.

Background and Literature Review

(i) International literature on motherhood and wage penalties

The negative relationship between fertility and FLFP is well-established in the demographic economics literature starting from the seminal contribution of Becker (1960). Subsequent empirical studies (Mincer, 1962; Gronau, 1973, Ashenfelter & Heckman, 1974; Heckman, 1974; Rosenzweig and Wolpin, 1980) have also found evidence of an inverse relationship between fertility and FLFPR.

Empirical studies by Budig and England (2001) and Correll, Benard, and Paik (2007) have found evidence of a substantial wage penalty for mothers with a greater number of children. For women who shift to a lower-paying job without increasing hours, childbearing is associated with lower income (Cáceres-Delpiano, 2012; Heath, 2017), especially for those in self-employment (Noseleit, 2014; Ajefu, 2019). In the context of the Philippines, Adair et al (2002) have found that having two or more additional children born over an 8-year interval

significantly reduced women's earnings, while having an additional child under two years of age reduced hours worked.

On the other hand, Rammohan and Whelan (2005) did not find any significant impact of child care costs on women's labor supply and work hours in the context of Australia. However, much of the previous studies on the motherhood penalty (Correll and Benard, 2007; Miller, 2010; Francavilla & Giannelli, 2011; Kahn, García-Manglano & Bianchi, 2014; Bave & Klesment, 2017; Gafini & Siniver, 2018; Gamaz, Sultana & Glinski, 2020) has focused on labor market discrimination against married women and those with children.

In this study, we assume that the discussion on the motherhood penalty is situated in the normative construction of motherhood and the gendered nature of caregiving or work sharing at the family or household level which considerably varies across countries, socio-cultural contexts and time. It is therefore vital to explore the effects of childbearing not only on employment status but also on hours allocated for paid work and its corresponding earnings, especially in a highly patriarchal society such as India.

(ii) Studies from India

Reasons for the low and declining trend in FLFPR in India have been widely studied. As previously discussed, explanations include lack of availability of appropriate data (Hirway & Jose, 2011), informal nature of work (Sethuraman, 1998; Thomas, 2012); unequal wages (Srivastava & Srivastava, 2010; Thomas, 2012; Kapsos, Bourmpoula, & Silberman, 2014); and other household and individual-specific factors (Chaudhary & Verick, 2014; Sonali Das, Jain-Chandra, Kochhar, & Kumar, 2015; Afridi, Dinkelman, & Mahajan, 2017).

Another strand of research has examined the relationship between fertility and labor supply to explain the recent decline in FLFPR in India (Rani & Unni, 2009; Bhalla & Kaur, 2011; Sengupta & Das, 2014; Sorsa et al., 2015; Sonali Das, Chandra, Kochhar, & Kumar, 2015; Klasen & Pieters, 2015; Lahoti & Swaminathan, 2016; Afridi et al., 2017; Das, Bordia & Žumbytė, 2017; Afridi, Bishnu, & Mahajan, 2019). The literature from India is highly heterogeneous in terms of differences in their findings, coverage and methodologies adopted. Both Sorsa et al. (2015) and Klasen and Pieters (2015) have focused on urban women specifically, and found an increasingly negative association between the presence of young children and female labor force participation. Chatterjee, Murgai, and Rama's (2015) focus is on the presence of older family members to act as alternative care givers to facilitate female labor force participation. Similarly, although Das and Žumbytė's (2017) study on the impact of young children on FLFPR found a negative association between the presence of young children and FLFPR over time, their study used repeat cross-section data, so they do not observe the same women over time as our study does. Afridi et al. (2017) found that higher perceived returns from home-based employment relative to market-based employment decrease female labor force participation. More recently, Afridi et al. (2019) show that the productivity of home-based work is higher than market-based employment for women in India, and the prevailing gendered division of labor at the households acts as a binding constraint for females' labor supply.

Summing up, the empirical studies discussed above on factors for the low FLFPR in India in general and the relationship between fertility and female labor market outcomes, in particular, have at least three limitations. First, these studies have typically used a binary variable to capture the female decision of whether or not to be employed, making it difficult to generalize their results at the intensive margin. Second, the lack of availability of a panel dataset in India has been a major constraint in analysing the implications of changes in fertility on female labor market decisions; especially those who have joined or dropped out of the

workforce in response to changes in the number of children ever born. Third, they include children as a control variable and do not explicitly study the dynamics of changes in fertility behaviour on labor market transitions. As described above, our analyses focus on the same women over five years, providing a dynamic perspective on the role of children in female transitions in and out of the labor market, focusing on not just whether they participate in the labor market, but also on the number of hours spent on work and their wage earnings. Additionally, we assess the heterogeneity of dynamics in fertility behaviour on female employment across caste, economic status and region.

Data and Econometric Strategy

The data used in the analyses come from two waves of the nationally-representative Indian Human Development Survey (IHDS) conducted in 2004-05 and 2011-12. The IHDS survey is a collaborative project of the University of Maryland, the USA and the National Council of Applied Economic Research (NCAER), India. The survey uses a multi-stage cluster sampling design for the data collection. The survey provides detailed information about household and individual socioeconomic and demographic characteristics.

The sample for our analysis includes 26,830 ever-married women aged 15-49 years in 2004-05. Of the original sample (33,482 women aged 15-50 years in 2005), there are 6,652 women for whom there is no follow-up information in 2012 due to household attrition, death or moving to other places. Some of the women are dropped from the analytic sample as they are above childbearing age, *i.e.* 50 years. Considering that the survey could only be re-administered for 80.13 per cent of the sample (26, 830 out of 33,482 women) in the second wave, we have first addressed the issue of observable determinants of attrition in Table 1. The determinants of attrition between the two rounds are reported in Table 1. For this study, we use the information on the fertility history of women of childbearing age and her labor market participation besides other socio-economic and demographic characteristics. The results suggest that the variables of interest are found to be significantly correlated with attrition rates. So, the panel data fixed effects regression model in the next section included the selection inverse mills ratio(λ) in the estimation process.

[Table 1 about here]

Dependent variables

To investigate the impact of fertility change on the female labor supply, we consider four dependent variables. These include: (i) working = 1 if the female respondent reported that she was currently in wage employment, 0 otherwise. For those women who have participated in the labor market, two separate analyses were conducted at both the extensive and intensive margins using (ii) the total annual hours worked, and (iii) the annual earnings in the 12 months prior to the survey. Although estimates for the intensive margin cannot provide overall causal estimates of the impact of having children on the female labor supply, they can be interpreted as a decomposition of the overall effects. They show how the female labor supply differs during a period with fewer children compared to a period where there are more children. Table 2 in the Appendix presents all the variables included in the empirical analyses.

We observe that the FLFPR was similar across the two waves, with approximately 25 per cent of the sample participating in the labor market in both the periods, 2004-05 and 2011-12 (Table 2). These figures are consistent with the figures reported in the NSS data. However,

some women have exited the labor market while others entered the labor market during this period. We also observe that the hours (6.91 hours/ per day) in 2004-05 drops slightly to 6.75 in 2011-12, whereas the earnings have increased slightly. To depict the causal relationship between fertility and labor force participation, we have estimated the effect of fertility change on women's employment transitions. In particular, we have examined the factors influencing woman's decisions to enter into and exit from the labor market, in response to fertility changes.

[Table 2 about here]

Explanatory variables

Our explanatory variables include variables reflecting the respondent's socio-economic, demographic and household decision-making autonomy (Table 2). Our sample is predominantly rural with only 31% of the respondents living in urban areas (Table 2). The fertility behaviour of respondents is a key explanatory variable in this study. In our analyses, we include three variables relating to the respondent's fertility behaviour: (1) the total number of children she has given birth to, (2) whether she is currently pregnant, and (3) the number of pre-school age children (under five years of age). On average a woman respondent had 2.67 children in 2004-05, increasing to 2.91 in 2011-12. Around 5% of the respondents were pregnant in the 2004-05 survey, which dropped to 1% in the 2011-12 survey (Table 2). Nearly 51% of the sample had children under 5 years of age in 2004-05, dropping to 46% in 2011-12.

The respondent's economic status is measured using a wealth index based on information on assets available in the IHDS survey. The wealth index takes into account household assets and is constructed using principal components analysis. Based on wealth scores respondents are categorised into five wealth quintiles. As wealth-based poverty may not reflect poverty, in some descriptive analyses, we have also used absolute poverty measure (Tendulkar poverty line) to classify households below the poverty line (poor) and above poverty line (non-poor) based on monthly per capita consumption expenditure (see Desai et al., 2010 for details on the methodology).

We observe that education levels are generally low in the sample, with nearly half the sample (47%) having no education in 2004-05, which slightly reduces to 44% in 2011-12; and around 17% reporting having education up to the primary schooling level (Table 2).

India is a society with traditional social norms that constrain women from working outside the household, and women's autonomy is an important consideration for their ability to participate in the labor market (Kambhampati, 2009; Rammohan & Vu, 2017). The IHDS survey has detailed questions on decision-making autonomy for women in the household with regards to an array of household decisions. These include decision-making autonomy relating to large household purchases, family size (the number of children), say on medical treatment for children, and children's marriage. For each of these decisions, if the respondent reports that she is involved in household decision-making either solely or in consultation with other household members (such as her husband or other household members), we assume that she has decision-making autonomy, and the variable takes on a value of 1, and 0 otherwise. The autonomy index sums all the five aspects of household decision-making, so the variable ranges between a maximum value of 5 and a minimum value of 0 for those women with no decision-making autonomy. Based on this, women are grouped into three categories-high, medium and low household decision-making autonomy. Women's autonomy is generally low in our sample, with 65% of the respondents in the low autonomy category in 2004-05, which

drops slightly to 61% in 2011-12. Only 7% of the respondents were in the high autonomy category, which increased to 11% in 2011-12 (Table 2).

It is also noteworthy that 27% of the respondents lived in a joint family household structure in 2004-05, increasing to 37% in 2011-12. While the presence of other adult members in the household provide alternative sources of child care and may increase the potential for women to participate in the labor market, the presence of other adults may also mean that there are greater restrictions on women.

Respondent's health is also found to be an important factor influencing labor market participation (Goryakin et al., 2014; Heath, 2017). Based on self-reported responses, the respondent's health status is categorised into the following three discrete categories; Good, OK and Bad. Further, we take into account the female respondent's membership of social networks which may influence their ability to find a job (Raeymaeckers et al., 2008; Yueh, 2008). The variable social network takes on a value of 1 if the respondent or any other family member reported being a member of organisations such as women's groups (*Mahila Mandal*), youth club, employee union, self-help group, credit/saving group, caste/ religious group, non-government organization (NGO) or any political party. We further take into account access to government transfers, by defining a variable 'government benefits' which takes on a value of 1 if the household received any income from government benefit schemes such as drought/flood compensation, insurance pay-out or any other, in the last one year otherwise categorised as 0.

Descriptive analysis

In Figures 1-5, we present trends in women's employment in our sample based on their economic status and fertility behaviour. A large literature has established that in low-income settings, the labor force participation of females follows a U-shape when plotted against income (Tam, 2011; Tsani et. al, 2012; Gaddis & Klasen, 2014). FLFPR is generally high at low levels of income (as women work out of necessity to contribute to household income), and it then falls among middle-income households, but again rises for women in high-income households (Bhattacharya & Haldar, 2020; Pradhan, Shalabh & Mitra, 2014). This is also observed in our data as shown in Figure 1. The labor force participation among the poor has remained constant at around 38% in both periods. Although female labor force participation in non-poor households remains below that of poor women, it has increased by nearly 8 percentage points over the period. About 20% of non-poor women were working in 2004-05 which increased to 28% in 2011-12.

Figure 1 also shows women's employment levels by fertility levels. A key point to note here is that across all three categories (no child, 2 or fewer children, greater than 2 children), there is an increase in female labor force participation in our sample between 2004-05 and 2011-12. In particular, the labor force participation among women with no children increases from 19.6% in 2004-05 to 35.5% in 2011-12. On the other hand, the increase in labor market participation among women with more than two children increased by only 2% between 2004-05 to 2011-12. These trends reflect the important role that the presence of children plays in female decision to enter the labor market.

[Figures 1-5 about here]

In Figure 2, we plot the transitions into and out of the labor market between 2004-05 and 2011-12 by fertility behaviour, separately for poor and non-poor women. As shown in Figure

2, one common observation across both poor and non-poor women is that those with less than two children represent the highest proportion of labor market entrants in both survey rounds. On the other hand, we observe that in both surveys, among women in the poor category with more than two children, a higher proportion dropped out of the labor market (18.47%) relative to those who joined the labor market (16.02%). Among non-poor women, however, we observe substantially large increases in labor market participation, *albeit* from lower levels. In particular, for women with more than two children, we observe that while 9% dropped out of the workforce between 2004-05 and 2011-12, 14.84% of women joined the workforce.

In Figures 3 & 4 we plot the annual hours worked and wage earnings of women, disaggregated by their poverty status and fertility behaviour, respectively. Although poor women have higher labor market participation rates as shown in Figure 1, Figure 3 shows that their annual hours of work are lower than those for non-poor women. However, with an increase in fertility, average annual hours of work slightly increased for poor women, but considerably declined among non-poor women. Figure 4 shows an overall increase in earnings for all women during the period between 2004-05 and 2011-12. Although the numbers are not inflation adjusted, we observe significantly higher earnings for women with two or less than two children with reference to those with higher than two children both in poor and non-poor households.

In 2005, the Government of India introduced a major program called the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA) to increase the labor force participation in rural areas. Since the introduction of the program was after Wave 1 (2004-05) but before Wave 2 (2011-12) of our survey, we have plotted the trends in workforce participation rates, hours of work and earnings separately for rural areas in Figure 5. The largest exit from the labor market is for those females who had less than 2 children in 2004-05, but had more than 2 children in 2011-12. Notably, we observe that annual hours of work declined for all three groups (women with less than 2 children in both waves, women with less than two children in 2004-05 but more than 2 children in 2011-12, and women with more than 2 children in both waves). However, the largest decline in annual working hours was observed for those women who had less than 2 children in 2004-05, but more than two children in 2011-12. We observe that annual earnings increased over this period for rural women. Despite a slight rise in overall employment for females and the movement of labor from farm to the non-farm sector (Desai, 2018), the female labor market outcomes in response to the inter-temporal change in their fertility levels have been remained similar throughout 2004-05 to 2011-12 (Figure 1 to 4). This re-emphasizes the robustness of the hypotheses that are being tested in this study.

Econometric methodology

In order to study the links between fertility and female labor market outcomes, using data from the IHDS survey, we first estimate a Fixed-effects panel regression model as shown in Equation 1. The Fixed-effects model is used to account for female-level unobservable factors that may have an impact on both fertility and female labor market outcomes. Results from the Hausman test statistic suggest that the fixed-effects model is appropriate for our analyses. The Fixed effects model also accounts for other female unobservable characteristics not accounted for in the model.

The main equation of interest takes the following form:

$$Y_{it} = \alpha_{1i} + \gamma_1 Child_{it} + \sum_{a=15}^{a=50} \theta_a 1\{Age = a\} + \partial_1 X'_{it} + \delta_1 \lambda_{it} * t + \varepsilon_{1it} \quad (1)$$

Where Y_{it} represents the labor market outcome of female i at time t, $Child_{it}$ refers to the number of children that female *i* has at time t, α_{1i} represents the constant term. X'_{it} is a vector of other time-varying variables such as female's health, autonomy and economic status. λ_{it} is selection inverse mill ratio included in the model as an additional regressor to avoid selection bias. We use age dummies to control for the flexibility of the labor market changes with women's age.

The coefficient γ in equation 1 compares a female's labor market outcomes for the same period over two periods- one with fewer children and another when the number of children has increased. In the current context, the model provides the average response across women who indicated that they worked more or fewer hours as there was an increase in the number of children they had. We include an additional variable for the Inverse Mill Ratio for fixed effect regression, which is estimated based on attrition in the sample between 2004-05 and 2011-12.

In the next stage, since women with young children have a higher opportunity cost of working, we include the presence of young children (less than 5 years of age) and other household members as additional variables that may influence female labor supply. While the relationship between fertility and employment dynamics adjusted to the heterogeneity in the household composition is presented in the robustness checks at a later stage in the paper.

The estimated γ reflects the unbiased impact of having children on female labor market outcomes if and only if the current number of children is uncorrelated with the time-varying determinants of labor supply *i.e.* $E(Child_{it}\varepsilon_{1it}|\alpha_{1i}) = 0$. We test the robustness of our results for potential endogeneity by regressing current fertility on lagged labor market outcomes at a later stage in the paper.

In the second stage, considering that two out of our three dependent variables (*i.e*. hours worked and earnings) may have many zero responses, due to respondents choosing not to work or lack of employment opportunities, we use a truncated sample (only non-zero cases) in equation (2). The dependent variable is a continuous variable and no zeros are allowed (truncated at zero). For instance, we observe the working hours for a sample of working women or the sample of women with positive earnings. The equation of interest in such models takes the following form:

$$y_{it} = y_{it}^{*} \; if \; y_{it}^{*} > L$$
$$= \alpha_{1i} + \gamma_1 Child_{it} + \sum_{a=15}^{a=50} \theta_a 1\{Age = a\} + \partial_1 X'_{it} + \delta_1 \lambda_{it} * t + \varepsilon_{1it} \quad (2)$$

However, there is potential for sample selection bias since the researcher does not observe the reasons for respondents not engaging with the labor market. Therefore, we estimate a Heckman sample selection model. Sample selection (incidental truncation) is different from the truncation criteria used in equation (2). For instance, we do not observe the hours of work or income for women who are not engaged in the labor market. Thus, sample selection assumes that the discrete decision z and the continuous decision y have a bivariate distribution with correlation *ρ.* The equation of interest in such models for the selected sample takes the following form:

$$E(y_{it}/Z = 1) = \alpha_{1i} + \gamma_1 Child_{it} + \sum_{a=15}^{a=50} \theta_a 1\{Age = a\} + \partial_1 X'_{it} + \rho\sigma\widehat{\lambda_{it}} \; (W` \gamma) \quad (3)$$

Where the inverse mills ratio is $\widehat{\lambda_{it}}$ $(W` \gamma)$

However, the truncated sample is not representative of the population and also implies a loss of information. Therefore, we estimate a Tobit regression model including the censored sample (cases with zero value). However, because of censoring, the dependent variable y is the incompletely observed value of the latent dependent variable y*. The Tobit model is the censored normal regression model which is formally given by:

$$y_{it}^{*} = \alpha_{1i} + \gamma_1 Child_{it} + \sum_{a=15}^{a=50} \theta_a 1\{Age = a\} + \partial_1 X'_{it} + \delta_1 \lambda_{it} * t + \varepsilon_{1it} \quad (4)$$

Finally, taking advantage of the longitudinal nature of the dataset, we estimate employment transition probabilities in response to fertility changes. In particular, we are interested in estimating how the probabilities of entry into and exit from the labor market are affected by changes in female fertility level, controlling for the socio-economic and demographic characteristics of the respondent and their household. To this end, we estimate two separate Probit regression models for entry and exit into the labor force, which can be formally written as follows:

$$P(Y^{Entry} = 1/X) = \phi(\alpha_{1i} + \gamma_1 Child_i + \partial_1 X'_i + \delta_1 \lambda_i + \varepsilon_{1i}) \quad (5)$$

$$P(Y^{Exit} = 1/X) = \phi(\alpha_{1i} + \gamma_1 Child_i + \partial_1 X'_i + \delta_1 \lambda_i + \varepsilon_{1i}) \quad (6)$$

The dependent variable in equation (5) is a binary indicator of whether a woman has entered into employment between 2004-05 and 2011-12. ϕ in the equation represents the cumulative standard normal distribution of the dependent variable. Similarly, in eq (6) the dependent variable is a binary indicator of whether a woman has exited from the employment between 2004-05 and 2011-12. $Child_i$ refers to the change in the number of female i's children between 2004-05 and 2011-12, X'_i is a vector of other control variables such as female's health and economic status.

ESTIMATION RESULTS

We present the results of our estimation in Tables 3-6. The main results of our analyses are summarized as follows: (i) the presence of an additional child reduces both the probability of a female being in paid employment and annual earnings; (ii) women with more than 3 children in both rounds of the survey had a 3.5 percentage points higher probability of exiting from the labor market; and finally, (iii) pregnancy status does not influence labor market outcomes in the Fixed-effects model. Below we discuss these results in more detail.

Fixed-effects estimates

Table 3 reports the estimation results from the Fixed-effects model showing the influence of having children on female labor market outcomes. The first three columns show the impact of fertility on labor force participation decisions. In col. 1 we observe that the coefficient for the variable 'total children' is statistically significant and negatively signed showing that the presence of an additional child is associated with a 1 percentage points decline that the female is in paid employment. In col. 2, we show that the presence of young children decreases the probability of a female being in paid employment by 0.2 percentage points. In Col. 3, we observe that with the inclusion of a dummy variable for the presence of a young child, the variable total children is no longer statistically significant. This suggests that the overall negative impact of children on female labor force participation at the extensive margin is

primarily driven by the presence of young children. In keeping with Heath's (2017) study of urban Ghana, the variable pregnancy status is not statistically significant.

In Columns 4 and 6 we capture the presence of children on hours of work and earnings. The results show that the variables number of children and the presence of a young child aged below 5 is not statistically significant in Column 4. However, in Column 6, the presence of a young child is statistically significant and negatively signed. Notably, the coefficient for pregnancy remained statistically insignificant across all the models.

[Table 3 about here]

Heckman selection model estimates

The results from the Heckman model (Second-stage) are presented in Col. 5 and 8 of Table 3, for hours worked and annual earnings respectively for the sample of women who are in the workforce. The results indicate that the total number of children is not statistically significant. However, a respondent's pregnancy status reduces her work hours by 36 percentage points (Col. 7, Table 3). In contrast to the estimates from the fixed effects model, in the Heckman model, the presence of a young child is not statistically significant in influencing female working hours. Nevertheless, pregnancy is negatively associated with hours of work. Column 7 of Table 3 indicates that the variable total number of children is statistically significant and negatively associated with female earnings.

Tobit model estimation

Since the truncated sample is not representative of the population and also implies the loss of information, we present empirical estimates from a Tobit regression model. The results presented in Table 3 (Col. 6 and 9) show the impact of changes in fertility on hours worked and annual earnings, respectively. The Tobit estimates show a significantly negative influence of pregnancy and children on female hours worked and annual earnings. The findings presented in Col. 6 based on the censored normal regression show that an increase in the number of children decreases female working hours by nearly 5 percentage points, and annual earnings by 6 percentage points (Col. 9, Table 3). From Col. 6 and Col. 9, we further observe that the presence of young children significantly reduces working hours by 19 percentage points (Col 6, Table 3), and annual earnings by 23.3 percentage points (Col. 9, Table 3), respectively. Similarly, the respondent's pregnancy status also reduces both hours' worked and annual earnings, although the statistical significance is only at 5% and 10% levels, respectively.

Fertility transitions and changes in labor market outcomes

We take advantage of the longitudinal nature of our survey to analyze the impact of fertility transitions on entry and exit out of the labor market in the two waves. Specifically, we estimate univariate Probit regression models for the probability of: (i) a female who was not employed in 2004-05, entering the labor market in 2011-12, and (ii) a female who was employed in 2004-05 exiting the labor market in 2011-12. Fertility transition is captured as follows: women with <2 children in both 2004-05 and 2011-12; <2 or 2 in 2004-05 but >2 2011-12; >2 in 2004-05 and 2011-12. The explanatory variables used in this model are the same as in the previous models above.

[Table 4 about here]

The results are reported in Table 4 (Cols 1 and 2) for women who entered the labor market in 2011, and in Cols 3 and 4 for those who exited out of the labor market (Cols 3 and 4). In Table 4, the first two columns show the impact of having additional children on the probability of a female entering the labor market in 2011-12 (*i.e*. if she was not employed in the first round but reported being employed in the second round). As with previous results, Col 1 of Table 4 shows that the presence of an additional child reduces the probability of a female joining the labor market by 2 percentage points. In Col. 2, we include variables relating to fertility transitions. The results indicate that relative to women who had less than two children in both 2004-05 and 2011-12, an increase in the number of children is statistically significant and negatively associated with joining the labor market. Having an additional child by the second wave of the survey reduces the probability of a non-employed female joining the workforce by nearly 3 percentage points.

In Cols 3 and 4 of Table 4, we investigate the impact of fertility changes on exiting from the labor market (*i.e.* if a woman was reported working in the first round but not working in the second round). The results show that women who had more than 3 children in both rounds of the survey had a 3.5 percentage points higher probability of exiting from the labor market.

Heterogeneous effects

In this section, we examine socio-economic and regional heterogeneity infertility transition and changes in labor market outcomes. Previous literature has documented the importance of caste, economic status and region factors as being influential forces in influencing fertility, women's status and her employment (Drèze and Sen, 1997; & Sundaram & Vanneman, 2008; Rammohan & Vu, 2018; Despande et al. 2018). Below, we present the heterogeneous effects of fertility transitions on change in labor market outcomes for women by caste, economic status and region.

(i) Effects of fertility changes on FLFP by Caste

Caste is an important marker of social discrimination in India (Deshpande, 2011). The Indian constitution has made caste discrimination unlawful and there are affirmative action policies to address inequities in education and labor market opportunities for members of disadvantaged castes. Despite this, wide differences are observed in both the fertility outcomes and labor force participation depending on caste status. Deshpande (2007) had noted the importance of including gender-caste overlap in a study of economic outcomes. A recent study by Despande et al. (2018) finds that between 1999-2000 and 2009-10, there was a 7 percentage points decrease in the participation of upper-caste women in regular salaried employment. On the other hand, there was an increase in the labor force participation of women from Scheduled castes (SCs), Scheduled Tribes (STs), and Other Backward Classes (OBCs), over this period. Table 7 presents the results from analysing the heterogeneous effects of changes in fertility on female labor market transitions, disaggregated by caste status. Since we are observing the same women at two points in time and caste is a time-invariant variable, we can observe the propensity for women to join or drop out of the labor market within each caste category. Our analyses show that the probability of a female from an SC/ST background to re-join the workforce after having additional children is 4.1 percentage points lower for women from the socially disadvantaged SC/ST groups, and 2.6 percentage points lower for women from the OBC group. Similarly, women from SC/ST are

5.2 percentage points more likely to drop out of work after having children. We do not observe any statistically significant effects for women from the General category.

[Table 7 about here]

(ii) Effects of fertility changes on FLFP by economic status

In Figures 2-4 we demonstrated differences in women's labor force participation, hours worked and earnings by economic status. In Table 8 we present regression results on the role of children in influencing transition into and out of the workforce separately by economic status.

Our analysis shows that both poor and non-poor women are 4 percentage points more likely to drop out of the workforce after having children. However, non-poor women have a significantly lower probability of re-joining the workforce after having children. It may be because non-poor women engage more in formal employment with maternity leave entitlements compared to poorer women, thereby increasing their probability of re-entering the labor market (Klasen and Pieters, 2015).

[Table 8 about here]

(iii) Effects of fertility changes on FLFP by region

In seminal work, Dyson and Moore (1983) have attributed differences in demographic outcomes (child mortality and fertility) to differences in kinship systems in North and South India. Following this, studies from India have incorporated the long-standing regional sociocultural differences in studies on gender differences (Drèze and Sen 1997; Kishor, 1993; Rammohan & Vu, 2018; Kambhampathi & Rajan, 2008; Sundaram & Vanneman, 2008). North-Western India is typically characterized as having kinship structures that disadvantage women as demonstrated in demographic outcomes from northern India compared to the South and the West. In Table 9 we conduct disaggregated analyses to examine if the transitions into and exit from the labor force differ by regions in response to changes in reproductive burden. Our results are in keeping with the literature, whereby women from the Northern states and the western states are significantly less likely to join the labor force after the birth of children. However, dropping out of the labor market due to children is greater in women from eastern and southern regions. This may be because labor force participation is higher in these regions (Drèze and Sen 1997), so we observe a higher proportion of women dropping out in these regions, relative to the reference category.

[Table 9 about here]

Robustness checks

Lagged labor market outcomes and fertility decisions

The results reported above are only valid under the assumption that fertility is not related to labor market shocks during the survey period. To check for this possibility, we regressed fertility levels on lagged labor outcome variables, given by:

$$Child_{it} = \alpha_i + \delta Y_{it-1} + \sum_{a=15}^{a=50} \theta_a 1\{Age = a\} + \varepsilon_{it} \quad (7)$$

Where Y_{it-1} represents the female labor market outcome variables in the previous survey period. Table 5 reports the estimated results for eq (7). We do not find any statistically

significant evidence for the influence of lagged labor market outcomes on the number of children. Therefore, these results rule out reverse causality from the estimates shown in the previous sections.

[Table 5 about here]

Household composition, fertility levels and female labor force participation

The availability of alternative care givers in the household may enable greater female labor force participation. A recent study by Dhanaraj and Mahambare (2019) using the same dataset as us finds that living in a joint family structure lowers female labor force participation in non-farm employment by 12 percentage points. However, their study has not focused on the fertility burden in particular. In Table 6 we test whether household composition, in particular living in joint families, which provides access to alternative sources of care-givers for children affects female labor supply. The results (col. 1 & 2) show that on average women living in joint families have a lower probability of working, and the presence of other adults and teenage siblings does not increase labor market participation. The presence of an older woman (col. 3) in the household (Mother/Mother-in-law) decreases the labor supply directly but, women with a greater number of children who have an older woman in the household (potentially providing care work) are 0.8 percentage points more likely to participate in the labor market. Women with older children who could provide care for younger children increased their hours of work by 5 percentage points with the increase in the number of children (col. 6). These results suggest that teenagers and other married women provide help in childcare and enable greater FLFP. Another important finding from Table 6 is that the presence of other working adults in the family reduces female labor supply directly, but with an increasing number of children, the presence of working adults increases female working hours and earnings.

[Table 6 about here]

Figure 6 re-estimates eq. (1) including dummies for the number of children (1 child, 2 children and 3 or more children). In comparison to having no children, we analyze whether the effect of children on female's labor supply differs by levels of fertility. The figure shows that while the probability of working decreases with the first child, the effect is strongest for women who have three or more children. On the other hand, we found that female earnings with one or two children is higher relative to women with no children. However, women earnings become go down only when a woman has three or more children.

[Figure 6 about here]

CONCLUSIONS

Female labor force participation in India continues to be low and the role of fertility and reproductive burden on labor market transitions remains unclear from previous empirical evidence. This paper has investigated the role of inter-temporal fertility changes on female labor force participation in India using the nationally representative IHDS panel dataset. To the best of our knowledge, we provide the first causal evidence on the role of inter-temporal change in fertility behaviour in influencing female labor market outcomes using longitudinal data.

Our analysis shows that female labor force participation has increased slightly over the period between 2004-05 and 2011-12. This may be due to the government's MGNREGA program, which increased labor force participation in rural areas. Moreover, female labor force participation is higher among poor women, but their annual earnings are lower. Our empirical estimates show that an increase in the number of children reduces labor force participation and earnings. We further investigated the impact of fertility changes on transitions from the labor market. The results show that women who had more than three children in both rounds of the survey had a 3.5 percentage points higher probability of exiting from the labor market.

The presence of a joint family household structure does not have any statistically significant influence on labor market participation. However, strong social norms may be inhibiting the labor force participation of women with young children, particularly given the traditional role of mothers as caregivers to young children. Our results indicate that the effects of children on labor market transitions are different for women based on caste status, economic status and region. Summing up, our findings show that a higher reproductive burden is negatively associated with labor market outcomes for women in India. Our study indicates that women's entry or exit from the labor market are sensitive to changes in the reproductive burden.

Although India's Maternity (Amendment) Bill 2017 has increased the right to paid maternity leave for working women from 12 weeks to 26 weeks, it only benefits a small proportion of working women. Approximately 84% of the female labor force in India is in the informal sector with no access to maternity leave provisions (De, Kumar & Sylendra, 2019; Williams, 2017). Therefore, India needs to design better 'work-family' policies to reconcile the tension between children's caring needs and wage employment.

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