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ABSTRACT

The Demand-Side Story: Structural Change and the Decline in Female Labour Force Participation in India*

Mainstream literature attributes the decline in female labour force participation rate (FLFPR) in India between 2004-05 and 2017-18 primarily to supply-side factors. In this paper, we show that, in fact, demand-side factors are predominantly responsible for the decline. We begin by demonstrating that the contribution of supply-side factors to the FLFPR decline has been reducing over time. Changes in supply-side factors explain a miniscule part of the decline between 2011-12 and 2017-18. We estimate the contribution of structural transformation and local labour demand as the key determinants of declining FLFPR. Our identification strategy uses the Bartik shift-share instrument as the instrumental variable for measuring exogenous change in local labour demand. We find that female employment is highly responsive to local labour demand, but not male employment. The period of decline in FLFPR has also been a period of "jobless growth". We show that women have borne the brunt of the stagnant employment creation from 2004-05 onwards. Our analysis suggests that India needs to focus on creating rural non-farm jobs to boost FLFPR.

JEL Classification: J23, J710, J160, O53

Keywords: female labour force participation rate, employment, social norms, India, labour demand

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1 Introduction

India's growth and development story since 1991 is characterised by several positives: sustained periods of high GDP growth; decline in absolute poverty; rapid increases in educational attainment; falling fertility and maternal mortality rates; improvement in the sex ratio at birth, to name the most notable ones. However, a consistent feature of the Indian economy has been the low level of recorded female labour force participation rate (FLFPR), which witnessed a secular decline between 2004-05 and 2017-18. India's FLFPR dropped from roughly 50 percent in 2004-05 to 25 percent in 2017-18 in rural areas; while it remained stagnant at just above 20 percent in urban areas (Figure 1). This is an anomaly, as the decline occurred despite the presence of factors conventionally seen as enablers of women's participation in the labour market - high GDP growth, increasing female education, and technological change that, in principle, would ease women's entry into traditionally male-dominated jobs.

There is a large body of literature attempting to uncover factors underlying the low level, as well as the decline, in India's FLFPR.[1] The mainstream view attributes the drop in FLFPR to various supply-side explanations. For instance, several papers suggest that women are voluntarily dropping out of the labour force due to rising household income and education enrollment (Kapsos et al., 2014; Klasen and Pieters, 2015; Mehrotra and Sinha, 2017; Afridi et al., 2018).

There is a small strand of the literature suggesting that demand-side factors have contributed to the decline in female LFPR (Kannan and Raveendran, 2012; Chatterjee et al., 2015; Desai and Joshi, 2019; Afridi et al., 2022). While these latter set of studies highlight the importance of moving away from the conventional supply-side explanations, no study has established a causal link between shifts in pattern of labour demand and decline in female LFPR, to the best of our knowledge. This paper attempts to fill this important lacuna by causally estimating the effect of falling demand due to structural change on female labour force participation in India.

1.1 The Context

India has been undergoing extensive structural transformation over the last three decades, with the share of the primary sector in GDP and employment declining and the share of tertiary sector rising. The value added by the primary sector (agriculture, forestry and fishing) as a percent of GDP has declined from 24.18 in 1998 to 16.61 in 2022, and that by manufacturing has declined from 15.71 to 13.31 percent, whereas value added by the ser-

[1] The extensive literature is summarised in greater detail in Deshpande and Kabeer (2024) and Deshpande and Singh (2021).

vices sector has risen from 40.13 to 48.58.[2] This has been accompanied by a sectoral shift in employment. The share of agriculture in total employment declined from 64 to 41 percent between 1991 and 2019, and rose through the Covid-19 pandemic to 44 percent. Service sector employment increased from 22 to 33 percent between 1991-2019, to decline to 31 percent in 2021. Industrial employment increased from 15 to 25 percent over the period.[3]

This structural shift has altered the shares of the three sectors in male and female employment differently. In 1991, 59 percent male and 76 percent female employment was in agriculture. By 2019, this had declined to 38 and 53 percent, respectively. Over the same period, the industry share in male employment increased by 11 percentage points (from 16 to 27 percent), whereas it increased by eight percentage points (from 11 to 19 percent) in female employment. The share of services in male employment increased from 25 to 35 percent, whereas it increased from 12 to 28 percent as a proportion of female employment.

India is not unique in experiencing this sectoral shift in employment. Elsewhere in the world, a movement away from the primary towards secondary and tertiary sectors has been associated with an increase in FLFPR (Bhalotra and Fernández, 2024). However, in India, this structural shift has been accompanied by negligible growth in absolute employment, because of the technology and capital-intensive nature of the high-growth service sectors. Thus, the increase in total employment fell short of the growth in the working-age population in this period (Figure 2). The change in composition was driven by a small increase in non-agriculture employment, and agricultural employment declined in absolute terms during this period.

Figure 3 shows more clearly that the rate of growth of employment in agriculture and allied activities (measured as percentage change over the previous year) plummeted to zero in 2004-05 and stayed at negative two percent over the period that witnessed a decline in rural female labour force participation rates.

What are the implications of the structural shift on female LFPRs? Figure 4 illustrates the main mechanism underlying our results. It shows the correlation, over all survey rounds, between FLFPR and the sectoral share in total employment by clubbing all industries into three broad sectors: agriculture or the primary sector, manufacturing, construction etc or the secondary sector and services or the tertiary sector. This figure establishes the major stylised fact that motivates our main analysis. Panels (A) and (B) shows that over the period, the share of primary and secondary sectors in total employment has been declining, along with FLFP. Panel (C) shows a strong negative correlation between the share of the tertiary sector in total employment and FLFP.

[2]The rest is due to other secondary sectors such as construction, electricity, gas, water supply etc. Data from the World Development Indicators, World Bank, https://data.worldbank.org/country/IN

[3]https://data.worldbank.org/country/IN

In contrast to present-day developed countries, women's employment in India is negatively associated with share of the service sector in total employment, and positively associated with the share of agriculture sector. Our paper shows that the declining share of agriculture in female employment was not compensated by an increase in the share of other sectors and this mismatch underlies the fall in Indian female LFPR.

Appendix Figure A.1 shows the changing sectoral composition of total employment by focusing on absolute numbers of workers in each sector. These numbers are from the KLEMS dataset, which in turn are calculated based on the numbers of Usual principal and subsidiary status (UPSS) workers using data from Employment-Unemployment as well as Periodic Labour Force Surveys conducted by the National Statistical Office during specified years. For intervening years, interpolation is used to arrive at total figures.[4]

It is worth noting that the Covid-19 pandemic and the resultant shutdown of economic activity saw the resurgence of employment in agriculture: in 2021, the share of agriculture in male and female employment had risen to 40 and 58 percent, respectively (Appendix Figure A.2). The share of both industry and services sector in female employment declined to 17 and 25 percent, respectively, between 2019 and 2021.[5]

Official statistics show an uptick in FLFPR between 2018 and 2023. The reasons behind this uptick are a combination of better measurement of women's unpaid economic work and an increase in self employment rates, which also reflects an increase in agricultural employment, which ended up becoming the sector of last refuge during the Covid-19 pandemic.[6] While this paper focuses on the period of decline, suffice it to note that supply-side factors that were presumed to be responsible for the decline have not shown a reversal so as to explain the recent rise in FLFPR. This is another reason to be sceptical of purely supply-side explanations for the decline.

1.2 Main Results

We begin with a Blinder-Oaxaca decomposition exercise to gauge the contribution of wage-earning characteristics that affect labour supply, such as education level, household income, and other demographic factors, in explaining the decline in rural female LFPR between 2004-

[4]The precise methodology is described in Chapter Four of the Data Manual for 2023 available at https://rbi.org.in/Scripts/KLEMS.aspx

[5]https://data.worldbank.org/country/IN

[6]See https://ceda.ashoka.edu.in/illusory-or-real-unpacking-the-recent-increase-in-womens-labour-force-participation-in-india/ and Figure 3.

05 and 2017-18. We find that the contribution of supply-side factors to this explanation has declined over time. Changes in wage-earning characteristics explained 17.8 percent of the decline in female LFPR between 2004-05 and 2011-12, and only 4.5 percent of the decline between 2011-12 and 2017-18. Thus, we show that the bulk of the decline is not explained by changes in supply-side factors. This provides validation for our investigation into the role of labour demand in explaining the decline in female LFPR.

Our exploration of the demand-side factors begins with a descriptive analysis of the sectoral pattern of employment in India over roughly the last three decades. This sets the context for our main analysis, as we provide suggestive evidence that employment opportunities for women are shrinking in rural areas.

Next, we causally estimate the effect of change in overall labour demand on female LFPR. Ideally, we would like to observe an exogenous change in labour demand and estimate its impact on women's LFPR. However, in observational data, we only observe the equilibrium level of employment, which is the result of both labour demand and labour supply. Since it is not possible to separate labour demand from supply, our identification strategy consists of instrumenting labour demand using the well-known Bartik or shift-share instrument. The instrument predicts the change in local demand (at the district level in our case) by combining the change in the sectoral share of composition of industries (the "shift" part of the instrument), with the initial share of different industries in the local area (hence, "shift-share"). Essentially, the instrument relies on the fact that the national trends of employment growth in different industries would be unrelated to the district-level changes in labour supply, and should impact district-level employment rates differently depending on their pre-existing industrial structure.

We find that female LFPR is highly responsive to the change in local labour demand driven by sectoral shifts. A one percentage point drop in the local employment level leads to a 1.45 percentage point fall in female LFPR. This result is specific to female rates; male LFPR does not change in response to the change in local labour demand.

The period since 2004-05 has been described as a period of "jobless growth", during which the divergence between the growth in working age population and total employment has continuously widened. We do a back-of-the-envelope calculation to estimate the contribution of changing demand on female LFPR. We find that the falling local demand for labour explains most of the fall in the female LFPR over the study period. In fact, had there been sufficient labour demand, female LFPR would have been higher compared to the initial period (2004-05), given that supply-side factors, *viz.*, wage-earning characteristics for women have been improving. Taken together, the two parts of this paper - the decomposition exercise exploring the contribution of supply-side factors and results from the instrumental variable (IV) estimation for labour demand - establish the critical role of demand-side factors by

showing that female LFPR would have risen, had local labour demand increased.

We also quantify the heterogeneity in the impact of local labour demand on female LFPR. Since the sectoral shift in the pattern of employment has implied a movement away from agriculture to other sectors, most notably services, we expect it to have differential impacts on LFPR for different demographic groups, based on their education level, social group, rural/urban location etc., depending on the relative involvement in different sectors. We find that the impact is relatively larger for low to middle-educated women. Also, while female LFPR has been falling mainly in rural areas and is stagnant in urban, we see the impact of falling labour demand in both rural and urban LFPR. A possible reason for this could be forward linkages between rural and urban activities.

The paper concludes with a discussion of the results which indicate that men might be replacing women when demand for labour is sluggish. Additionally, literature indicates employers might have a bias towards hiring men over women, given the types of new jobs in the technology and capital intensive high-growth sectors (Chowdhury et al., 2018).

1.3 Contribution to the literature

This paper contributes to the literature on falling female LFPR in India by adding a new and relatively under-explored dimension to the literature. We offer an explanation for the puzzle of declining female LFPR over the last three decades by examining the relative importance of the role of supply-side factors and labour demand. The first part of the paper is closely related to Afridi et al. (2018). Their decomposition results show that a part of the decline in rural female LFPR between 1987-88 and 2011-12 can be explained by changing supply-side characteristics, particularly rising education levels and household income. We revisit and extend their analysis to 2017-18 and find that supply-side factors explain only a small share of the decline in the initial years, and hardly explain the decline in recent years.

This paper fits into the small body of literature that argues that women's LFPR is falling due to the limited employment opportunities available for them (Kannan and Raveendran, 2012; Chatterjee et al., 2015; Lahoti and Swaminathan, 2016; Desai and Joshi, 2019; Afridi et al., 2022). Chatterjee et al. (2015) and Lahoti and Swaminathan (2016) argue that changing sectoral composition of employment, and a collapse in farm employment without an increase in non-farm employment opportunities led to a drop in female LFPR. Afridi et al. (2022) show that agricultural mechanization caused a disproportionate decline in women's employment. Other descriptive studies also suggest that it could be the outcome of changing labour demand in rural India. This paper is the first attempt to causally measure to role of aggregate local labour demand in explaining the decline in female LFPR.

Other papers that depart from supply-side explanations examine the impact of trade

liberalization in India and the China shock on women's employment. Gupta (2021) finds that districts exposed disproportionately more to liberalization witnessed a relatively larger decline in female employment. Shi (2024) examines the impact of increasing trade from China and finds a weak positive impact on female employment.

Through our focus on the Indian puzzle, this paper also contributes to the global literature on estimating the effect of labour demand on female labour force participation. In particular, our work is close to Bhalotra and Fernández (2024) and Fallah et al. (2021): both papers estimate the effect of labour demand on female LFPR using shift-share instrument approach. Bhalotra and Fernández (2024) disaggregate the demand and supply channel on rising female LFPR in the context of Mexico. The main difference between our work and Bhalotra and Fernández (2024) is the context and the channel. Female LFPR rose in Mexico primarily due to supply-side reasons, while in the Indian case, female LFPR fell largely due to demand-side reasons. Further, Bhalotra and Fernández (2024) and Fallah et al. (2021) focus on gender-specific demand as they estimate the discouragement effect due to demand for women's work, whereas our paper estimates the effect of total employment (male and female combined) on female LFPR.

The rest of the paper is organized as follows. Section 2 examines whether, and to what extent, supply-side factors explain the declining female LFPR. Section 3 investigates the causal impact of changing labour demand due to structural change on female LFPR. Both Sections 2 and 3 have three subsections: Data, Methodology, and Results. Section 4 contains a discussion and Section 5 offers concluding remarks.

2 Do Supply-side Factors Explain the Decline in Female LFPR?

Several supply side factors affect an individual's labour force participation such as age, education, household income and so forth. The change in these demographic characteristics over time would contribute to the change in LFPRs for both men and women. Since the focus of this paper is on women, we follow the existing literature, which has used the Blinder-Oaxaca decomposition (B-O decomposition) technique to quantify the contribution of changing supply-side factors to changes in LFPRs (Klasen and Pieters, 2015; Afridi et al., 2018).

We revisit the analysis of Afridi et al. (2018) and extend that for recent years. Afridi et al. (2018) analyse the decline in LFPR of rural married women of age 25-65 years between 1987-88 and 2011-12. They use three EUS rounds (1987-88, 1999-00, and 2011-12) and find that supply-side factors explain 1) a total decline of 3 percentage points between 1987-88

and 1999-00, 2) half of the decline of 10 percentage points between 1999-00 and 2011-12. We should note the female LFPR increased from 46 percent in 1999-00 to 50 percent in 2004-05 but Afridi et al. (2018) did not consider that subperiod separately. If we include the period 2004-05 separately, we observe a major 25 percentage point decline in female LFPR between 2004-05 and 2017-18.

2.1 Data

We use official data on labour force participation drawn from Employment and Unemployment Surveys (EUS) and Periodic Labour Force Surveys (PLFS). Both EUS and PLFS are nationally representative household surveys conducted by National Statistical Organisation. Our analysis includes five rounds of EUS surveys conducted in 1987-88, 1993-94, 1999-2000, 2004-05, and 2011-12; and three rounds of PLFS conducted in 2017-18, 2018-19, and 2019-20 to understand the broad trends in Indian labour markets. For the main analysis, we focus on three datasets: two rounds of NSS EUS conducted in 2004-05 and 2011-12, and PLFS 2017-18. This is because the major decline in female LFPR occurred between 2004-05 and 2017-18.

We measure LFPR using the "Usual Principal and Subsidiary Status" (UPSS) definition for labour force participation. The Usual Principal Status (UPS) is based on the majority time criterion, which is the activity on which the person spent their majority time during the 365 days preceding the date of survey. By this criterion, a person will be considered in the labour force if she/he is reported as *working* or *seeking and/or available for work* for the majority time in the preceding 365 days. The Subsidiary Status (SS) captures involvement in an economic activity, other than UPS activity, for at least 30 days during the preceding 365 days. The UPSS definition considers an individual in the labour force if the person was economically active either by the UPS or SS activity criteria. We consider individuals who are 15 years and older as the working-age population for labour force participation rate (LFPR) and worker population ratio (WPR) estimation. We limit the analysis to rural women as the decline in female LFPR was driven by rural areas. All estimates use survey weights.

Supply side indicators include variables such as educational attainment, marital status, social groups (caste and tribe), and religious affiliation. We also include household size, share of children in the household, and share of male members in the household as covariates. Since the labour force surveys do not provide income data, we use real household monthly per capita expenditure (MPCE) in the household and the highest education level of male members as a proxy for household socio-economic status (SES).

We convert nominal MPCE into constant prices by using the Consumer Price Index for Agricultural Labourers (CPI-AL) for rural households and the Consumer Price Index for

Industrial Workers (CPI-IW) for urban households.[7] We create 10 deciles of real household MPCE in 2004-05.[8] We create five levels of the size of land ownership as a proxy for household wealth.

2.2 Summary Statistics

Table 1 shows the summary statistics for all rural women, aged 15 years and above. Our dependent variable is "In the labour force" (ILF) based on the UPSS status. We see that this proportion dropped from 49.4 percent in 2004-05 to 35.8 in 2011-12 to further decline to 24.6 in 2017-18.

Note that the distribution of education levels has changed significantly over the period. Particularly, the share of women with an education level below primary has declined, along with a substantial increase in middle school education and a moderate increase in college-educated women. This rising trend for women is similar to the trend for male education. Since we created 10 MPCE deciles based on household consumption in 2004-05, a roughly equal number of women are in each decile in 2004-05. The share of women in higher deciles has increased over the years, reflecting rising incomes in India. More than 25 percent of women in 2017-18 are in the top MPCE decile.

The distribution of women across other characteristics such as age groups, marital status, social group categories, and religion did not change significantly over the period. This is not surprising given that these distributions are slow to change, especially given endogamous marriage patterns. The childcare burden proxied by the share of children below the age of 5 years has gradually declined significantly, as the share of women with children below five years has declined from 11.6 percent to 8 percent. The average size of land ownership declined between 2004-05 and 2011-12. The land ownership variable is not available in the data for PLFS 2017-18. In summary, education level and household income (proxied by MPCE and male education) could be the primary drivers of the decline in female LFPR among supply-side factors, if any.

[7] The price indices can be accessed at `https://epwrfits.in/`

[8] There is a comparability issue with MPCE in EUS (2004-05 and 2011-12) and PLFS (2017-18). In EUS, the MPCE is calculated based on a separate detailed schedule of household consumption, including both durables and non-durables. The PLFS only has a single question on "household's usual monthly expenditure" reported by the households and potentially does not capture the expenditure on durable goods (Jajoria and Jatav, 2020). To make the two more comparable, we create a multiplier for durable goods for 10 deciles of household MPCE in rural and urban and adjust the household MPCE in PLFS 2017-18 based on that.

2.3 Methodology

We use the decomposition method proposed by Blinder (1973) and Oaxaca (1973) to understand the contribution of different supply-side factors, referred to as the Blinder-Oaxaca (B-O) methodology. This method decomposes the change in the dependent variable, in this case, labour force participation, into two parts, one that is accounted for by changes in the covariates or characteristics, and the remainder, which cannot be accounted for by changes in covariates. To implement this, first, we estimate the following linear regression equation:

$$Y_i^t = \mathrm{X}_i^t \beta^t + u_i^t \tag{1}$$

where Y_i^t is a binary indicator variable which takes value 1 if woman i is in the labour force in period t and 0 otherwise. X_i^t is the set of covariates comprising of various individual and household level variables listed in Table 1.

Next, we estimate the following regression:

$$\overline{Y}^{t+1} - \overline{Y}^t = \underbrace{\sum^j \beta_j^t (\bar{\mathrm{X}}_j^{t+1} - \bar{\mathrm{X}}_j^t)}_{\text{explained}} + \underbrace{\sum^j \bar{\mathrm{X}}_j^{t+1} (\beta_j^{t+1} - \beta_j^t)}_{\text{unexplained}} \tag{2}$$

where $\overline{Y}^t$ and $\overline{Y}^{t+1}$ are the mean female LFPR in periods t and $t+1$, respectively. β_j^t are coefficients obtained from Equation (1) for year t and variable j. $\bar{\mathrm{X}}_j^t$ is mean value of the variable j in period t.

Since supply-side characteristics ($\bar{\mathrm{X}}_j$), as well as the returns to the characteristics (β_j), both change over time, the B-O method involves generating counterfactual scenarios, where the total change in LFPR is decomposed into two components: a) change in characteristics over time evaluated at the same rate of return, and b) change in rate of return applied to characteristics at one point in time. Equation (2) decomposes the difference in mean labour force participation between two subsequent survey years into two components: a) explained, or accounted for by the change in characteristics, and b) unexplained, or accounted for by the change in rates of returns to the characteristics.

2.4 Results

Appendix Table A.1 shows the results from estimating Equation (1) for each of the three survey rounds. The dependent variable is female LFPR using the UPSS criterion. We see that the relationship between women's own education level and FLFPR is U-shaped in all three years. The LFPR of highly educated women (UG and above) has actually increased

between 2004-05 and 2017-18 from 4.9 percent to 12.3 percent. Women with some intermediate level of education are less likely to be in the labour force compared to illiterate women in all three survey rounds, but the gap in the likelihood of being in the labour force between different categories of education is declining over time, barring UG and above women.

Next, the likelihood of women being in the LF decreases with the education level of the most educated male member of the household. *Prima facie*, this supports the argument that rising household incomes are associated with low female LFPR, as households with higher levels of male education are more likely to be richer households. However, the gap between female LFPR probability, associated with different levels of male education, has narrowed over the period. We see that the MPCE levels are not systematic predictors of FLFP both within and across time periods. The relationship between age and FLFP shows that compared to women between 15-25 years (i.e, the marriage and early childbearing years), the probability of being in the LF increases with age. In 2004-05, it started to decline at 55 years, but in subsequent rounds, only women 65 years and older are less likely to be in the labour force, compared to women in the 15-25 age group. Currently married women's participation probability is larger than the unmarried women. Gaps in FLFP between social groups and major religions are falling over the period. FLFPR is inversely correlated with household size and male share in each round, but the strength of the correlation is weakening over time. The association between share of children in the household and FLFPR is inconsistent (negative in two time periods and positive in one).

In summary, the predictive power of different supply-side factors is declining over the time period that witnessed a decline if FLFPRs. This is clearly seen in Table 2.

Table 2 reports the results from the decomposition exercise from estimating Equation (2).[9] Column (2) shows the results for the period 2004-05 and 2011-12. We find that of the total decline of 15 percentage points, only 2.7 percentage point decline in female LFPR can be explained by changes in supply-side characteristics. Further, virtually none (0.05 percent) of the total decline of 11 percentage point between 2011-12 and 2017-18 can be explained by changing characteristics (Column (3)). Overall between 2004-05 and 2011-12, 17.8 percent of the decline is "explained", i.e., accounted for by a change in supply side characteristics. Between 2011-12 and 2017-18, only 4.5 percent of the decline is similarly explained. This establishes the case for investigating the role of demand-side factors in contributing to the decline in FLFPR over the period under consideration.

[9]In the paper we have shown the aggregate decomposition. The detailed table with the contribution of each characteristic to the decline, which is negligible in most cases, is available with the authors upon request.

3 The Demand-Side Story: Structural Change and Labour Demand

The previous section established that changes in women's supply side characteristics explain an increasingly smaller proportion of the decline in their labour force participation rates. Therefore, we now turn to an investigation of the demand-side factors. There are several stylised facts that are relevant to this investigation.

First, as noted in the Introduction, the period under investigation is marked by a growing divergence between the growth of the working age population and total employment (Figure 2). We see that while there has always been a gap between the numbers employed and the population in the working age group, till the early 1990s, employment was growing roughly at the same rate as the working-age population. After that, the trends in the growth of working-age population and employment started diverging. Since around 2004, India has been witnessing jobless growth with almost no additional jobs that could productively absorb the growing labour force. This also marks the beginning of the decline in female LFPR in rural India. The decline lasted primarily between 2004-05 and 2017-18, coinciding with the period of jobless growth and rising unemployment.

In this section, we will present causal estimates to establish that the decline in female LFPR is specifically related to labour demand induced by the structural shifts in the pattern of employment over the period of study, where the share of agriculture in total employment declined, and the share of the service sector increased.

3.1 Data

To causally estimate the effect of labour demand, we start by creating a panel, where districts are the geographical units and survey rounds are the time units. Since we are seeking to explain the decline in female LFPR, which was primarily observed after 2004-05, we limit the regression analysis to three survey rounds: 2004-05, 2011-12, and 2017-18.

Geographical boundaries of Indian districts have changed over the years as new districts get created routinely due to the delimitation exercise or other political reasons. The total number of districts increased from 597 in 2004-05 to 641 in 2017-18. We harmonize districts across rounds to create consistent district boundaries across survey rounds by following Fan et al. (2023). They consider "a region to be the smallest area that covers a single district or a set of districts with consistent borders over time" as a geographical or district unit for analysis. In most instances, a given district is divided into multiple districts. In such cases, we construct pre-partition year districts as district units. In some other cases, parts of multiple neighbouring districts from shared borders are clubbed together to carve out new districts. In such cases, we merge all these districts to create a single geographical unit. Additionally,

we omit 13 districts where surveyed working-age women were less than 30 in numbers for precision in estimating district-level values of variables. Therefore, our final data set consists of 574 districts (geographical units) over three rounds between 2004-05 and 2017-18.[10] In addition to district changes, industry classification also varies across NSS rounds. We adopt the concordance table used by the Reserve Bank of India for the Capital (K), Labour (L), Energy (E) and Materials (M) or KLEMS database to create 27 industry categories consistent over the study period.[11]

Table 3 shows the change, between 2004-5 and 2017-18, in the industry-wise share in total employment and female share in each industry, with all industries clubbed into six groups: agriculture and allied activities, mining and quarrying, manufacturing, electricity, gas & water supply, construction and services. Appendix Table A.3 shows the same indicators for the each of the 27 industry groups.

We see that over the period, the share of agriculture in total employment dropped by 14.36 percentage points (from 58.48 percent to 44.12 percent). Additionally, the female share in this sector declined from roughly 42 to 30 percent. Three sectors increased their share in total employment, *viz.*, electricity, gas & water supply, construction and services. Female share declined in the first two, and increased by one percentage point in the service sector. The net result of these shifts was that overall, between 2004-5 and 2017-18, female share in total employment declined by 10 percentage points.

Table 4 shows the industry-wise employment share and growth in employment relative to total population. Column (1) reports the share of 27 industries in total employment in 2004-05, the initial period. As noted above, the share of agriculture and allied activities was the highest and constituted more than 58 percent of total employment in India. The other large sectors in terms of employment include Construction (5.6 percent), Trade (9 percent), Transportation & Storage (3.4 percent). Columns (2) and (3) report the growth in sectoral employment minus the growth in the working-age population. The agriculture sector, which is the largest and employed more than two third of total working women, witnessed a sharp decline in employment relative to population growth. Employment growth was high in Construction, Trade, and Service activities among the large sectors and therefore, their share increased over time.

Next, we create a set of local district-level explanatory variables that would be correlated with women's labour supply. These include the share of working-age women in rural areas, the share of women in different age groups, social groups, religious groups, different educa-

[10]Since the PLFS 2017-18 may not be representative at the district level due to change in sampling strategy, we re-check our results with NSS Household Social Consumption: Health survey 2017-18. Our main results are the same with this alternate data source.

[11]KLEMS data are publicly available and can be accessed at https://rbi.org.in/Scripts/KLEMS.aspx

tion levels, and household MPCE (monthly per capita expenditure) deciles. We divide all households into ten equal groups based on MPCE in 2004-05 rounds to proxy for household income levels. Table 5 shows the unweighted mean of key variables and other control variables, including the mean growth in female LFPR and total WPR at the district level for both periods. The share of working-age women from different demographic characteristics such as rural-urban, social groups, and religion did not change significantly. The share of rural population declined over time due to urbanization. Since female LPFR has always been lower in urban areas compared to rural areas, the increasing population in urban areas may have led to a decline in total female LFPR. There has been a significant increase in the education levels of women over the years, as the share of illiterate women declined and women with higher education are rising. The increasing mean value of higher MPCE deciles reflects the rising income levels of Indian households.

3.2 Empirical Strategy

The aim is to analyse the impact of changing local employment opportunities on female LFPR. We could have regressed the change in female LFPR on the change in employment level at the district level. Since the population level is also changing, we would take the worker population ratio (WPR), i.e., the total employed population divided by the working-age population at the district level. However, following Bhalotra and Fernández (2024), we call this the *naive* regression equation (which we do not estimate for reasons explained below):

$$\Delta\text{female LFPR}_{d,t} = \beta_0 + \beta_1 \Delta\text{EMP}_{d,t} + \beta_2 \mathbf{X}_{d,t} + \mu_d + \pi_t + \epsilon_{d,t} \tag{3}$$

where d & t in the subscripts represent district and year respectively. Δfemale LFPR$_{d,t}$ is the change in female LFPR, and $\Delta\text{EMP}_{d,t}$ is the change in employment level (WPR) between two consecutive survey rounds. μ_d and π_t are district fixed effects and period fixed effects respectively. $\mathbf{X}_{d,t}$ are control variables described in Table 5.

Estimating the naive Equation (3) from observational data suffers from endogeneity problems and simultaneity bias due to the following reasons. First, the employment or WPR growth in the district cannot be taken as the measure of exogenous labour demand, because we observe only the equilibrium employment level which is determined by both labour demand and supply. Second, female LFPR is mechanically related to the total employment or WPR level. Thus, FLFPR and WPR will be simultaneously determined.

3.2.1 The Bartik Shift-Share Instrument

To circumvent these issues, we use an instrumental variable approach. We construct a shift-share instrument or 'Bartik' instrument to get a measure of exogenous change in labour demand, similar to Bartik (1991), Blanchard and Katz (1992), Bound and Holzer (2000), Autor et al. (2013) among others. Essentially, the Bartik instrument provides an exogenous estimate for local labour demand by exploiting the changing industry composition in total employment at the national level. The idea is that the national-level growth in different industries is unrelated to local labour supply but affects the local district-level labour demand. The instrument is constructed by interacting initial share of different industries in local employment with industry-specific employment growth at the national level as follows:

$$\text{Bartik}_{d,t} = \sum_{k \epsilon K} (\frac{EMP_{k,d,t_0}}{EMP_{d,t_0}}) \Delta L_{-d,k,t} \tag{4}$$

The first $(\frac{EMP_{k,d,t_0}}{EMP_{d,t_0}})$ is the 'initial share' measured as the employment of district d in the industry k relative to total employment of that district at the initial period (2004-05), and the term $L_{-d,k,t}$ is percentage employment growth per population in industry k between round $t-1$ and t in other districts (country minus own district).[12] The local employment growth could be endogenous and related to other confounding factors and using own-share could lead to finite sample bias; we create a leave-out type instrument by excluding the district's own growth in the second term.

The validity of instruments in observational data rests on two assumptions. One, is called the relevance condition, i.e., a high correlation with that part of the endogenous instruments that cannot be explained by other instruments. This means that a valid instrument is highly correlated with the endogenous regressors even after controlling for the exogenous regressors. This requirement can be empirically tested in the first stage regression. Second, valid instruments need to satisfy the exogeneity condition. The next subsection shows that the relevance condition is satisfied in our case. The exogeneity condition in the case of the shift-share instrument could either come from exogeneity of initial share (Goldsmith-Pinkham et al., 2020) or quasi-random shocks (Borusyak et al., 2022). Goldsmith-Pinkham et al. (2020) shows that the instrument will be valid if the local initial industry shares are exogenous. In our case, this assumption is met, as the initial industry share should be orthogonal to the growth in other determinants of female LFPR.

[12] Since the PLFS 2017-18 does not allow use to estimate absolute levels of employment for each industry in district by summing up the survey weights, we cannot estimate absolute change in employment for industry in rest of the country, the traditional measure of $L_{-d,k,t}$. However, the survey weights allow us to estimate the share of industry's employment in total employment for the rest of the country. So, we create an alternative measure in terms of share defined as: $\frac{\frac{\text{employment in industry } k \text{ in rest of the country in } t}{\text{working-age population of rest of the country in t}} - \frac{\text{employment in industry } k \text{ in rest of the country in t-1}}{\text{working-age population of rest of the country in t-1}}}{\frac{\text{employment in industry } k \text{ in rest of the country in t-1}}{\text{working-age population of rest of the country in t-1}}}$

3.3 Results

First, we discuss the relevance condition of the instrument. The bottom panel of Table 6 reports the coefficient from first stage estimation with F-statistics. All the specifications include district fixed effects and year fixed effects. We use the district's total employment in 2004-05 as a weight for that district in the following rounds. We progressively increase controls from Column (2) to Column (8). The value of F-statistics remains above 10 across all the specifications, showing that the shift-share instrument satisfies the relevance condition. The coefficient of the instrument is approximately 0.5 in most specifications and equals 0.66 in the most preferred specification with all the controls. This suggests that more than half of the change in WPR at the district level is driven by the growth in predicted labour demand.

We check whether the instrument is systematically correlated with the supply-side variables. To check this, first we get the residuals of the instrument (controlling for fixed effects) and regress those on the supply-side covariates (Appendix Table A.3). We do not find any systematic relationship between the instrument and covariates. The small value of R-square suggests that the labour demand shift-share is not driven by local changes.

Appendix Table A.4 reports the reduced form regression results. The results show that the instrument and growth in female LFPR are highly correlated after controlling for fixed effects and other supply-side variables. A one percentage point increase in predicted labour demand is associated with approximately one percentage point increase in the actual female LFPR in the most preferred specification with all controls (Column (7)).

Table 6 presents the main regression results from estimating Equation (3) with the shift-share IV. We present coefficients only of the key explanatory variable. Column (1) shows the baseline OLS results with all the controls, and Column (2) to Column (8) report the Two Stage Least Squares (2SLS) estimates. We find that female LFPR is highly responsive to the change in the local employment level (WPR) at the district level. One percentage point increase (or decrease) in local employment leads to a 1.45 percentage point increase (or decrease) in female LFPR. Since the growth in employment level per working-age population is negative in India over the study period, it explains the fall in female LFPR. We quantify the contribution of changing labour demand in the decline in female LFPR later in this section.

Next, we check the impact of local labour demand on the LFPR of men. Table 7 reports the results from estimating Equation (3) with the OLS and IV for male sample. We find a positive correlation for men in OLS estimates – as they are mechanically related and men constitute a relatively larger part of local employment. However, unlike women, we do not find a strong positive effect of local labour demand on men's LFPR. In all specifications, the impact is insignificant and the magnitude is also small.

3.3.1 Heterogeneity

In this section we report results from checking for heterogeneity in the impact of labour demand on female LFPR for various demographic groups. Table 8 shows the results from estimating Equation (3) with instrument variable for different sub-groups. We estimate female LFPR by rural-urban location, education levels, and social group at the district level and use them as dependent variables. Columns (1) and (2) show the results for the rural and urban areas. The impact is larger for rural women compared to urban women. Since the female LFPR remained stagnant in urban areas in the study period, it shows that the urban female LFPR could have increased had there been steady employment growth. In terms of age groups, we find that the impact is largest for middle-aged women between 25 years to 40 years. Next, we divide the sample into three education groups. We find that the impact is relatively large for low-educated women, consistent with the falling LFPR among low-educated women in rural areas. Also consistent with stylized facts, the impact is larger for women from the marginalised communities, i.e. Scheduled Caste and Scheduled Tribe.

Next, we conduct robustness checks to examine the validity of the results. First, we use alternate criteria to estimate the employment and LFPR. In the main estimates, we use the usual principal and subsidiary status (UPSS) criteria, according to which an individual is employed or in the labour force, either by the majority time in the previous year (principle status) criterion, or if they report themselves as working for more than 30 days (the latter condition known as "subsidiary status"). We check if the results hold if we exclude individuals employed by their subsidiary status from the estimation of district-level employment and LFPR. Accordingly, we use the usual principal status (UPS), which is a relatively stricter inclusion criterion that considers an individual in the labour force if he or she is working or looking for work for the larger part of the year. Appendix Table A.5 shows the results from estimating Equation (3) with variables created using the UPS criteria. We find the results similar to the main estimates using the UPSS criteria.

Second, since the PLFS 2017-18 may not be representative at the district level due to a change in sampling strategy, we re-estimate our results using the NSS Household Social Consumption (HSC): Health Survey 2017-18. The HSC: Health surveys are conducted by the NSS Office for the health assessment of the population, health expenditure, access to public health, etc. In addition to health and demographic characteristics, the HSC: Health Survey (July 2017-June 2018) also provides the usual principal activity status of all members of the surveyed households. The survey uses a sampling strategy similar to the EUS, therefore, it is representative at the district level. Since the 75th round of the health survey coincided with the PLFS 2017-18, we use the data from the health survey for a robustness check of employment and LFPR estimation at the district level for 2017-18. We find the results qualitatively similar to the main estimates, if we use this alternate data source (Appendix Table

A.6).[13] We also check if the results are driven by any particular state. Appendix Table A.7 shows the results from estimating Equation (3) by excluding each state one by one from the regression. The stability of coefficients shows that changing industrial structure in a particular state is not driving the results.

3.3.2 How much does the demand-side explain?

We can use our estimates to quantify the impact of changing labour demand in explaining the decline in female LFPR. Since the estimates from Table 6 are in terms of elasticity, we are able to do a rough back-of-the-envelope calculation to assess the magnitude of the decline that is explained by labour demand (Table 9). In order to do this, first, we create a measure of the national change in labour demand as the weighted average of the change in WPR across districts. For the period between 2004-05 and 2011-12, the weight for each district is the district's employment in 2004-05, and for the calculation of explained component between 2011-12 and 2017-18, the weight is the district's employment in 2011-12. Next, we multiply the weighted average labour demand by 1.45 (the regression coefficient in the preferred specification (Column (8) of Table 6). We divide this explained component by the national change in FLFPR to estimate the share of the decline in FLFPR explained by the change in labour demand.

We find that the changing labour demand explains the decline of 109 percent from 2004-05 to 2011-12 and 162 percent from 2011-12 to 2017-18 (Row 5 of Table 9). The explained component being more than 100 percent implies that the labour demand explains more than the actual decline. In other words, female LFPR would have increased in the period had labour demand not fallen. The assumptions underlying this back-of-the-envelope calculation are that 1) the effect of labour demand is equal for both periods, 2) the IV estimates are equal to the average treatment effect, and 3) the WPR would have remained the same in case of no change in the labour demand. However, the WPR could have declined in case of higher enrollment in education irrespective of demand. In such a scenario, the explained part would be lower.

4 Discussion

Our results show that changes in supply side characteristics of Indian women (most notably, rising education levels and household income) explain an increasingly smaller proportion of

[13] A small difference in the magnitude from the main estimates may arise from the fact that the female LFPR is much lower in the HSC Survey compared to PLFS for the same period at the national level. The relatively low rate of female LFPR in the HSC survey could be because the survey is not designed to measure employment and therefore, the enumerator might not be trained to apprehend economic activity appropriately.

the decline in female LFPR. Our investigation of demand-side reasons shows that the changing nature of labour demand, specifically due to the declining share of agriculture in total employment and the rising share of three industry groups, construction, services and electricity, gas & water supply, is the primary reason for the observed decline in female LFPR between 2004-5 and 2017-18.

A question that arises is this. How would the labour demand factors affect women's labour supply? In other words, if there is unmet need for employment or labour market slack, would that be reflected in lower labour supply? According to the International Labor Organisation (ILO), labour market slack refers to recorded unemployment[14], as well as three supplementary indicators: underemployed part time workers (are people working part-time who wish to work additional hours and are available to do so. Part-time work is recorded as self-reported by individuals); people seeking a job but not immediately available to work; and people available to work but not seeking.

The latter two categories are jointly referred to as "potential additions to the labour force".[15] These individuals will be recorded as out of the labour force, as they are neither working for pay or profit, nor unemployed according to the conventional definition. However, it is reasonable to view these individuals as reflecting an unmet supply of employment.

There is evidence that labour market slack affects not only FLFP but other indicators related to women's participation in paid work. Lara and Baird (2024) examine the relationship between labour market slack and women hired in leadership positions, using data from LinkedIn for thirteen countries, including India, between 2020-2023. They find that during worse labour market periods, defined by fewer jobs postings per active applicant on the platform, a smaller share of new hires into leadership are women. They find this is primarily driven by industries within countries with fewer than 50 percent of women in the workforce at the start of their data. We should note that their results are not driven by labor supply, as the share of leadership applicants who are women does not decrease with worse labor markets.

The Indian labour market during the period of declining FLFPRs was characterised by labour market slack, or a supply-demand mismatch, as we have shown above. Could women in India, who are not in the paid labour force, be seen as "potential additions to the labour force" or would they have opted out of the labour force unambiguously? This is an especially

[14]An unemployed person is defined, according to the guidelines of the International Labour Organization, as: someone aged 15 to 74; not employed during the reference week according to the definition of employment; currently available for work, i.e. available for paid employment or self-employment before the end of the 2 weeks following the reference week; actively seeking work, i.e. had either carried out activities in the four-week period ending with the reference week to seek paid employment or self-employment or found a job to start within a period of at most 3 months from the end of the reference week. The unemployment rate is the number of people unemployed as a percentage of the labour force.

[15]https://ec.europa.eu/eurostat/statistics-explained/SEPDF/cache/12449.pdf

important question to consider in a country like India where the division of domestic chores tends to be highly unequal with women spending upto ten times as much time on daily domestic chores and care work relative to men. If the labour market is slack, with an unmet need for employment, would women cease to be interested in paid work and concentrate their labour in home production, which would be a better use of their time? We investigate the evidence on this below.

4.1 Willingness to Work

Panel A of Figure 5 shows that the relationship between FLFPR and women's education is a U-shaped one. Women with middle-level of education have the lowest LFPRs. If the labour market slack negatively affected women's labour supply, this would show up in their (lack of) willingness to accept paid work.

The EUS rounds would ask women, who were not in the labour force[16], if they would be willing to [accept paid] work if work was made available at their home. Panel B of Figure 5 illustrates women's willingness to work by their education level in 2011-12, the last round in which these questions were asked. We see that women's willingness to accept paid work has an inverse-U shaped relationship to their education level, the exact opposite of the pattern in Panel A. This suggests that women with the lowest LFPRs are willing to work if paid work was available at or near their homes. The latter proviso reflects the highly unequal gendered norm around domestic work in India, coupled with poor transportation facilities that make it difficult for women to access work far away from home. Thus, women, currently not in paid work and not actively seeking work, can be seen as potential additions to the labour force according to the ILO definition.

EUS data throws more light on this question by asking women if they were seeking regular or occasional work (whether full or part time) and which industry they would like to work in. Panel A of Figure 6 shows that the largest proportion of women across all education categories (currently not in paid work) would prefer regular part-time work. The proportion of women seeking regular full time work rises with education level. Panel B of Figure 6 shows women's preference for work other than dairy, poultry, animal husbandry; or weaving/garment related; or food processing declines with education level.

These correlations suggest that our main conclusion of labour demand being responsible for declining FLFPR is indeed valid. Despite significant constraints inside and outside the home and social norms dictating the gendered nature of domestic work, the overwhelming majority of women are keen to engage in paid work. In other words, there is an unmet

[16]These were women who had codes 92 and 93 as their activity status, i.e., attended domestic duties only.

demand for work, the evidence for which also comes from smaller primary surveys such as in Deshpande and Kabeer (2024).

4.2 Conservative Social Norms and Other Barriers?

Conservative gender norms, mobility restrictions or lack of efficient transportation options, and sexual violence are very important factors that adversely impact women's lives along several dimensions. However, how valid is the belief that women in India are daunted by these factors and willingly stay indoors? These factors would affect women's ability to pursue tertiary education, as they have to battle the same inhospitable conditions on their way to, and inside, institutes of higher education.

Appendix Figure A.3 shows the trend of gross enrollment ratio (GER) in tertiary education. We find that the GER of women has sharply increased from below 10 percent in 2004-05 to above 28 percent in 2019-20; surpassing the GER of men in tertiary education. India has also leaped ahead of other South Asian countries regarding women's GER in tertiary education (Appendix Figure A.4). The increasing number of post-pubertal women going outside the home to colleges and universities, which are, for the most part, mixed-gender spaces, and where interaction with men outside their families is inevitable, does not suggest that women are being browbeaten with strict restrictions on their mobility outside the home.

Additionally, we do not see any evidence indicating that these restrictions have tightened over the years to potentially explain the fall in female LFPR. If anything, we find evidence contrary to this. Data from various rounds of the National Family and Health Survey (NHFS), spanning a period from 1992-93 to 2019-21, shows a clear upward trend in mobility indicators. To take just two examples, Appendix Figure A.5 shows the change, from 1998 to 2021, in the proportion of currently married women who can go to the market, with or without permission, alone or with someone else across states of India. These are self-reported responses which show a clear improvement over time. Similarly, Appendix Figure A.6 shows a clear increase, across all states of India, in the proportion of women who can decide, either alone or jointly with their husbands, about their visits to family and friends.

There are other indicators that cast doubt on the "social norms affecting labour supply adversely" narrative. India has the longest-lasting and largest rural livelihood programme anywhere in the world. More than 70 million women are mobilizing through self-help groups in rural areas, which is larger than the combined population of Australia and Canada. These are very poor women who are willing to explore avenues of self-employment in a context of a shortage of paid employment.[17]. Under highly restrictive norms, we would not have seen a steady increase in the number of women enroling in these collectives.

[17]https://thedocs.worldbank.org/en/doc/62141abf1152d94953e76c11345c869f-0310022021/related/SARL-India-Final-Report-Final-May22.pdf

Finally, using high-frequency panel data, Deshpande and Singh (2021) show that women enter and exit the paid workforce several times over short duration. Norms do not oscillate back-and-forth across months. This suggests that women join the paid workforce when work is available.

5 Concluding Remarks

Using unit-level data from the official national quinquennial Employment-Unemployment Surveys (EUS) till 2011-12, and annual rounds of the Periodic Labour Force Surveys (PLFS), this paper investigages the relative contribution of supply and demand-side factors in explaining the decline in female LFPR. The existing mainstream literature links female LFPR to the various supply-side reasons and argues that women's participation in the paid labour force declined due to the rise in education and household income, or changes in other supply-side features. However, we find that these factors explain only a smaller part of the decline and their importance declined over time. The trends other than the labour market also do not seem to be consistent with the idea that women are voluntarily dropping out of the labour force.

In the second part of the paper, we causally establish the link between the decline in female LFPR with another feature of the Indian economy, *viz.*, structural change and jobless growth. Our identification strategy uses the Barkik Shift-Share instrument to causally estimate the impact of local labour demand on female employment. Using the elasticity measure from our IV estimates, we do back-of-the-envelope calculations to estimate the contribution of local labour demand in the change in female employment. We find that the contribution is more than 100 percent, which implies that if the local labour demand had not been falling, female LFPR would have increased.

Internationally, structural transformation, i.e., the transition from agriculture to secondary and tertiary sectors, has been associated with an increase in women's participation in the labour force. However, the Indian experience is different and structural transformation has actually displaced women from paid work. India's female LFPR declined during the period that the Indian economy witnessed jobless growth in between 2004/5 and 2017/18. During this period, the Indian economy grew at more than seven percent between 1995 and 2016, before it started to slow down, the slowdown exacerbated by the Covid-19 pandemic. The long period of high growth did not create sufficient employment opportunities (Mehrotra et al., 2012; Tejani, 2016). Between 2004-05 and 2017-2018, the total projected working-age population in India increased by 27 percent, while employment growth was only around 2 percent – causing a mismatch between labour demand and labour supply. This paper establishes a link between the decline in labour demand and female LFPR. Our analysis indicates that a decline in the agriculture sector without a substantial increase in jobs in other sectors

is primarily responsible for the decline in female LFPR. Our results highlight the urgent need for policies to boost employment creation, especially non-farm employment in rural areas.

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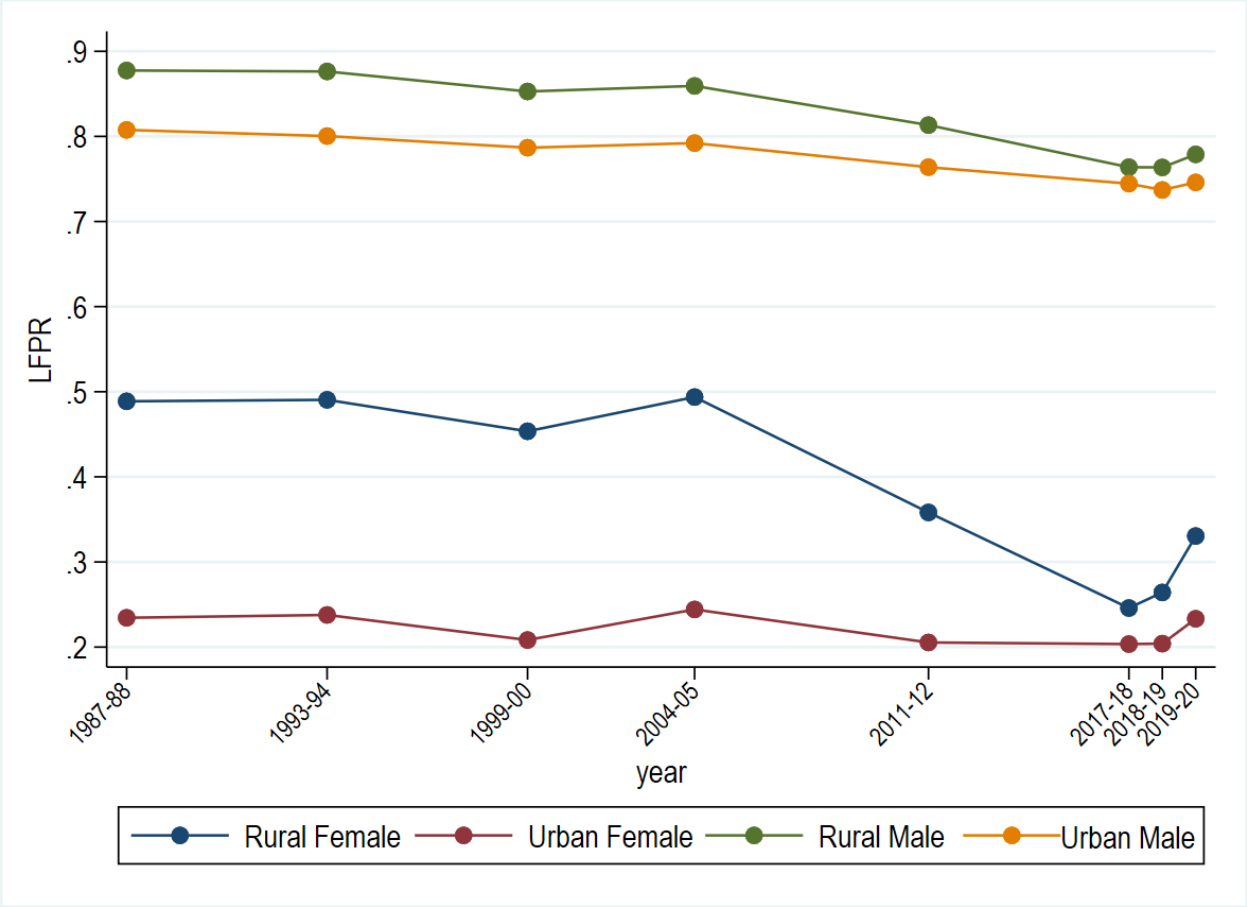
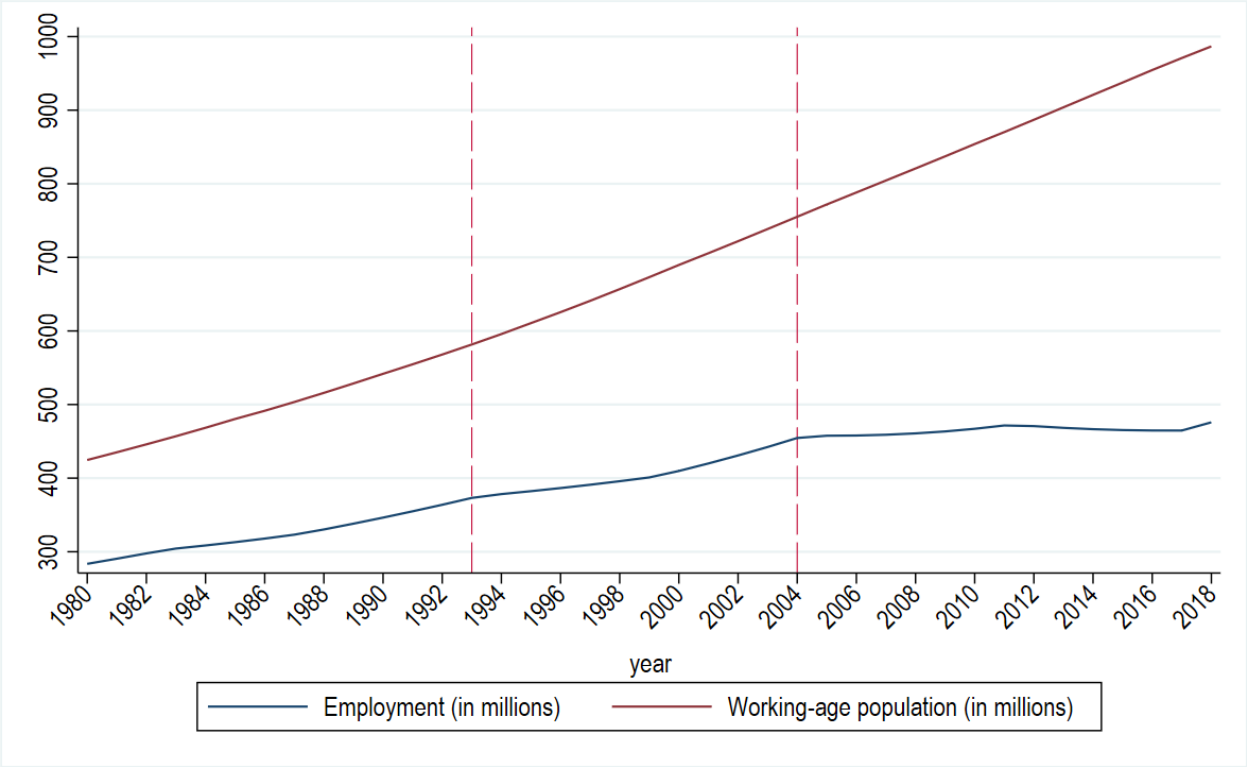
Figures

Figure 1: Trends of labour force participation rate



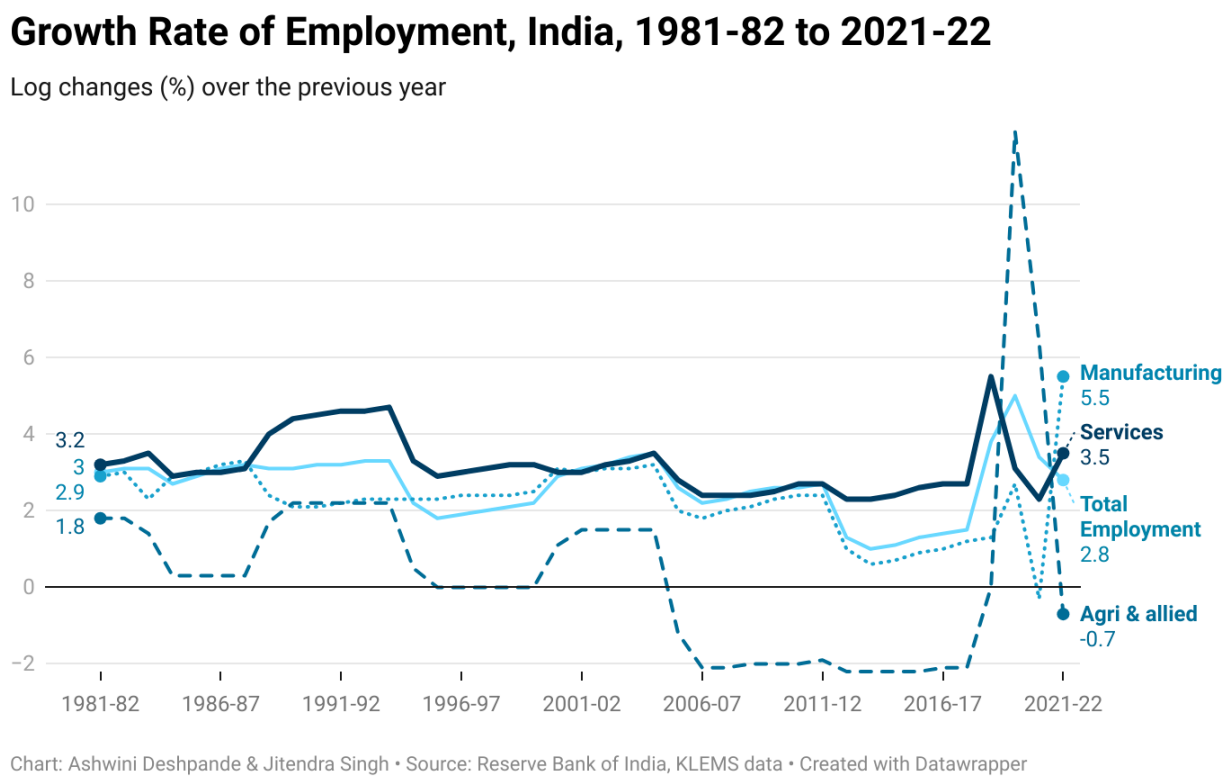
Note: This figure plots the trend of labour force participation rate in India by gender and sector (rural-urban). The numbers are estimated using various rounds of NSS EUS and PLFS surveys. The sample includes individuals of age above 14 years.

Figure 2: Trends of population and employment growth



Note: The figure plots the annual trend of total employment and total projected working-age population (age above 14 years) in India. Source: The employment figures borrowed from the RBI KLEMS database and the population estimates/projections from the World Bank data. The red line shows the projected total working-age population (in millions) in the calendar year and the blue line shows the total employment level (in millions) in the financial year.

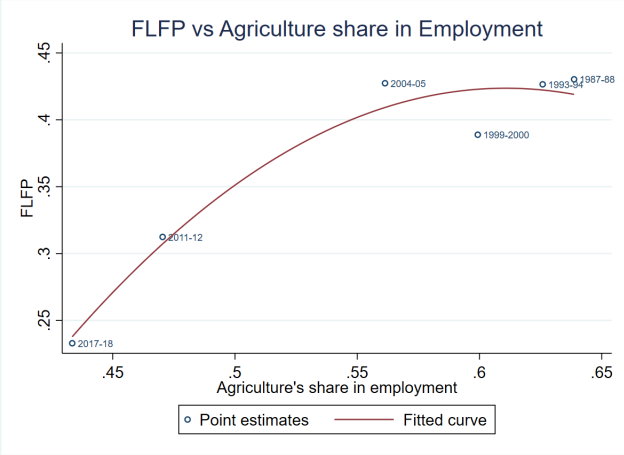
Figure 3: Growth Rate of total employment by sector



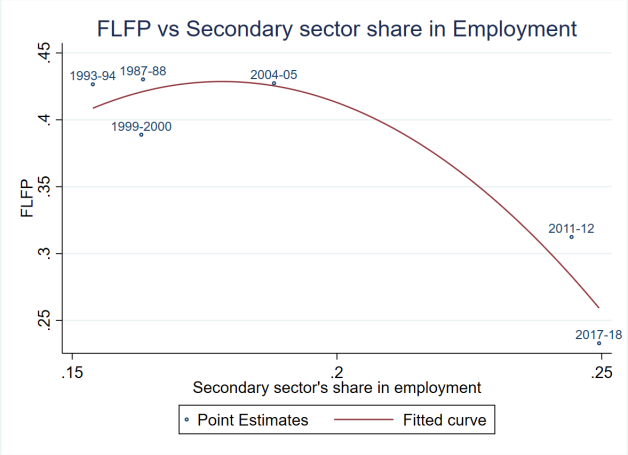
Note: This figure is based on rate of growth of employment calculated by the Reserve Bank of India as a part of the KLEMS project. Details about the project and data are available at https://rbi.org.in/Scripts/KLEMS.aspx

Figure 4: Female LFPR vs sectoral share in total employment over time

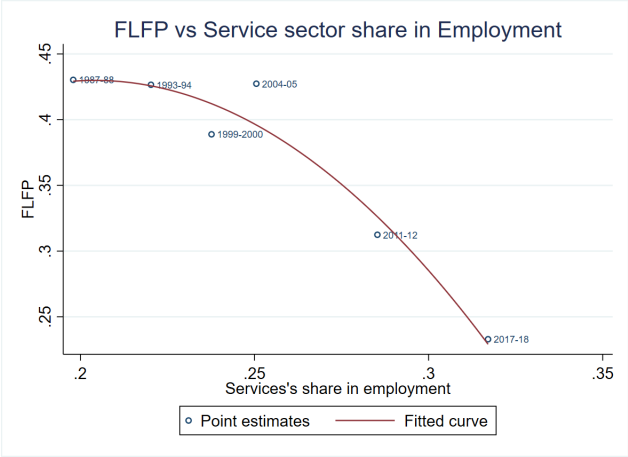
(a) Agriculture



(b) Secondary sector



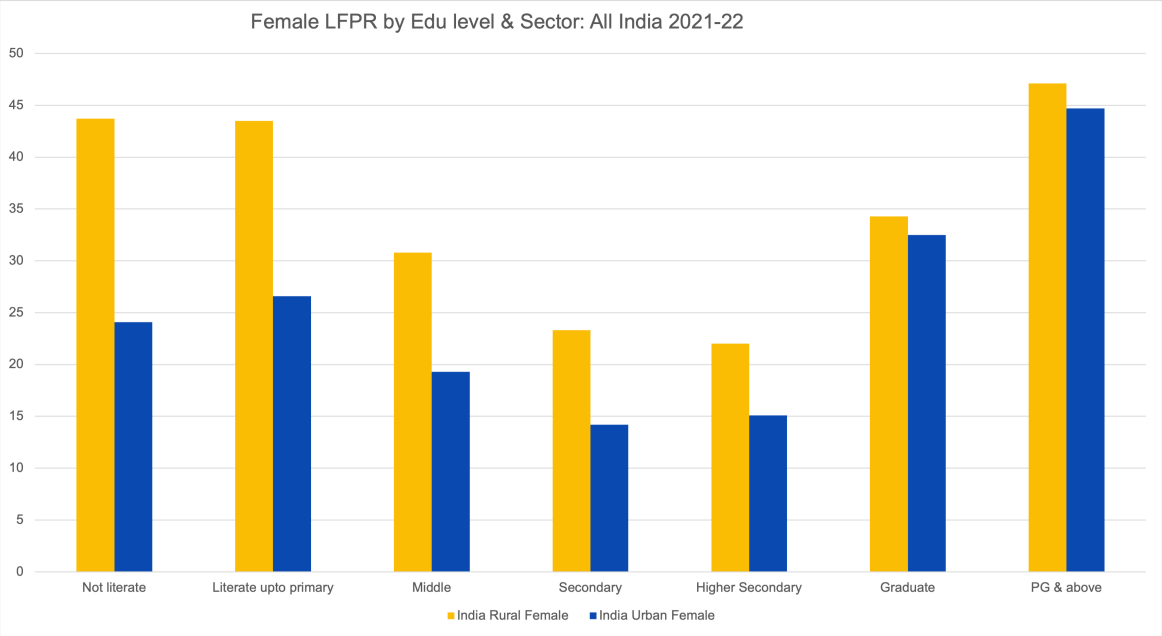
(c) Tertiary sector



Note: This figure plots the correlation between sectoral share and FLFPR. In each panel Y-axis is FLFPR and the X-axis is share of agriculture in total employment in panel (a), share of secondary sector in total employment in panel (b) and share of tertiary sector in total employment in panel (c). The figures are estimated using various rounds of NSS EUS and PLFS surveys.

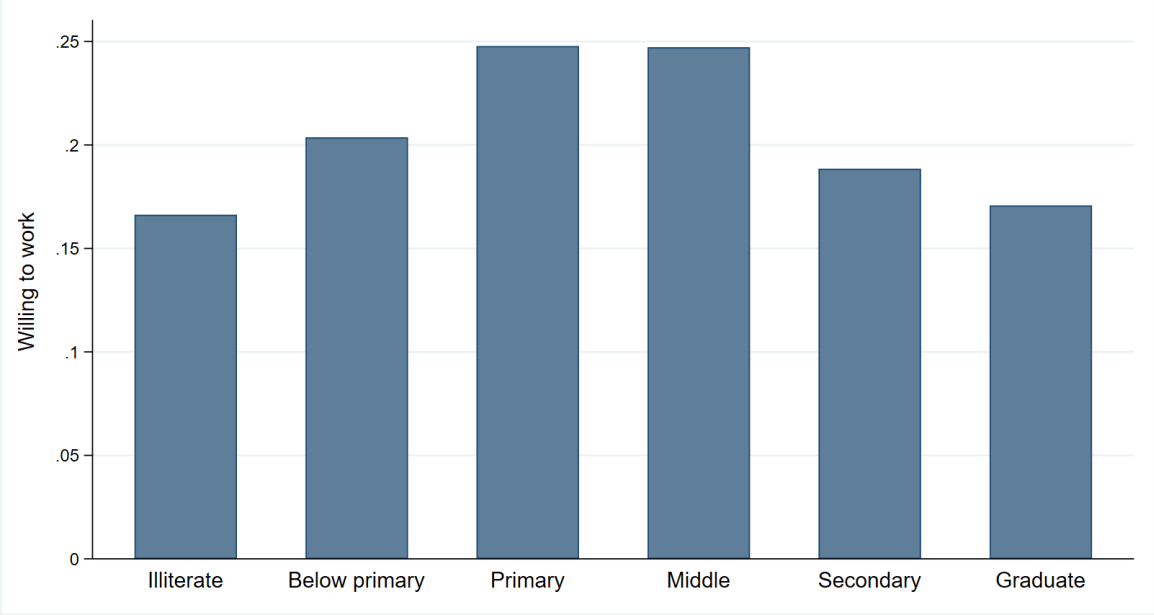
Figure 5: FLFP and willingness to work, by education level

(a) FLFP by Education Level



Note: This figure is based on PLFS for 2021-22. Earlier rounds of PLFS show a similar pattern

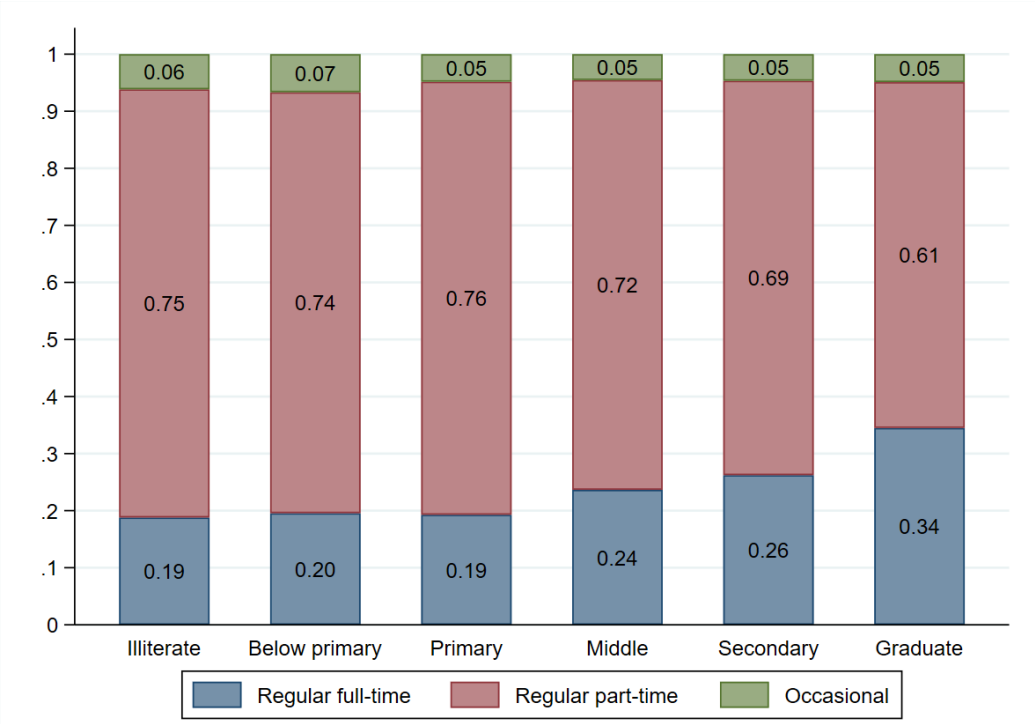
(b) Willingness to accept paid work, by education level



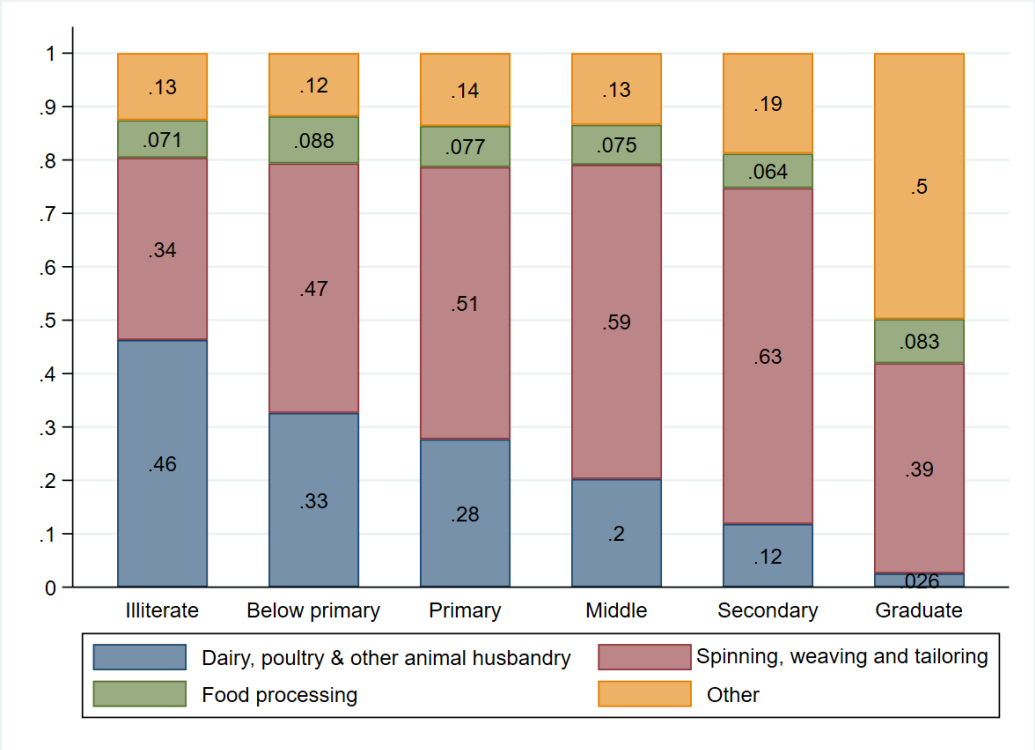
Note: This graph is based on EUS 2011-12 and reports the proportion of women who are willing to accept paid work despite being reported as out of the labour force. The sample includes women with usual principal activity status codes 92 or 93, capturing women who primarily attended domestic duties. The survey question is: "In spite of your preoccupation in domestic duties, are you willing to accept work if work is made available at your household?"

Figure 6: Duration and industry of work sought by women, by education level

(a) Nature of work sought



(b) Preferred industry of work



Note: This graph is based on EUS 2011-12 and the sample includes women who are willing to accept paid work despite being reported as out of the labour force.

Tables

Table 1: Summary statistics for Blinder-Oaxaca decomposition (Rural)

	(1)		(2)		(3)	
	2004-05		2011-12		2017-18	
	mean	sd	mean	sd	mean	sd
ILF	0.494	0.500	0.358	0.479	0.246	0.431
Own education level						
Illiterate	0.586	0.493	0.475	0.499	0.418	0.493
Below Primary	0.091	0.288	0.099	0.299	0.058	0.234
Primary	0.108	0.310	0.114	0.317	0.119	0.324
Middle	0.113	0.317	0.138	0.345	0.178	0.383
Secondary or higher secondary	0.085	0.278	0.145	0.352	0.178	0.383
UG and above	0.017	0.130	0.029	0.167	0.049	0.215
Highest education level of male member in HH						
Male:Illiterate	0.301	0.459	0.249	0.432	0.219	0.413
Male:Below Primary	0.128	0.334	0.119	0.323	0.062	0.240
Male:Primary	0.154	0.361	0.141	0.348	0.133	0.340
Male:Middle	0.185	0.388	0.193	0.395	0.242	0.428
Male:Secondary or higher secondary	0.163	0.369	0.218	0.413	0.238	0.426
Male:UG and above	0.070	0.255	0.080	0.271	0.106	0.308
Monthly per capita expenditure (MPCE)						
MPCE decile1	0.102	0.303	0.068	0.251	0.066	0.248
MPCE decile2	0.106	0.307	0.065	0.247	0.058	0.234
MPCE decile3	0.106	0.307	0.076	0.264	0.057	0.232
MPCE decile4	0.104	0.305	0.081	0.273	0.041	0.197
MPCE decile5	0.102	0.302	0.092	0.289	0.105	0.307
MPCE decile6	0.102	0.302	0.094	0.292	0.061	0.239
MPCE decile7	0.100	0.300	0.107	0.310	0.121	0.326
MPCE decile8	0.097	0.297	0.119	0.323	0.113	0.317
MPCE decile9	0.096	0.294	0.142	0.350	0.122	0.327
MPCE decile10	0.086	0.281	0.155	0.362	0.256	0.437
Age group (in years)						
15-25	0.273	0.445	0.257	0.437	0.253	0.435
25-29	0.120	0.325	0.117	0.322	0.112	0.316
30-34	0.121	0.326	0.113	0.317	0.107	0.309
35-39	0.110	0.313	0.118	0.322	0.106	0.308
40-44	0.085	0.279	0.088	0.283	0.090	0.287
45-49	0.073	0.260	0.076	0.265	0.083	0.276
50-54	0.057	0.231	0.057	0.232	0.060	0.237
55-65	0.110	0.313	0.122	0.327	0.130	0.336
65+	0.051	0.220	0.051	0.221	0.059	0.235

Marital status						
Currently married	0.734	0.442	0.726	0.446	0.709	0.454
Divorced/windowed	0.123	0.329	0.114	0.318	0.116	0.321
Never married	0.142	0.349	0.160	0.366	0.175	0.380
Caste category						
Upper Caste	0.266	0.442	0.245	0.430	0.242	0.428
OBC	0.428	0.495	0.448	0.497	0.433	0.495
ST	0.100	0.300	0.106	0.308	0.115	0.318
SC	0.205	0.404	0.201	0.401	0.211	0.408
Religion						
Hindu	0.837	0.369	0.836	0.370	0.836	0.370
Muslim	0.107	0.308	0.116	0.320	0.108	0.310
Christian	0.023	0.151	0.020	0.141	0.020	0.140
Other	0.033	0.178	0.028	0.164	0.037	0.188
Household structure						
log (HH size)	1.631	0.502	1.559	0.479	1.509	0.464
Male share	0.450	0.170	0.450	0.173	0.451	0.176
Children share	0.115	0.150	0.092	0.140	0.080	0.135
Land Owned by Household						
<0.1 Ha	0.690	0.463	0.726	0.446		
0.1–0.2 Ha	0.132	0.339	0.121	0.326		
0.2–0.4 Ha	0.090	0.286	0.078	0.268		
0.4–0.6 Ha	0.027	0.162	0.020	0.141		
> 0.6 Ha	0.061	0.239	0.055	0.229		
Observations	130890		98112		90754	

Note: This table reports the summary statistics (mean and standard deviation) of dependent variable and covariates. The sample includes rural women of age 15 years and above. Column (3) does not include Land size dummy variables as the information on land ownership is unavailable in the PLFS 2017-18.

Table 2: Blinder-Oaxaca decomposition results (Rural)

	(1)	(2)	(3)
	2004-05	2011-12	2017-18
Female LFPR	0.506***	0.355***	0.243***
	(0.002)	(0.001)	(0.004)
Difference		0.151***	0.112***
		(0.004)	(0.004)
Explained		0.027***	0.005***
		(0.001)	(0.001)
Unexplained		0.124***	0.107***
		(0.004)	(0.001)
% Proportion Explained		17.8	4.5
Observations		194595	159233

Note: This table reports the results from estimating Equation (2). Sample: Rural women of age 15 years and above. The base category of Blinder-Oaxaca decomposition for each column is the respective pre-period. Covariates: dummies for age group, marital status, Own education level, Highest education of male members in HH, MPCE deciles, Caste, Religion, Land owned by households and variables share of children below 5 years in HH, Share of male members in HH and HH size, similar to reduced form regressions in Table A.1. Standard errors are in parenthesis. *** p<0.01, ** p<0.05, *p<0.1.

Table 3: Industry shares in total employment and female share in each industry: Summary

Sl no	Industry name	(1) share of industry in national employment (2004-05)	(2) share of industry in national employment (2017-18)	(3) change (2)-(1)	(4) female share in industry (2004-05)	(5) female share in industry (2017-18)	(6) change (5)-(4)
1	Agriculture, Hunting, Forestry & Fishing	58.48	44.12	-14.36	42.03	30.02	-12.01
2	Mining & Quarrying	0.57	0.41	-0.16	16.26	9.36	-6.90
3	Manufacturing	10.94	10.9	-0.04	30.89	20.96	-9.93
4	Electricity, Gas & Water supply	0.27	0.44	0.17	4.67	3.7	-0.97
5	Construction	5.57	11.67	6.10	10.68	10.03	-0.65
6	Services	24.17	32.46	8.29	19.08	20.03	0.95
	All				33.27	23.26	-10.01

Note: This table reports the industry share in total employment and women's share in each industry at the national level. Column (1) and Column (2) report the share (%) of industry groups in total employment in 2004-05 and 2017-18, respectively. Column (3) reports the change (in percentage points) in industry's share in total employment between 2004-05 and 2017-18. Column (4) and Column (5) report the share of women in each industry for 2004-05 and 2017-18 respectively. Column (6) reports the change in the share of women in each industry group between 2004-05 and 2017-18. The estimates are based on NSS EUS 2004-05 and PLFS 2017-18 using survey weights and UPSS criteria.

Table 4: Industry-wise employment share and growth rate, national level

	(1) 2004-05	(1) 2004-05 to 2011-12	(3) 2011-12 to 2017-18
	Initial share (%)	Growth in Emp relative to pop (%)	
Agriculture, Forestry & Fishing	58.48	-23.11	-18.97
Mining & Quarrying	0.57	-12.45	-31.10
Food, Beverages & Tobacco	2.23	-1.44	-25.40
Textiles, Textile Products, Leather & Footwear	3.18	-19.68	-12.31
Wood, Of Wood & Cork	1.14	-34.49	-29.53
Pulp, Paper, Paper Products & Printing	0.33	-13.44	3.29
Coke, Refined Petroleum & Nuclear Fuel	0.02	19.20	24.77
Chemicals & Chemical Products	0.43	-11.93	-4.75
Rubber & Plastics	0.16	33.16	-14.96
Other Non-Metallic Mineral	0.98	-0.86	-25.37
Basic Metals & Fabricated Metal Products	0.77	11.97	-4.78
Machinery, N.e.c.	0.28	25.85	37.31
Electrical & Optical Equipment	0.24	103.19	15.80
Transport Equipment	0.22	32.66	-0.42
Manufacturing N.e.c., Recycling	0.96	20.34	-27.07
Electricity Gas & Water supply	0.27	13.08	18.77
Construction	5.57	74.97	-1.13
Trade	8.98	-0.50	-3.60
Hotels & Restaurants	1.26	19.72	2.57
Transport & Storage	3.43	8.05	8.16
Post & telecommunications	0.41	-19.86	-7.95
Financial Intermediation	0.62	33.95	4.46
Business Services	0.83	72.36	53.79
Public Admin & Defence; Compulsory Security	1.80	-14.56	-13.19
Education	2.41	12.63	13.38
Health & Social Work	0.77	13.68	15.58
Other Services	3.67	11.26	-5.58

Note: Each cell in Column (1) reports the share of industry in total employment at the national level in 2004-05. Column (2) reports growth in the industry's employment per working-age population between 2004-05 and 2011-12. Each cell is estimated as $\frac{\frac{\text{industry emp}_{2011-12}}{\text{working-age population}_{2011-12}} - \frac{\text{industry emp}_{2004-05}}{\text{working-age population}_{2004-05}}}{\frac{\text{industry emp}_{2004-05}}{\text{working-age population}_{2004-05}}}$. The ratios are estimated using survey weights. Column (3) is similar to the Column (2) for the period 2011-12 to 2017-18.

Table 5: Summary statistics: Bartik estimation

	2004-05	2011-12	2017-18
	mean	mean	mean
Female LFPR	0.464	0.334	0.242
WPR (M + F)	0.654	0.561	0.473
Change Female LFPR	.	-0.130	-0.093
Change WPR (M + F)	.	-0.093	-0.088
Rural share	0.792	0.767	0.753
Married share	0.786	0.733	0.681
SC-ST share	0.336	0.337	0.346
Religious group (base: Hindu)			
Muslim share	0.102	0.110	0.100
Other religion share	0.124	0.119	0.118
Education level (base: Illiterate)			
Below Primary	0.097	0.096	0.055
Primary	0.114	0.117	0.118
Middle	0.127	0.148	0.192
Secondary or higher secondary	0.116	0.185	0.203
UG and above	0.037	0.057	0.082
Age-group (base: 15-25 years)			
26-35	0.246	0.244	0.229
36-45	0.192	0.200	0.198
46-55	0.118	0.125	0.136
56+	0.131	0.140	0.158
MPCE Deciles (2004-05) (base: MPCE Decile 1)			
MPCE decile2	0.115	0.080	0.066
MPCE decile3	0.108	0.085	0.049
MPCE decile4	0.106	0.094	0.092
MPCE decile5	0.103	0.089	0.068
MPCE decile6	0.101	0.104	0.089
MPCE decile7	0.102	0.115	0.119
MPCE decile8	0.091	0.119	0.102
MPCE decile9	0.080	0.124	0.168
MPCE decile10	0.057	0.101	0.165
Observations	574	574	574

Note: Each cell is an unweighted mean of the district-level variables. First, we create dummies for categorical variables (rural, caste, religion, education, age, MPCE decile) for each individual observation. Next, we calculate the weighted average for each variable at the district level using individual-level observation and survey weights. The table shows the unweighted mean of each district-level variable. The numbers are different from Table 2 because here we are using a complete sample (both rural and urban) compared to Table 2, where we use only the rural sample. Further, the numbers are district level means here compared to individual level in Table 2.

Table 6: Main results, OLS & IV estimates (female sample)

Dependent:Δ FLFPR	(1) OLS	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
Panel A								
Δ WPR	1.443***	1.346***	1.352***	1.366***	1.329***	1.427***	1.500***	1.454***
	(0.0521)	(0.220)	(0.245)	(0.228)	(0.234)	(0.232)	(0.197)	(0.193)
Controls								
Rural share	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Married share	Yes			Yes	Yes	Yes	Yes	Yes
SC/ST share	Yes				Yes	Yes	Yes	Yes
Religion share	Yes				Yes	Yes	Yes	Yes
Age group share	Yes					Yes	Yes	Yes
MPCE decile share	Yes						Yes	Yes
Education level share	Yes							Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,148	1,148	1,148	1,148	1,148	1,148	1,148	1148
Number of Districts	574	574	574	574	574	574	574	574
Panel B: First stage								
Bartik instrument		0.516***	0.472***	0.526***	0.510***	0.502***	0.362***	0.656***
		(0.129)	(0.132)	(0.134)	(0.134)	(0.140)	(0.126)	(0.147)
F-stat		16.12	12.76	15.33	14.42	12.81	19.09	19.89

Note: This table corresponds to the results from estimating Equation (3). The dependent variable is the change in female LFPR at the district level. Column (1) reports OLS estimate. Column(2) to Column(8) report IV estimates with varying control variables. Age group, MPCE decile, and Education levels include multiple control variables for each category, as reported in Table 5. Robust standard errors are clustered at the district level and are in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

Table 7: Main results, OLS & IV estimates (male sample)

Dependent: Δ **male** LFPR	(1) OLS	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
Δ WPR	0.387***	-0.060	-0.045	0.017	0.019	0.001	0.009	0.147
	(0.043)	(0.217)	(0.239)	(0.217)	(0.220)	(0.216)	(0.231)	(0.169)
Controls								
Rural share	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Married share	Yes			Yes	Yes	Yes	Yes	Yes
SC/ST share	Yes				Yes	Yes	Yes	Yes
Age group share	Yes					Yes	Yes	Yes
MPCE decile share	Yes						Yes	Yes
Education level share	Yes							Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,148	1,148	1,148	1,148	1,148	1,148	1,148	1148
Number of Districts	574	574	574	574	574	574	574	574
R-squared	0.627	0.013	0.039	0.196	0.216	0.244	0.345	0.458

Note: This table corresponds to the results from estimating Equation (3) for the male sample. The dependent variable is growth in male LFPR. Column (1) reports OLS estimate. Column(2) to Column(8) report IV estimates report with varying control variables. Age group, MPCE decile, and Education levels include multiple control variables for each category, as reported in Table 5. Robust standard errors are clustered at the district level and are in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

Table 8: Heterogeneous impact of labour demand on female LFPR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Sector		Age group			Education level			Caste groups	
VARIABLES	Rural	Urban	15-25 years	26-40 years	41-65 years	Below Primary	Primary to middle	Secondary & above	SC-ST	Others
Δ WPR	1.961***	0.594**	1.237***	2.090***	1.111***	1.642***	1.380***	0.594	2.198***	1.355***
	(0.393)	(0.296)	(0.328)	(0.354)	(0.360)	(0.348)	(0.403)	(0.366)	(0.623)	(0.424)
All controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,114	980	948	1,116	1,116	1,080	1,034	1,066	998	998
Districts	557	490	474	558	558	540	517	533	499	533
R-squared	0.711	0.267	0.491	0.634	0.551	0.672	0.456	0.277	0.204	0.396

Note: This table corresponds to the results from estimating Equation (3) for the different subgroups. The dependent variable is growth in female LFPR for different subgroups. The explanatory variable and instrument variables remain the same across specifications and are estimated for the whole sample. Control groups in all the variables, similar to the Specification (8) in Table 6, excluding the heterogeneity group itself mentioned in the column header. Robust standard errors are clustered at the district level and are in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

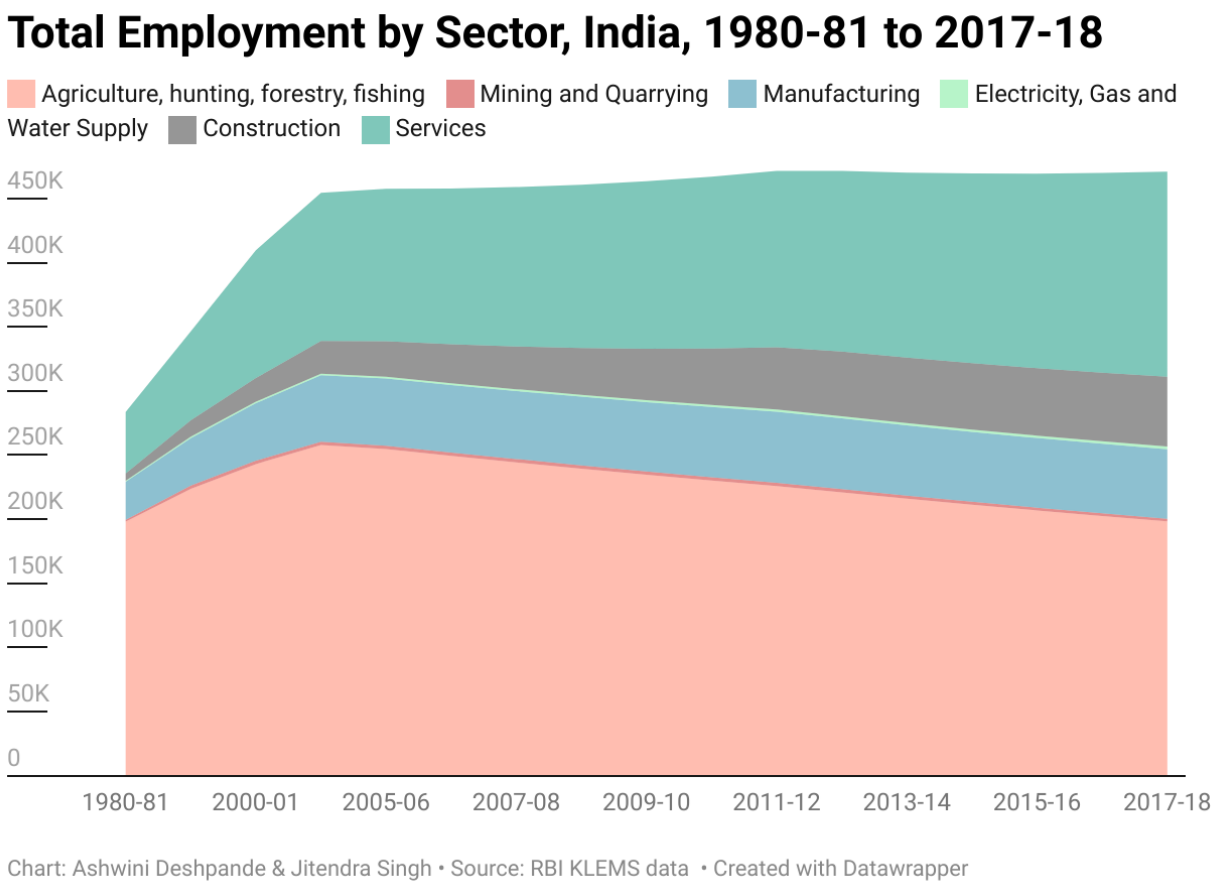
Table 9: Quantifying the effect of labour demand on female LFPR

	(1) 2004-05	(2) 2011-12	(3) 2017-18
(1) Female LFPR	0.427	0.312	0.233
(2) Δ Female LFPR (pp)		-0.115	-0.079
(3) Change in Demand (weighted Δ WPR)		-.087	-.088
(4) Δ Female LFPR explained by IV estimates (1.45 $\times$ R(3))		-.126	-.128
(5) % Proportion Explained (100 $\times$ (R4)/(R2))		109	162

Note: Row (1) is the mean FLFPR in the country in the respective survey years. Row(2) is a change in FLFPR between two consecutive rounds. Row (3) is a measure of change in labor demand estimated as the weighted average of the change in WPR across districts where weights are districts employment in 2004-05 for the explained component between 2004-05 and 2011-12, and districts employment in 2011-12 for the explained component between 2011-12 and 2017-18. Row (4) is estimated by multiplying Row(3) with the regression coefficient from the preferred specification (Column (8) of Table 6).

Appendix Figures

Figure A.1: Total employment by sector

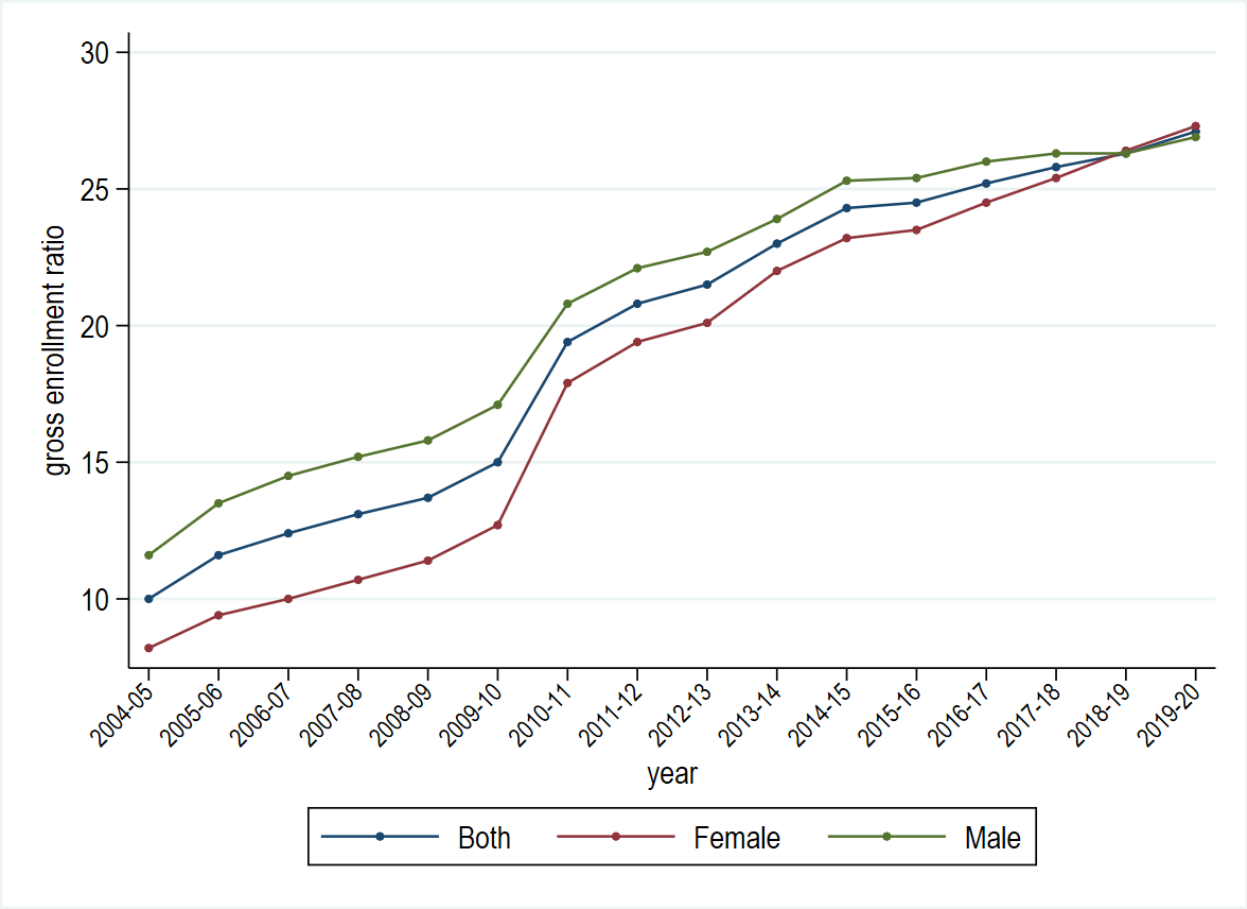


Note: This figure is based data on employment calculated by the Reserve Bank of India as a part of the KLEMS project. Details about the project and data are available at https://rbi.org.in/Scripts/KLEMS.aspx

Figure A.2: Distribution of workers by sex and sector, 1987-88 to 2019-20

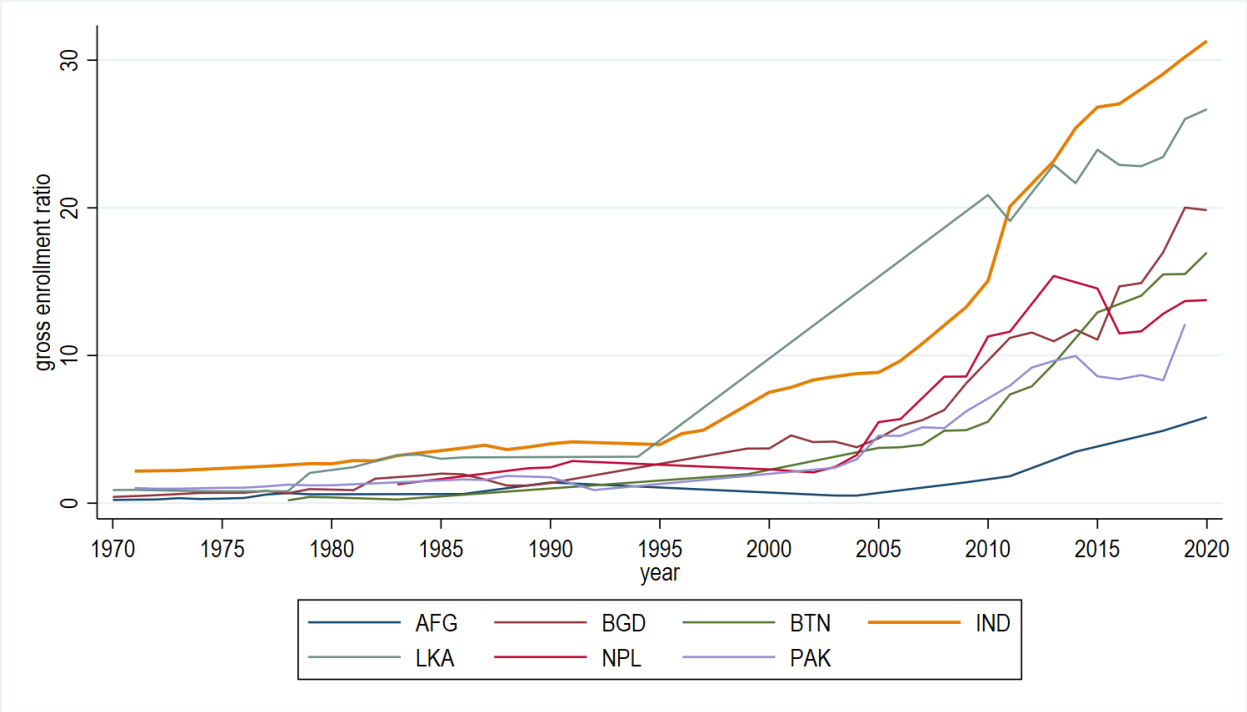
Source: various rounds of NSS EUS and PLFS

Figure A.3: Gross enrollment ratio (GER) in tertiary education in India



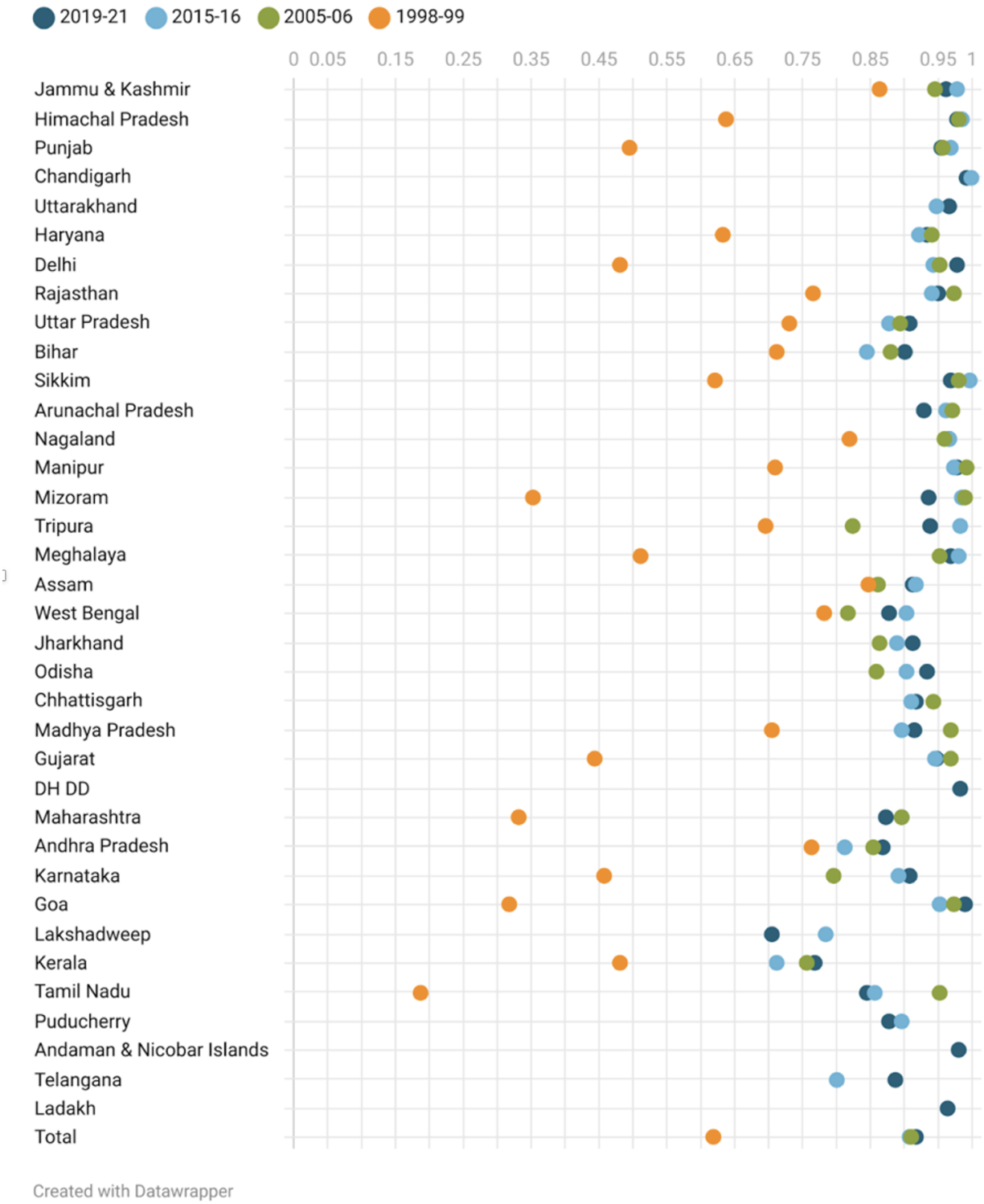
Source: All India Survey on Higher Education (AISHE)

Figure A.4: Female gross enrollment ratio (GER) in tertiary education, South Asia



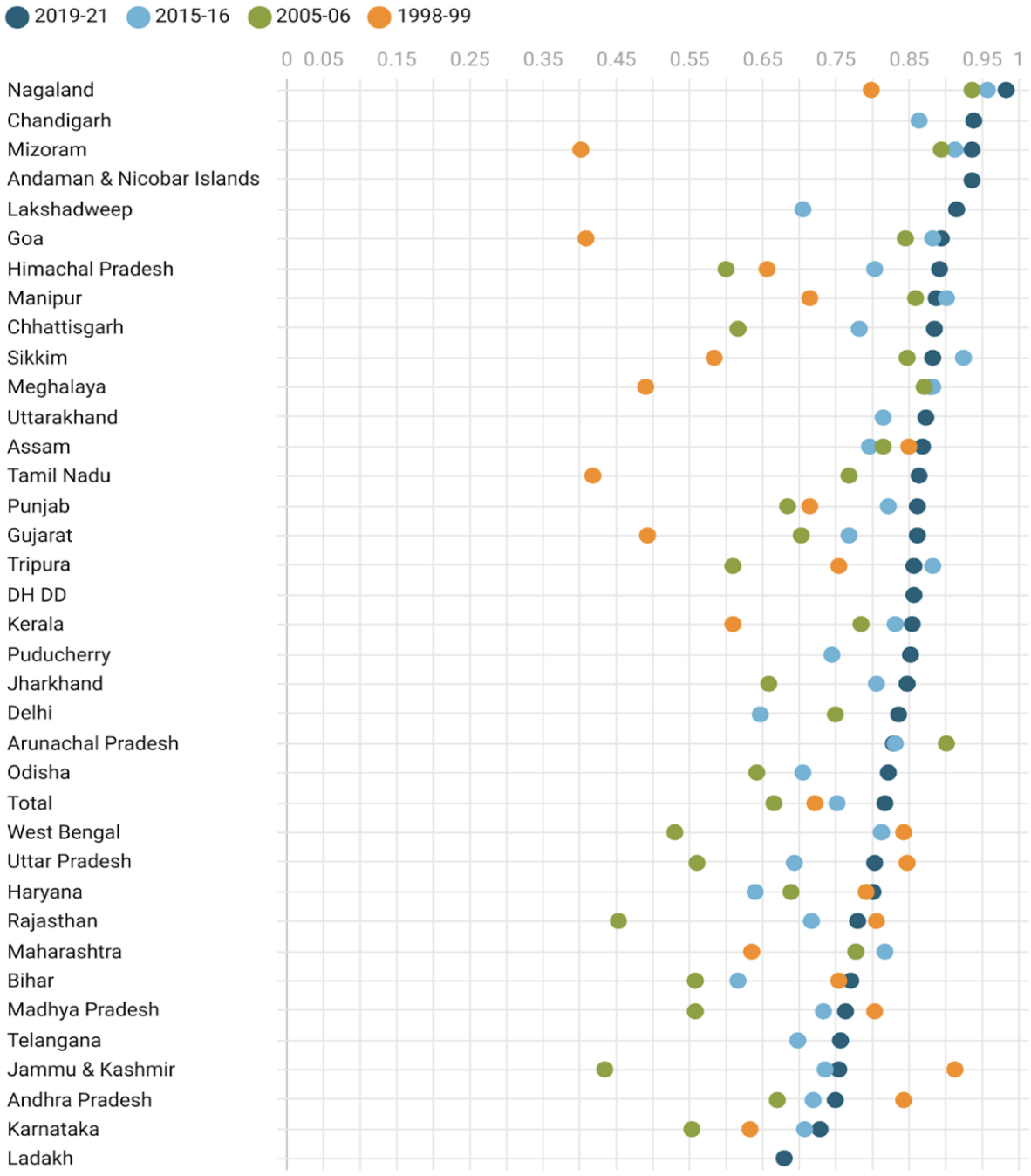
Source: UNESCO Institute for Statistics

Figure A.5: Ability to visit the market



Source: Authors' calculations from various rounds of NHFS. Question is asked to currently married women. if the respondent can usually go to the market, with or without permission, alone or only with someone else.

Figure A.6: Visiting family or friends



Source: Authors' calculations from various rounds of NHFS. Question is asked to currently married women. Constructed variable = 1 if the respondent alone or the respondent jointly with her husband decides regarding visits to relatives and friends

Appendix Tables

Table A.1: Reduced form regression results (Rural)

	(1)		(2)		(3)	
Dependent var: ILF	2004-05		2011-12		2017-18	
Own education level (base category: Illiterate)						
Below Primary	-0.075***	(0.007)	-0.054***	(0.011)	-0.015	(0.012)
Primary	-0.076***	(0.007)	-0.026*	(0.011)	-0.037***	(0.009)
Middle	-0.116***	(0.007)	-0.082***	(0.010)	-0.054***	(0.008)
Secondary or higher secondary	-0.138***	(0.008)	-0.109***	(0.011)	-0.047***	(0.009)
UG and above	0.049**	(0.016)	0.047*	(0.018)	0.123***	(0.014)
Highest education level of male member in HH (base category: Illiterate)						
Male:Below Primary	-0.048***	(0.007)	-0.035**	(0.011)	-0.009	(0.013)
Male:Primary	-0.034***	(0.007)	-0.031**	(0.010)	0.003	(0.010)
Male:Middle	-0.052***	(0.007)	-0.042***	(0.010)	-0.034***	(0.008)
Male:Secondary or higher secondary	-0.107***	(0.007)	-0.084***	(0.010)	-0.053***	(0.008)
Male:UG and above	-0.162***	(0.009)	-0.137***	(0.012)	-0.100***	(0.010)
MPCE deciles (base category: decile 1)						
MPCE decile2	0.001	(0.009)	-0.016	(0.016)	0.010	(0.015)
MPCE decile3	0.010	(0.009)	-0.011	(0.016)	-0.003	(0.014)
MPCE decile4	0.017	(0.009)	-0.028	(0.016)	0.012	(0.015)
MPCE decile5	0.001	(0.009)	0.006	(0.015)	-0.008	(0.012)
MPCE decile6	-0.021*	(0.009)	0.004	(0.015)	0.007	(0.013)
MPCE decile7	-0.014	(0.009)	0.048**	(0.015)	0.008	(0.012)
MPCE decile8	-0.017	(0.009)	0.034*	(0.015)	0.011	(0.012)
MPCE decile9	-0.014	(0.010)	0.055***	(0.015)	0.030*	(0.012)
MPCE decile10	-0.051***	(0.010)	0.040**	(0.015)	0.020	(0.011)
Age group (base category: below 25 years)						
25-29 years	0.114***	(0.008)	0.085***	(0.012)	0.120***	(0.010)
30-34 years	0.150***	(0.008)	0.141***	(0.012)	0.163***	(0.011)
35-39 years	0.186***	(0.008)	0.179***	(0.013)	0.189***	(0.011)
40-44 years	0.169***	(0.009)	0.172***	(0.014)	0.194***	(0.012)
45-49 years	0.151***	(0.009)	0.166***	(0.015)	0.193***	(0.012)
50-54 years	0.099***	(0.010)	0.116***	(0.016)	0.169***	(0.014)
55-65 years	-0.043***	(0.009)	0.003	(0.014)	0.043***	(0.011)
>65 years	-0.287***	(0.011)	-0.173***	(0.017)	-0.085***	(0.013)

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	(1) 2004-05		(2) 2011-12		(3) 2017-18	
Marital status (base category: never married)						
Currently married	0.064***	(0.008)	0.080***	(0.011)	0.044***	(0.009)
Divorced/Widowed	-0.033**	(0.012)	0.009	(0.017)	0.023	(0.014)
Caste group (base category: Upper caste)						
OBC	0.067***	(0.005)	0.040***	(0.007)	0.025***	(0.006)
ST	0.197***	(0.007)	0.202***	(0.011)	0.153***	(0.010)
SC	0.055***	(0.007)	0.060***	(0.009)	0.017*	(0.007)
Religion group (base category: Hindu)						
Muslim	-0.186***	(0.007)	-0.107***	(0.009)	-0.092***	(0.008)
Christian	0.023*	(0.012)	0.021	(0.015)	-0.022	(0.015)
Other	0.091***	(0.009)	0.035*	(0.015)	-0.013	(0.011)
Household structure						
log (HH size)	-0.062***	(0.005)	-0.029***	(0.008)	-0.040***	(0.007)
Male share in household	-0.213***	(0.017)	-0.246***	(0.025)	-0.183***	(0.020)
Children share	-0.064***	(0.016)	0.049	(0.026)	-0.044*	(0.022)
Land owned by HH (base category: below 0.1Ha)						
0.1–0.2 Ha	0.078***	(0.006)	0.071***	(0.009)		
0.2–0.4 Ha	0.110***	(0.007)	0.057***	(0.011)		
0.4–0.6 Ha	0.170***	(0.011)	0.046*	(0.018)		
$>$ 0.6 Ha	0.071***	(0.008)	0.029*	(0.013)		
Constant	0.610***	(0.016)	0.369***	(0.025)	0.272***	(0.021)
Observations	115640		87824		78794	

Note: This table reports the results from estimating reduced form Equation (1). Column (3) does not include the Land size variables as the information is unavailable in the PLFS 2017-18. Standard errors are clustered at the district level and are in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

Table A.2: Industry shares in total employment & and female share in each industry: Detailed

		(1)	(2)	(3)	(4)	(5)	(6)
Sl no	Industry name	share of industry in national employment (2004-05)	share of industry in national employment (2017-18)	change (2)-(1)	female share in industry (2004-05)	female share in industry (2017-18)	change (5)-(4)
1	Agriculture, Forestry and Fishing	58.48	44.12	-14.36	42.03	30.02	-12.01
2	Mining and Quarrying	0.57	0.41	-0.16	16.26	9.36	-6.90
3	Food and Beverages and Tobacco	2.23	1.98	-0.25	49.75	44.34	-5.41
4	Textiles, Textile Products and Leather and Footwear	3.18	2.71	-0.47	37.16	30.64	-6.52
5	Wood and Of Wood and Cork	1.14	0.64	-0.50	30.77	12.75	-18.02
6	Pulp, Paper & Paper Products & Printing and Publishing	0.33	0.36	0.03	14.64	12.40	-2.24
7	Coke, Refined Petroleum and Nuclear Fuel	0.02	0.04	0.02	14.16	7.48	-6.68
8	Chemicals and Chemical Products	0.43	0.44	0.01	38.95	12.11	-26.84
9	Rubber and Plastics	0.16	0.23	0.07	11.90	14.40	2.50
10	Other Non-Metallic Mineral	0.98	0.87	-0.11	26.64	15.13	-11.51
11	Basic Metals and Fabricated Metal Products	0.77	0.99	0.22	4.63	3.43	-1.20
12	Machinery, N.e.c.	0.28	0.59	0.31	4.57	5.64	1.07
13	Electrical and Optical Equipment	0.24	0.67	0.43	10.87	6.38	-4.49
14	Transport Equipment	0.22	0.36	0.14	3.24	5.67	2.43
15	Manufacturing N.e.c., Recycling	0.96	1.02	0.06	16.60	9.71	-6.89
16	Electricity Gas & Water supply	0.27	0.44	0.17	4.67	3.70	-0.97
17	Construction	5.57	11.67	6.10	10.68	10.03	-0.65
18	Trade	8.98	10.43	1.45	11.67	10.83	-0.84
19	Hotels and Restaurants	1.26	1.87	0.61	19.94	17.99	-1.95
20	Transport and Storage	3.43	4.85	1.42	1.59	1.20	-0.39
21	Post & telecom- munications	0.41	0.36	-0.05	13.70	13.11	-0.59
22	Financial Intermediation	0.62	1.05	0.43	14.38	18.35	3.97
23	Business Services	0.83	2.66	1.83	10.41	14.68	4.27
24	Public Admin & Defence; Compulsory Social Security	1.8	1.62	-0.18	12.14	14.57	2.43
25	Education	2.41	3.73	1.32	42.59	46.68	4.09
26	Health and Social Work	0.77	1.23	0.46	37.78	48.04	10.26
27	Other Services	3.67	4.66	0.99	40.66	38.18	-2.48
	All				33.27	23.26	-10.01

Note: This table reports the industry share in total employment and women's share in each industry at the national level for 27 KLEMS industry groups. Column (1) and Column (2) report the share (%) of industry groups in total employment in 2004-05 and 2017-18, respectively. Column (3) reports the change (in percentage points) in industry's share in total employment between 2004-05 and 2017-18. Column (4) and Column (5) report the share of women in each industry for 2004-05 and 2017-18 respectively. Column (6) reports the change in the share of women in each industry group between 2004-05 and 2017-18. The estimates are based on NSS EUS 2004-05 and PLFS 2017-18 using survey weights and UPSS criteria.

Table A.3: Correlation between Bartik instrument and covariates

	(1)	(2)	(3)	(4)	(5)
Dependent var: Bartik residual					
Rural share	0.0029***	0.0030**	0.0031**	-0.0085**	-0.0065
	(0.0011)	(0.0014)	(0.0014)	(0.0037)	(0.0045)
Married share		-0.0058***	-0.0056***	-0.0057***	-0.0057***
		(0.0020)	(0.0020)	(0.0020)	(0.0020)
SC-ST share		0.0024	0.0010	0.0014	0.0042
		(0.0025)	(0.0030)	(0.0032)	(0.0032)
Religion group (base category: Hindu)					
Muslim share		-0.0029	-0.0045	-0.0042	-0.0030
		(0.0027)	(0.0028)	(0.0030)	(0.0030)
Other religion share		-0.0007	-0.0002	0.0033	0.0009
		(0.0020)	(0.0023)	(0.0029)	(0.0032)
Age group (base category: below 25 years)					
26-35			-0.0068	0.0000	0.0078
			(0.0136)	(0.0136)	(0.0144)
36-45			-0.0197	-0.0233	-0.0200
			(0.0162)	(0.0157)	(0.0168)
46-55			0.0187	0.0201	0.0193
			(0.0171)	(0.0190)	(0.0199)
56+			-0.0251*	-0.0212	-0.0224
			(0.0135)	(0.0144)	(0.0146)
MPCE deciles (base category: decile 1)					
MPCE decile2				-0.0072	-0.0049
				(0.0162)	(0.0163)
MPCE decile3				-0.0672***	-0.0618***
				(0.0151)	(0.0149)
MPCE decile4				-0.0037	-0.0080
				(0.0132)	(0.0132)
MPCE decile5				-0.0261*	-0.0225
				(0.0139)	(0.0138)
MPCE decile6				0.0116	0.0120
				(0.0134)	(0.0132)
MPCE decile7				-0.0021	-0.0019
				(0.0140)	(0.0138)
MPCE decile8				-0.0130	-0.0071
				(0.0146)	(0.0147)
MPCE decile9				0.0130	0.0097
				(0.0115)	(0.0111)
MPCE decile10				-0.0446***	-0.0489***
				(0.0101)	(0.0107)
Own Education (base category: Illiterate)					
Below Primary					-0.0324**
					(0.0128)
Primary					-0.0100
					(0.0126)
Middle					0.0188*
					(0.0102)
Secondary or higher secondary					0.0187
					(0.0117)
UG and above					0.0057
					(0.0233)
Observations	1,148	1,148	1,148	1,148	1,148
R-squared	0.0009	0.0145	0.0192	0.0614	0.0745

Note: This table reports the correlation between the instrument and covariates at the district levels after controlling for district fixed effects and year fixed effects. Robust standard errors clustered at the district level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.4: Reduced form regression (female sample)

Dependent: ΔFLFPR	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bartik instrument	0.694***	0.638***	0.718***	0.678***	0.716***	0.956***	0.954***
	(0.211)	(0.217)	(0.224)	(0.223)	(0.226)	(0.239)	(0.241)
Controls							
Rural share		Yes	Yes	Yes	Yes	Yes	Yes
Married share			Yes	Yes	Yes	Yes	Yes
SC/ST share				Yes	Yes	Yes	Yes
Religion share				Yes	Yes	Yes	Yes
Age group share					Yes	Yes	Yes
MPCE decile share						Yes	Yes
Education level share							Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.041	0.048	0.056	0.071	0.087	0.135	0.184
Observations	1,148	1,148	1,148	1,148	1,148	1,148	1148
Number of districts	574	574	574	574	574	574	574

Note: This table corresponds to the results from reduced form estimates, i.e. regressing the change in female LFPR on the Bartik instrument. Column(1) to Column(7) reports estimates with varying control variables. Age group, MPCE decile, and Education levels include multiple control variables for each category, as reported in Table 5. Robust standard errors are clustered at the district level and are in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

Table A.5: Robustness check, employment measurement

Dependent: Δ Female LFPR	(1) OLS	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
Δ WPR	1.442***	1.511***	1.518***	1.520***	1.497***	1.588***	1.685***	1.584***
	(0.0694)	(0.203)	(0.217)	(0.212)	(0.221)	(0.233)	(0.223)	(0.211)
Controls								
Rural share	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Married share	Yes			Yes	Yes	Yes	Yes	Yes
SC/ST share	Yes				Yes	Yes	Yes	Yes
Religion share	Yes				Yes	Yes	Yes	Yes
Age group share	Yes					Yes	Yes	Yes
MPCE decile share	Yes						Yes	Yes
Education level share	Yes							Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,142	1,142	1,142	1,142	1,142	1,142	1,142	1,142
Number of Districts	571	571	571	571	571	571	571	571
F-statistics		25.63	22.02	23.32	20.67	16.91	21.86	23.44

Note: This table corresponds to the results from estimating Equation (3) with using UPS criteria to estimate LFPR. The dependent variable is growth in female LFPR at the district level. Column (1) reports OLS estimate. Column(2) to Column(8) report IV estimates with varying control variables. Age group, MPCE decile, and Education levels include multiple control variables for each category, as reported in Table 5. Robust standard errors are clustered at the district level and are in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

Table A.6: Robustness check, alternate dataset

Dependent: Δ FLFPR	(1) OLS	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
Δ WPR	1.173***	1.148***	1.192***	1.189***	1.158***	1.304***	1.331***	1.312***
	(0.0868)	(0.299)	(0.331)	(0.325)	(0.328)	(0.335)	(0.331)	(0.339)
Controls								
Rural share	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Married share	Yes			Yes	Yes	Yes	Yes	Yes
SC/ST share	Yes				Yes	Yes	Yes	Yes
Religion share	Yes				Yes	Yes	Yes	Yes
Age group share	Yes					Yes	Yes	Yes
MPCE decile share	Yes						Yes	Yes
Education level share	Yes							Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144
Number of Districts	572	572	572	572	572	572	572	
F-stat		26.80	22.15	22.34	20.65	18.93	20.78	21.04

Note: This table corresponds to the results from estimating Equation (3). We use the NSS Social Consumption - Health Survey 2017-18 in place of PLFS 2017-18. The dependent variable is growth in female LFPR at the district level. Column (1) reports OLS estimate. Column(2) to Column(8) report IV estimates with varying control variables. Age group, MPCE decile, and Education levels include multiple control variables for each category, as reported in Table 5 Robust standard errors are clustered at the district level and are in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

Table A.7: Robustness check, removing each state one by one from the estimates

Dependent var: Δ FLFPR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Δ WPR	1.453***	1.440***	1.458***	1.455***	1.464***	1.539***	1.462***	1.271***	1.483***	1.439***	1.454***	1.453***
	(0.195)	(0.195)	(0.188)	(0.193)	(0.194)	(0.184)	(0.205)	(0.196)	(0.175)	(0.205)	(0.193)	(0.194)
Observations	1,130	1,124	1,114	1,146	1,122	1,110	1,146	1,084	1,008	1,078	1,140	1,122
Number of districts	565	562	557	573	561	555	573	542	504	539	570	561
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Δ WPR	1.458***	1.452***	1.455***	1.424***	1.461***	1.465***	1.475***	1.500***	1.428***	1.522***	1.368***	1.419***
	(0.193)	(0.192)	(0.192)	(0.197)	(0.194)	(0.204)	(0.230)	(0.194)	(0.189)	(0.190)	(0.197)	(0.202)
Observations	1,132	1,130	1,132	1,140	1,134	1,102	1,112	1,112	1,088	1,116	1,058	1,100
Number of districts	566	565	566	570	567	551	556	556	544	558	529	550
	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
Δ WPR	1.454***	1.454***	1.468***	1.476***	1.454***	1.455***	1.454***	1.553***	1.387***	1.460***	1.453***	1.467***
	(0.193)	(0.193)	(0.227)	(0.184)	(0.226)	(0.193)	(0.193)	(0.208)	(0.195)	(0.195)	(0.193)	(0.190)
Observations	1,144	1,146	1,080	1,122	1,094	1,144	1,146	1,120	1,088	1,142	1,146	1,128
Number of districts	572	573	540	561	547	572	573	560	544	571	573	564
All controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table corresponds to the results from estimating Equation (3) using IV. The 36 different coefficients in the table are estimated by removing each of the 36 state/union territories one by one from the regression. Robust standard errors are clustered at the district level and are in parentheses. *** p<0.01, ** p<0.05, *p<0.1.