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Economic Growth and Female Labour Force Participation in India

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Abstract

India has experienced rapid economic growth, structural shifts in the economy, increase in educational attainment levels, and rapid urbanization in the last twenty five years. In the same period there has been a 23% decline in the female labour force participation rate. What's the relationship between economic growth and women's economic activity? Is growth enough or does the nature of growth matter in attracting more women to the labour force? This paper explores these questions using state-level employment data spanning the last twenty five years, 1983-84 to 2009-10. Several cross-country and within-country studies suggest female labour force participation tends to decline initially with economic development, plateaus at a certain stage of development before rising again. This is argued to be mainly a result of structural shifts in the economy, changing influence of income and substitution effects, and an increase in education levels of women in the population. Using dynamic panel models, this paper does not find a significant relationship between level of economic development and women's participation rates in the labour force. Our results also suggest that growth by itself is not sufficient to increase women's economic activity, but the dynamics of growth matter. These findings are especially important to help design policies to improve women's labour force participation rate so that India can take complete advantage of its upcoming demographic dividend.

Key Words: female labour force participation rate, economic growth, structural change, U shaped relationship, India

1. Introduction

The persistent decline in female labour force participation rate (LFPR) in India in the face of consistent economic growth is a puzzling phenomenon. While this declining trend has been discernible for a while, it was brought sharply into focus with the results of the latest Employment and Unemployment Survey which showed that in the period 2004-05 to 2009-10 women's labour force participation declined from 33.3 per cent to 26.5 per cent in rural areas and from 17.8 per cent to 14.6 per cent in urban areas (NSSO 2011). According to the International Labour Organization's Global Employment Trends 2013 report, India is placed at 120th of 131 countries in women's labour force participation.

The decline in women's economic activity is cause for concern to those who are interested in women's well being as well as those who believe that women are valuable resources and must be utilised efficiently. Women's employment is a critical factor in their progression towards economic independence and is also considered as an indicator of their overall status in society (Mammen and Paxson 2008). The gender gap in employment has macroeconomic implications as well. Based on data from 2000-2004, the United Nations Economic and Social Commission for Asia and Pacific (ESCAP) estimates that if India's female labour force participation reached parity with that of United States (86%), its gross domestic product (GDP) would increase by 4.2 per cent a year and growth rate by 1.08 per cent representing an annual gain of $19 billion. A 10 per cent permanent increase in female labour force participation would lead to increase in growth rates by 0.3 per cent (UNESCAP 2007). Surprisingly, there is rather limited and mixed evidence on the impact of economic growth on women's employment.

This paper contributes to the literature by exploring the relationship between economic development and women's economic activity in India, a country with huge variation in economic, social and cultural factors across its states. The juxtaposition of relatively high economic growth over the last three decades coupled with a conservative and patriarchal society makes it a particularly interesting case study. Prima facie, economic growth does not seem to have improved women's status. The sex ratio, considered a proxy for how society values its women, has declined from 927 to 914 between 2001 and 2011 (Registrar General of India 2011). Investment in women's health has also been low with maternal mortality showing only a marginal improvement while anaemia has increased by 6 percentage points during the first half of the 2000s (Registrar General of India 2012). A Bill that seeks to provide one-third representation to women in Parliament has faced opposition from several political parties since it was first drafted in 1996.

Structural change in India has followed a different trajectory compared to most developing and developed countries. The common pattern is that agriculture sector declines initially and manufacturing sector's share of the economy grows; and in second stage, services sector experiences growth. India has witnessed a rapid decline in the size of value added by the agricultural sector to the economy, but without the corresponding growth in manufacturing. The slack has been picked up by the services sector which has enjoyed high growth rates over the last twenty years. Furthermore, India's employment growth has not kept up with economic growth (Himanshu 2011; Mehrotra et al. 2012; Alessandrini 2009). Only 2.6 million jobs were generated during 2004-05 to 2009-10, in contrast to the 60 million jobs that were added during 1999-00 to 2004-05 (Mehrotra et al. 2012). The situation is further worsened due to growing casualization and informalization of the work force. Although the study does not specifically explore the gender dimensions of this process, it can be safely assumed that women will be at least as equally affected by men, if not more, by the lack of employment creation.

This paper uses state-level panel data from 1983-2010 to explore the relationship between economic growth and women's labour force participation. The analysis is conducted using two approaches. First, we examine the relationship between the level of net domestic product of states and women's economic activity in the states, specifically testing for the U shaped relationship. The U shaped hypothesis postulates that with female labour force participation will initially decline with increasing economic growth, but will eventually increase as the economy develops and undergoes a structural transformation. We use dynamic panel methods in estimating this relationship to control for endogeneity of economic development and education while also accounting for time and region fixed effects. Second, we disaggregate economic growth to explore if the composition of growth has a role in explaining women's economic activity. If the U-shaped hypothesis is confirmed, then the decline in employment is temporary and simply reflects the development process which would correct itself in due course. But if the hypothesis is not supported, then other underlying causes of the decline need to be explored and policies designed to deal with them. The knowledge about the nature of growth (sectors) which promotes women's economic activity will help policy makers to both target growth in particular sectors and identify roadblocks for women in other sectors. To the best of our knowledge, such a comprehensive exercise to test the relationship between economic growth and women's labour force participation has not been undertaken for India.

Our results suggest there is no significant relationship between level of economic development of the states and women's labour force participation rates. Contrary to a U-shaped relationship, initial results are suggestive of an inverted U relationship between labour force participation and economic growth. This relationship however, loses its significance once we control for region and time fixed effects. The composition of growth plays a role in attracting more women to the labour force. Growth in agricultural employment and in manufacturing value shares has a positive effect on women's economic activity.

The remainder of the paper is organised as follows. Section 2 briefly discusses the relationship between growth and female labour force participation while section 3 reviews key reasons that may help explain the declining participation rate in India. Section 4 describes the data and presents descriptive statistics focusing on regional patterns. The empirical strategy and estimation results are presented in sections 5 (growth and economic activity) and 6 (structural change analysis). Section 7 concludes.

2. Literature Review

While the impact of gender inequality in education on economic growth has been studied extensively, there are few studies that explore the relationship between women's labour force participation and economic growth. Moreover, the results from these studies do not always present a uniform picture which is partly attributed to data constraints and econometric issues surrounding reverse causality, wherein growth and women's economic activity do not share a one-way relationship. Considering the impact of labour market inequality on growth, a recent study by Klasen and Lamanna (2009) used two measures of labour force participation – female share of total labour force and the ratio of female to male economic activity rates for 93 countries, covering 1960 to 2000. The study results broadly suggest a negative impact of gender discrimination in the labour market on growth with the actual findings sensitive to the sub sample of countries, time period of the study, and the inclusion of a gender gap in education as a control variable. Baliamoune-lutz (2007) results reinforce the need to carefully consider the impact of the country or regional context while interpreting the results. They investigate this relationship for Sub-Saharan African (SSA) and Arab countries and find that female share of labour force to be negatively associated with economic growth. This is largely an outcome of historic economic activity rates by women (low in Arab countries and high in SSA though in low productive sectors) and the structure of the regional economies. The only study in the Indian context was undertaken by Esteve-Volart (2009). Using panel data from sixteen Indian states over 1961-1991, she finds that gender discrimination in the labour market, as measured by female to male ratio in managerial roles and non-agricultural workers has a substantial negative impact on per capita income. The study also controls for endogeneity in gender gaps in employment at the state level.

This paper is interested in examining the impact of growth on female labour force participation. Economic development and women’s economic activity have shown a U-shaped relationship in several studies (Goldin 1994; Tansel 2002; Fatima and Sultana 2009; Kottis 1990). Female labour force participation has been hypothesized to decline initially with economic development, then plateau before rising again giving it the U shape. This is argued as being reflective of the structural shifts in the economy, changing influence of income and substitution effects, and an increase in education levels of women in the population (Goldin 1994). In a low-income, agriculture dominated economy women are active participants in the labour force through their roles as contributing family workers on family farms or enterprises. There is no monetary remuneration for this work, but is recognized as being part of the labour force. This phase of economic development also coincides with relatively high fertility rates and low educational levels for women. Economic growth is usually accompanied by a changing sector composition; there is a greater focus on industrialization while agriculture starts losing its primacy which has the effect of lowering women’s participation in the labour market. Agriculture related activities are easier to combine with other household duties that women are responsible for. Further, the jobs available during the early stages of industrialisation are not attractive to women largely because of the social norms against their participation in blue-collar activities. Household incomes increase with economic growth and women tend to drop out of the labour force as they are not needed to contribute monetarily to the household. As the economy grows, several changes take place that once again encourage women's labour force participation. Their educational levels improve leading to more and improved employment opportunities, fertility rate drops reducing the burden of child-rearing on women and new socially acceptable service sector jobs open up for women. With increasing wage levels, the substitution effect dominates the income effect.

Over a period of time, several studies have affirmed the existence of the U shaped phenomena in empirical work. The first generation articles used cross sectional data across countries to test this relationship (Goldin 1994; Mammen and Paxson 2008). Tansel (2002) studied this relationship within provinces in Turkey across three time periods whose results support the U shaped hypothesis. Using cross sectional data to support this hypothesis can lead to the 'Kuznets fallacy'[1] wherein the relationship is an artefact of the data and is not validated using time series data (Tam 2011). This concern was addressed by the use of panel methods in two separate studies which once again found evidence supporting the U shaped pattern of women's LFPR within a country (Tam 2011; Luci 2009).

In a recent comprehensive review of the literature, Gaddis and Klasen (2012) note several shortcomings with the panel data applications as well as the empirical specifications used to test this relationship. They argue that rather than aggregate GDP, sector specific shifts in GDP should be investigated for its impact on women's labour supply. Another concern is that the panel studies do not account for the potential endogeneity of GDP with female labour force participation. They estimate the relationship between female labour force and economic development using the 4th, 5th and 6th edition of the International Labour Organisation's Estimates and Projections of the Economically Active Population. They find that evidence of a U shaped relationship is feeble and is very sensitive to underlying data, especially the GDP estimates. Using a dynamic GMM estimator, the U-shaped relationship vanishes in several cases. They also unpack the components of structural change to consider the impact of sectoral growth on women's economic activity.

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[1] This refers to Kuznets' famous inverted U relationship between inequality and economic growth. This was initially based on country level cross-sectional data that did not hold up with panel estimation methods (Bruno, Ravallion, and Squire 1998).

Overall, there is no clear relationship between economic growth and an enlargement of the economic opportunities space for women. This relationship is mediated by both the cultural context and the actual process of growth. This complex interplay is reinforced by Kabeer and Natali (2013) who survey this literature and find that the impact of growth also varies across different constructs of gender inequality.

3. The Indian Context

Women's participation in the labour market is influenced by social norms governing gender roles and responsibilities as much as it is by economic and structural factors. This section reviews the factors that explain this decline in the Indian context. Most studies discussed here are based on individual data from various NSS survey rounds and focus mainly on the role of education, income, employment opportunities or cultural factors as drivers of women's labour market participation. What emerges is that the causal mechanisms that affect women's economic activity are not really well understood and there are no simple explanations that are applicable across contexts. The factors impacting women's employment also interact among themselves making it tricky to disentangle their effect. The impact of education, for example, will depend on both economic opportunities available and cultural perceptions that govern women's work norms. This to a certain extent will also be mediated by the economic status of households.

In traditional societies where the man is accorded the role of providing for the family, women's relative absence in the labour market could well reflect both their and the household's preferences, which often has class connotations. A working woman could signal economic hardship issues for the household and thus, with improving household income, there is a tendency for women to move out of the labour market. This would particularly play out when men's economic opportunities are expanding and there is a rise in their wage rates thus making it feasible for women to concentrate her energies in the reproductive sphere (Rangarajan & Kaul, 2011). Analysing 1999-2000 NSS data using logistical regression models, Olsen and Mehta (2006) find a U curve for employment by female educational status with illiterate and poorly educated women as well as those with university degrees more likely to work than middle educated women. The authors suggest these results are driven by increasing household incomes and cultural norms, resulting in a 'housewifesation' process for certain groups of women. Poor women face the double burden of domestic work as well as outside employment, which makes a compelling case for them to be willing to opt out of employment with increasing household income. Highly educated women (also a proxy for class), on the other hand can afford to employ domestic help and thus, are able to participate in the labour market. It can also be argued that there is interplay of economics and cultural factors; as their wages increase and social norms become less restrictive, women are more likely to engage in outside economic activity. A simple bivariate analysis for the 2009-10 NSS data by Kannan & Raveendran (2012) does not support the income effect hypothesis. Their study finds that majority of the reduction in labour force are from rural areas and are largely from poorer households. However, one cannot draw any definitive conclusions since this study does not control for the impact of other factors on women's employment. Further, it is also possible that the income effect might be operating through increased household income for poorer households even though their relative status has not changed.

The declining labour force participation rates among women with rising household economic status is also consistent with women's labour supply acting as a insurance mechanism for households. Attanasio et al. (2005) present a conceptual framework where heightened uncertainty over future earnings increases women's labour force participation, particularly when the household does not have savings or access to credit. Female labour force participation in rural areas also tends to increase during periods of distress (droughts or decline in growth rates of agricultural output, depressed wages and so on), and recede again when the economy improves (Himanshu 2011; Bhalotra and Umaña-Aponte 2012). In fact, the spurt in employment growth during 1999-00 to 2004-05 can be partially attributed to the crisis in the agricultural sector which forced the normally non-working population (women, elderly and children) to enter the labour market to supplement household income (Abraham 2009). This explanation however, cannot account for the long term decline in women's labour force participation from 1983-84 to 2009-10.

A positive factor that could account for the decline is greater access to education as reflected by the increase in enrolment numbers. However, for this explanation to be valid, one should expect only younger age groups (15 to 23 years) to show lower participation rates. But the decline between 2004-05 and 2009-10 is consistent across all age groups among women, suggesting that education can explain only part of the decline (Chowdhury 2011). This study speculates that declining employment opportunities for women could perhaps explain why women are exiting the labour force. But this contention is not upheld by (Neff, Sen, and Kling 2012) who conduct a bivariate analysis for rural women over the same time period. They consider net state domestic product (NSDP) as a proxy for employment opportunities and find that while all states have witnessed rapid economic growth during 2004-05 to 2009-10, most of them have experienced decline in female labour force participation. They interpret this as a lack of evidence of decreasing employment opportunities leading to declining labour force participation for women. The use of NSDP as a proxy for employment is arguable, given India's poor employment generation inspite of strong economic growth.

An important factor that could impact women's labour force participation is the National Rural Employment Guarantee Act (NREGA) enacted in 2005. It guarantees 100 days of employment per household annually and has provisions to ensure that men and women are paid equally along with child care facilities on work sites. Due to this it has been found to have a positive impact on women's economic activity (Azam 2012). Using difference-in-difference framework, the author finds that NREGA has a positive impact on female labour force participation rate wherein the NREGA districts experienced a smaller decline in female labour force participation between 2004-05 and 2007-08 than non NREGA districts in the country.

4. Regional Variations in Employment and Economic Growth

Data on women's economic activity is drawn from six National Sample Survey Organization's (NSSO) Employment and Unemployment thick rounds conducted between 1983-84 and 2009-10. We proxy women's economic activity by the labour force participation rate for women aged 25-59 years in 28 states of India[2]. All analyses in this paper are based on usual principal and subsidiary status (UPSS) activities[3]. The sample is restricted to women in the 25-59 age groups, to isolate the trend in employment from an increase in education among the younger cohorts. The

[2] Data for states created in 2000 (Jharkhand, Chhattisgarh and Uttarakhand) were merged with the original states to maintain comparability over time periods

[3] Usual status is based on reference period of one year, in which principal activity is the activity in which respondent spends majority of the time. Subsidiary status is determined based on economic activity pursued for a shorter time throughout the reference period of 365 days preceding the survey or for a minor period, which is not less than 30 days, during the reference period (NSSO 2011). The 30 day restriction for an activity to be considered subsidiary was not imposed before 2004-05 survey, so the subsidiary activity status across all surveys are not strictly comparable (Klasen and Pieters 2012). Since subsidiary activity impacts status of a small minority of adult women it should not impact our results substantially.

data on NSDP per capita[4] and sector wise shares is obtained from Central Statistical Organization (CSO 2011).

Table 1 presents change in labour force participation rate among women aged 25-59 years over 1983-84 to 2009-10 for India and disaggregated at the regional level. It also shows the employment rate for the latest NSSO round (2009-10) and changes in the previous 5 years. National trends show that labour force participation has declined over the long term as well as the shorter time horizon. This is true for both unpaid and paid work participation rates. In the period between 1983-84 and 2009-10, unpaid work participation rate declined by 22.8 per cent and paid work participation rate declined by 24.3 per cent.

There is huge variation in the levels and trend of female labour force participation within regions[5] in India. In 2009-10, eastern states showed the lowest overall participation rate of 22.6 per cent, while the southern states were more than double at 51 per cent. Compared to the rest of the country, women in southern states enjoy a higher status with fewer restrictions on mobility which could have implications for women’s ability to engage in productive work. Interestingly, the eastern states also experienced the steepest decline over the short and longer term (36.7% and 42.5%, respectively) while the southern states have shown the least decline (16% and 15.3%, respectively). Over the 25 year period of 1983-84 to 2009-10, paid and unpaid work participation rate has declined across all regions except for the north-eastern states. These states have experienced an increase in the overall labour force participation rate for women, fuelled by an increase of 120.3 per cent increase in the unpaid work participation rate.

The distribution of women in the work force among the various sectors of the economy reveals some interesting trends (Table 2). A majority of women are employed in the agricultural sector (68.4%), followed by the service sector (15.8%). The eastern states, which are among the poorest states, show surprising patterns in involvement of women among the various sectors. At 59.4 per

[4] NSDP per capita is converted into constant prices with 2004-05 as the base year to maintain comparability across the various years.
[5] The country is divided into six geographical regions for the analysis. The states are classified as follows: North – Jammu & Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi and Chandigarh; Centre – Uttar Pradesh, Rajasthan and Madhya Pradesh; East - Bihar, Orissa and West Bengal; West - Gujarat, Maharashtra and Goa; South – Andhra Pradesh, Karnataka, Tamil Nadu, Puducherry and Kerala; North-East – Sikkim, Assam, Arunachal Pradesh, Nagaland, Mizoram, Manipur and Tripura. Data for states created in 2000 (Jharkhand, Chhattisgarh and Uttarakhand) were merged with the original states to maintain comparability over time periods.

cent, women here are less likely to be employed in agriculture than any of the other regions, but almost twice as likely to be involved in manufacturing (18.7%) as compared to the national average (9.8%). Manufacturing of tobacco products and products out of wood (other than furniture) are among the major activities for women in these states. Women in north-east are more likely to be employed in construction than in manufacturing. In western states, women are least likely to be in the construction sector as compared to any of the other regions.

In the last twenty five years there has been a substantial change in the sectors in which women work. With the decline in agriculture at the national level, the proportion of women involved in it has reduced by 15 per cent; while the proportion of women in all other sectors has increased. The construction sector has witnessed almost a five times increase in the proportion of women in the work force involved in it. This is not surprising, given the rapid growth and the need of manual labour in this sector. NREGA may have also contributed to the increase in women's employment in construction sector. Similarly, services and manufacturing have seen an increase of 60 per cent and 23 per cent, respectively in the proportion of women involved in them. The pattern is similar across regions with a few exceptions. Both, central and north-eastern states have seen a decline in involvement of women in manufacturing.

The patterns of involvement of men in the various sectors are similar to women, but the extent differs substantially (Table 3). Overall, men are less likely to be in agriculture as compared to women (44.7% *vs.* 67.9%, respectively), but almost twice as likely to be in construction, services and mining. These differences are sharp in the northern states. Only 26.5 per cent of men in the work force are in agriculture, while 70.1 per cent of women in the work force are in agricultural and allied sectors (Table 2), many of whom are involved in livestock rearing. Proportion of men in construction in the northern states is almost seven times that of proportion of women (14.1% vs. 2.4%, respectively). Over the period of 1983-84 to 2009-10, proportion of men in agriculture and manufacturing has declined. Men have exited the agricultural sector at a faster rate than women (23% *vs.* 15%, respectively). In northern states this pullback is the sharpest (45%) with perhaps a concomitant increase in the share of manufacturing to the workforce (32%).

The status of employment is an important aspect to consider as it provides insight about the quality of employment experienced by the worker. In 2009-10, nationally across agricultural and non-agricultural sectors, more than one-third of women are casual labourers while another third are unpaid workers, essentially working on family farms or enterprises (Table 4). Casual labour is typically associated with low pay, no benefits and insecure working conditions. It is not the preferred form of employment and is detrimental to women's welfare that casualization has almost doubled in the non-agricultural sector. Contributing family workers is the dominant category in central and north-eastern states; and casual labour is dominant in the other regions. In the northern states, proportion of women self-employed in agriculture is more than thrice that of national average. Wage employment is low overall, and highest in north-eastern states and lowest in the central states. Over the period of 1983-84 to 2009-10, it is seen that casual employment in the non-agricultural sector has almost doubled. Wage, self-employment in non-agriculture sectors and contributing workers in non-agriculture sectors have also seen an increase over these years.

Contrasting with men shows some interesting differences. At the aggregate level, men are less likely to be contributing family workers or casual labourers, but more likely to be self-employed or wage employees (Table 5). The trends are similar across regions except the northern region. Self-employment in agriculture is more among women in northern states than among men. This is likely reflecting the fact that more than 40 per cent of women are involved in livestock rearing and large proportions report themselves as self-employed, while men are not involved in livestock rearing. Wage employment among men has declined by 6 per cent; while casual work in non-agricultural sector has more than doubled reflecting perhaps high levels of construction activity.

Table 6 shows the net per capita domestic product and annual growth rates by regions in India. Western states in India have the highest per capita net domestic product followed by northern[6] and southern regions in 2009-10 at 2004-05 constant prices. Eastern states have the lowest per capita net domestic product. The annual growth rate in the per capita net domestic product has accelerated in the 2004-05 to 2009-10 period. Between the years 1983-84 and 2009-10, growth was highest in the southern region (9.8%) and lowest among the North Eastern states (3.3%). Eastern states had a growth rate of 6.3 per cent, which was better than Central and North Eastern

[6] The high domestic product in northern states is mainly due to Delhi and Chandigarh.

States, even though they experienced the highest decline in female labour force participation rate (Table 1).

The U-shaped hypothesis is based on the assumption that the share of agricultural sector declines as the economy grows and share of manufacturing sector increases initially followed by an increase in the share of services sector. India experienced a decline in the share of value added by the agricultural sector but no significant increase in the share of the manufacturing sector with growth being fuelled by the services sector (Table 7). Agricultural sector which constituted 13.7 per cent of the economy by value in 2009-10 saw its contribution to the economy slide by 63 per cent while manufacturing witnessed a decline of 11 per cent in its share between 1983-84 and 2009-10. The share of the services sector though, increased by 56 per cent during the same time frame. The pattern of sectoral growth has been similar across the different regions with only a few exceptions. This unconventional growth across sectors has had an impact on the inter-sectoral movement of workers. Over the 25 year reference period, agriculture's contribution to women's employment declined by only 15 per cent (Table 2) as compared to the decline in the share of value added by agriculture of 63 per cent (Table 7). As of 2009-10, approximately 68 per cent of women workers participate in agriculture even though it contributes only 13.7 per cent to the economy. Only 15.8 of women are employed by the service sector which at 56 is the largest contributor to GDP.

5. Economic Growth and Women's Economic Activity

Figure 1 plots the female labour force participation rate for all Indian states against the log of NSDP, 1983-84 to 2009-10. Instead of the hypothesized U-shaped relationship, we find an inverted-U-shaped relationship between women's employment and economic growth. The negative correlation of 0.17 between these variables is statistically significant. The inverted U result holds even when the data is examined by type of employment (paid/unpaid), area (rural/urban) and by individual survey time periods (data not presented here).

Examining the data at the regional level (Figure 2) shows mixed results indicating the importance of contextual factors in determining this relationship. States in central India indicate existence of a slight U-shaped relationship, while states in eastern and western regions indicate existence of an inverted-U-shaped relationship between NSDP and women's economic activity.

North-Eastern states have experienced an increase in women's economic activity with increase in NSDP, while states in northern and southern India have experienced a decline in women's economic activity with increase in NSDP.

We regress female labour force participation rate for the age group 25-59 years at the state level on the log of NSDP per capita at constant 2004-05 prices using the base-line model given below:

$$FLFPR_{it} = \alpha + \beta_1\, LN\mathrm{NSDP}_{it} + \beta_2 LN\mathrm{NSDP}^2 + \beta_3\, \mathrm{Ed}_{it} + \mu_{it} \qquad [1]$$

where *i* denotes state, and *t* denotes time and Ed is the percentage of women 25-59 years of age who have completed secondary school. Education is one of the key pathways through which the U is traced; increase in educational level among women equips them to be eligible for service sector jobs which the economy generates. We include this variable to investigate its impact separately in the Indian context, which has seen a significant increase in educational levels of young girls[7]. If the U hypothesis holds, labour force participation will decrease initially with increase in per-capita net state domestic product ($\beta_1 < 0$) and start increasing after attaining a certain level of development ($\beta_2 > 0$). It is more appropriate though to use a fixed-effect estimator allowing for region and time-specific fixed effects (Eq. 2) which bases identification over-time variation in the states while allowing for time trends.

$$FLFPR_{it} = \alpha + \beta_1\, LN\mathrm{NSDP}_{it} + \beta_2 LN\mathrm{NSDP}^2 + \beta_3\, \mathrm{Ed}_{it} + \Omega_i + \delta_t + \mu_{it} \qquad [2]$$

where Ω_i are region dummies[8] and δ_t are time dummies.

The region fixed effects capture the impact of cultural, social and other unobservables on women's economic activity. For example, impact of fertility rates, women's overall status, and extent of patriarchy on women's labour force participation would be captured by the region variables. These factors vary substantially across the regions and might have significant impact on women's economic activity. Fertility rates are high in central and eastern states than other

[7] Fertility, similar to education, is also important to tracing the U shape. We, however, do not include it separately in the regression due to small sample size. Its impacts would be captured by the regional level dummy variables.

[8] Taking into consideration the small sample size, we chose to use dummy variables at the region level instead of the state level. Regions are defined based on geography and states within each region tend to share economic, cultural and several other attributes.

parts of the country, and women are more mobile and empowered in southern states of India as compared to other regions.

Other potentially important variables not included in the model are wage rates and unemployment rates. These are not considered due to data limitations. The NSSO surveys do not provide complete wage information for all workers. It is collected only for the wage and casual workers leaving out a significant proportion of women who are self-employed or contributing workers. The unemployment data does not capture the high under-employment rate in the population and is not a good proxy of discouraged-worker effect.

While equation (2) accounts for fixed effects, it does not deal with the persistence of labour force participation rate over time and the possible endogeneity of NSDP and education variables. To address these we turn to dynamic panel data estimation methods developed by Arellano and Bond (1991) and used for similar applications (Gaddis and Klasen 2012; Tam 2011; Luci 2009):

$$FLFPR_{it} = \alpha + \gamma\, FLFPR_{it-1} + \beta_1\, LN\mathrm{NSD}P_{it} + \beta_2 LN\mathrm{NSDP}^2 + \beta_3\, \mathrm{Ed}_{it} + \delta_t + \mu_{it} \qquad [3]$$

The first lag of female labour force participation rate is included to account for dynamics of the process wherein current participation rates are impacted by its own past values. This model cannot be estimated using Ordinary Least Squares (OLS) methods as the lag term would be co-related with error term and there is a problem of endogeneity with the possibility that NSDP might be determined simultaneously with labour force participation rate. This paper draws on Gaddis and Klasen (2012), and uses the difference Generalised Methods of Moments (GMM) estimator for the analysis. The difference GMM is designed to handle small number of time periods relative to observations, along with issues of autocorrelation, fixed effects and endogenous independent variables (Roodman 2006; Arellano and Bond 1991; Blundell and Bond 1998). In difference GMM, regressors are transformed by differencing or taking forward orthogonal deviations, and lagged levels are used as instruments.

Table 8 presents the results for the OLS regression models with varying controls (equations 1 and 2) before moving to the panel models. The results do not support the U-shaped relationship between economic development and women's economic activity. In fact, columns 1 to 3 indicate that the presence of an inverted-U shaped relationship: the coefficient on log per capita NSDP is positive and significant and the coefficient on the squared term is negative and significant. This implies women's labour force participation increases with development, plateaus at a certain stage and then starts declining. But the inverted U-shaped relationship loses its significance once we control for time and region fixed effects (column 4).

There are a substantial proportion of women involved in unpaid work and the characteristics of women doing paid and unpaid work are likely to be different. The analysis is repeated separately for paid and unpaid participation rates (columns 5 and 6, respectively) with similar results to the overall model.

Women's education, proxied by percentage of women in the state who have completed secondary education, has a consistent and significant negative impact on labour force participation across the various models. Alternate specifications of education (literacy rates, completion rates of primary and middle school) were attempted to check for robustness of the results. All estimations resulted in qualitatively similar findings. This finding is consistent with the literature on the relationship between education and women's economic activity. Analysing NSS data for 1993-94, Das and Desai (2003) find that educated women in India are less likely to be employed, which is attributed to a lack of employment opportunities rather than social norms restricting their movement. Several researchers have found that a U-shaped relationship exists between educational status and women's labour force participation at any given point in time. Klasen and Pieters (2012) argue that women with low-levels of education are forced to work to contribute towards household income; while women with very high levels of education are attracted towards the labour market due to high wages. Women between the two groups face social stigmas associated with female employment without the economic need for their income.

Results from the region fixed effects variables are presented in Table 9. They show that eastern states, on average across the years, have lower participation rates than northern states. These differences are significant for labour force participation rate and unpaid work participation rate. Western and southern states, on average, have better paid work participation rate than Northern states. The average unpaid work participation rates in north-eastern and southern states are significantly lower than Northern states. These results are consistent with the descriptive results of participation rates discussed earlier in Table 1.

Before discussing the dynamic panel estimations (equation 3), we highlight some concerns associated with these models. Roodman (2009) warns against the proliferation of instruments and the associated risk of generating invalid results in difference GMM estimators. These estimators tend to generate numerous instruments which even though individually valid, can be collectively invalid in finite samples as they over fit endogenous regressors. They also weaken the Hansen test of over identifying restrictions used to test validity of the instruments. Given the small sample size, the analysis in this paper is especially vulnerable to this concern. Roodman (2009) and Mehrhoff (2009) suggest collapsing instruments by combining them through addition into smaller sets or using principal component analysis to choose instruments to estimate a relatively parsimonious model. The results presented here collapse the instruments by combining them to reduce instrument count and we also test for the robustness of the results to further decrease in instrument count.

Model 1 (Table 10, column 1) is estimated considering NSDP and education as exogenous variables and the lag of female labour force participation as endogenous. The coefficient on the log of per capita NSDP is negative and on the squared term is positive, but insignificant. The difference in Hansen test, which tests validity of a subset of instruments, indicates that NSDP and education might be endogenous. Model 2 (column 2) instruments NSDP with its lag variables while education is maintained to be exogenous. It is seen that the lag of female labour force participation rate changes sign and loses its significance and the absolute value of the coefficients on the NSDP variables increase but are still insignificant. The difference in Hansen test still indicates that education might not be exogenous and hence we relax this assumption in model 3 (column 3). The log of per capita NSDP is now negative and significant at the 10% level, but the square term does not show any effect, suggesting there is no U-shaped relationship between women’s economic activity and economic development. We find only a weak negative relationship; women’s economic activity tends to decrease with increase in per capita NSDP. The Arellano Bond test indicates there is no autocorrelation in the models. The Hansen test of joint validity of all instruments is also not a concern in the models. The null of exogeneity of the instruments cannot be rejected at the 5% level.

We test robustness of our results to change in instrument count by using principal component analysis to select instruments. Except for one specification, the results do not show any significant relationship between economic development and women's economic activity (Appendix Table A1). When net state domestic product and education enter the model as endogenous variables, female labour force participation rate does show a U-shaped relationship with an instrument count of 10. Further, the models are estimated separately for rural and urban areas with no substantial difference in the results[9]. There was a change in methodology in measuring the number of workers in 1993-94 survey, so the estimates of labour force for survey years prior to 1993-94 are not fully comparable with the recent surveys (see Himanshu, 2011 for details). In order to test whether this impacts the results, the models are re-estimated for a subset of the years[10], 1993-94 to 2009-10. Once again, there is no evidence to support the U hypothesis. Results of the rural/urban and the sub sample analysis are not presented here, but available on request.

While there is some divergence between the OLS and the panel models, in either case, the evidence points away from the simple relationship between economic development and women's labour force participation. Similar results were reported from an analysis of 191 countries using data from the ILO's Estimates and Projections of the Economically Active Population (EAPEP) database (Gaddis & Klasen 2012). There are several aspects which need to hold for the U-shaped hypothesis to be true. The authors conclude that the pattern, process and pace of structural change experienced by each country is different and the U hypothesis is too simplistic to account for all of these factors. The authors argue that based on relative shifts in the various sectors of economy, countries might or might not end up tracing a U-shaped relationship.

Given the Indian growth story, it is perhaps to be expected that the U hypothesis does not hold. As discussed in the previous section, India moved from being an agrarian economy to one that is dominated by the services sector bypassing the industrialisation stage. Compared to 1999-2000, the absolute numbers employed by the agricultural sector has gone up by 7.18 million in 2009-

[9] State domestic product is not broken up by rural or urban areas and hence we have to use the combined State domestic product as proxy for economic development in these regressions. This is not ideal as rural and urban areas might have grown vastly differently which is not captured through this variable. As part of future research we plan to explore proxies for economic development for which data can be obtained separately for rural and urban areas.

[10] The re-estimation is undertaken only for the static fixed effect models. The reduced sample size does not permit the estimation of the dynamic models.

10. The reverse is true for the service sector whose share of GDP was 55 per cent in 2009-10, but share of labour force stood at a mere 25.3 per cent (Mehrotra et al. 2012). Based on a review of India's growth performance over the last three decades, Kotwal, Ramaswami, and Wadhwa (2011) conclude that the growth pattern where services dominate is biased towards a high-skilled labour force, whereas manufacturing-led growth would have created more opportunities for unskilled labour. This has hampered the movement of low-skilled labour from agriculture to non-agriculture sectors compared to other developing countries. In addition to being skill intensive, the authors also note that the sectors making a high contribution to GDP as also capital intensive with little employment generation potential.

While overall employment is affected, there are reasons to believe that growth in different sectors will have a differential impact on women's economic activity. The GDP elasticity of female employment depends not only on labour intensity of production in that sector, but how "friendly" that sector is to women. Also women tend to cluster in some sectors due to occupational preferences, lack of mobility, lack of adequate skills or social non-acceptance of jobs in a sector (Anker 1997; Dutta and Satyabhama 2010). Growth in women "friendly" sectors would likely have a greater impact on women's employment rate than in other sectors. This is examined in the next section.

6. Structural Change and Women's Economic Activity

Value added by a particular sector is an indicator of its contribution to economic growth, while the employment generated in that sector gives insights into the process of economic growth. Following Gaddis and Klasen (2012), this paper explores the relationship of women's economic activity to both value added as well as employment growth at the sectoral level. This approach borrows from the poverty literature relating changes in poverty and sectoral growth (Ravallion and Datt 1996).

Let e_f indicate the female labour force participation rate, Y_i be the per capita GDP. The change in female labour force participation rate can be expressed as GDP elasticity of female employment rate multiplied by the proportionate change in per capita GDP.

$$\frac{de_f}{e_f} = \left(\frac{de_f}{e_f}\ \frac{Y}{dY}\right)\frac{dY}{Y} \quad = \varepsilon_{efy}\frac{dY}{Y} \qquad [4]$$

Approximating for small changes we obtain:

$$dlne_f = \varepsilon_{efy} dlnY \qquad [5]$$

The GDP elasticity of female employment depends on the GDP elasticity of total employment and female intensity of employment, both of which can vary across sectors. The growth in GDP can be approximated by the sum of share-weighted growth rates of the sectors. So we can rewrite equation [4] as:

$$dlne_f = \sum_{i=1}^{7} \varepsilon_{efy\,i}\, s_i\, dlnY_i \qquad [6]$$

with s_i denoting the share of sector i in total GDP.

From equation [5], the proximate determinants of change in women's economic activity are the GDP elasticity of female employment rate, size of the sector in the economy and the growth rate of the sector. GDP elasticity of female employment measures the response of women's economic activity to growth in a sector controlling for its size. The impact of growth in a particular sector on change in women's employment rate may differ because the sector is bigger ($s_i > s_j$) or the marginal impact on women's employment of growth is more in that sector as compared to other sectors ($\varepsilon_{efy\,i} > \varepsilon_{efy\,j}$). Whether growth in one sector has more impact on change in women's economic activity than other sector depends on if $s_i\varepsilon_{efy\,i} > s_j\,\varepsilon_{efy\,j}$. If ε_{efy} is the same across all sectors, then equation [5] is reduced to equation [4] and the source of growth has no impact on the growth in labour force participation rate. In addition if $\varepsilon_{efy} = 0$ for all sectors, then growth in GDP has no impact on change in female labour force participation rate. Both these conditions are tested in the empirical investigation.

To test the relationship between sectoral growth and women's economic activity, we regress the proportionate change in female labour force participation rate in Indian states with the share-weighted growth in per capita value added for each sector in NSDP. The empirical specification is as follows:

$$\Delta lnFLPR_{jt} = \beta_0 + \sum_{i=1}^{7} \beta_i \, s_{ji\,t-1} . \Delta \ln Y_{jit} + \delta_t + \epsilon \qquad [7]$$

Time-specific fixed effects (δ_t) are included to capture common changes in female labour force participation across time. State or region fixed effects are not relevant as the specification is expressed in first differences. The growth in each sector is weighted by the share of the sector in total value added in the initial year ($s_{ji\,t-1}$).

In addition to change in value added by different sectors of the economy, labour re-allocation across the various sectors can also be interpreted as an indicator of structural change in the economy. In India, value added and labour allocation across sectors are quite different and at times provide different interpretation of the structural change undergoing in the economy. Also national accounts data are known to underestimate the contribution of agriculture and informal enterprises, sectors in which women are disproportionally concentrated. Hence we estimate the relationship between change in female labour force participation rate and the share-weighted growth in employment ($s_{ji\,t-1}$).

$$\Delta lnFLPR_{jt} = \beta_0 + \sum_{i=1}^{7} \beta_i \, s_{ji\,t-1} . \Delta \ln E_{jit} + \delta_t + \epsilon \qquad [8]$$

Figure 3 plots the growth in per capita NSDP across Indian states over the period 1983-84 to 2009-10 against the change in women's economic activity. We find that states which experience higher growth tend to see a slight decline in labour force participation rate by women with a statistically significant negative correlation of 0.15.

Separate regressions are estimated for total labour force participation rate, paid work participation rate and unpaid work participation rate to investigate how each of these is impacted by value added and employment growth in different sectors (Table 11). Robust standard errors are reported as the White test of heteroskedasticity indicated that it might be an issue in some of the specifications.

We test two hypotheses across the models; coefficients for all sectors are simultaneously equal to zero and coefficients for all sectors are the same. That null hypothesis that sectoral coefficients are simultaneously equal to zero is rejected at the five per cent significance level for all models except the value added paid employment rate specification. This implies that sector specific growth has an effect on female labour force participation rate. In paid employment rate regressions (column [2] and [5], Table 11), and unpaid employment rate value share regression (column [3], Table 11), we cannot reject the hypothesis that the sectoral coefficients are the same. Except for these, the differential pattern of growth across sectors does have an effect on women's economic activity.

There is significant positive effect of growth in agricultural employment share on female employment, but growth in agricultural value share has no significant effect on female employment. The difference in results across value shares and employment shares might be due to low level of correlation between value added and employment generation in the agricultural sector. Agricultural share of GDP in 2009-10 was only 15 per cent, but the sector was employing 53 per cent of the workforce (Mehrotra et al. 2012).

Growth in mining sector, in either value shares or employment shares, has no significant association with change in women's economic activity. This is to be expected as the mining sector is male dominated due to the nature of work involved. Growth in value share of manufacturing sector has a positive association with change in female labour force participation rate. Women are more likely to be engaged in sub-contracted own account or piece-rate manufacturing at home and in labour intensive manufacturing sub-sectors like textiles. But manufacturing employment growth has no effect on female employment. Growth in value added by trade, hotel and restaurants sector has a negative impact on change in female labour force participation rate. Though surprising at first, it is validated by the high concentration of men in this sector. Women constitute only 12 per cent of the work force in trade, hotels and restaurants, while they are 29 per cent of the overall work force in 2009-10.

Similar to our results, Gaddis & Klasen (2012) also find that agriculture employment growth and manufacturing value share growth has a positive effect on women's employment. Though they find a positive association of growth in value shares in trade, hotel and restaurants sector in contrast to our finding of a negative effect. This might be due to the low level of involvement of women in this sector as compared to women in countries in their analysis.

7. Conclusion

India has undergone substantial changes in the last twenty five years. The country has experienced rapid economic growth, structural shifts in the economy accompanied by high rates of urbanisation, increase in educational attainment levels, and declining fertility rates among other things. But during the same period there has been a gradual and long term fall in women's economic activity. The proportion of 25-59 year old women who are part of the labour force has declined by 23 per cent. This has been far higher in some of the poorest states in India.

In this paper we investigate the relationship between economic development, composition of economic growth and women's employment. In some cross-country case studies, researchers have found a U-shaped relationship between economic development and women's employment. This is argued as being reflective of the structural shifts in the economy, changing influence of income and substitution effects, and an increase in education levels of women in the population. In our analysis we do not find any evidence for such a relationship in India. Our results indicate that the decline in female labour force participation in India is not part of the "normal" development process which will reverse itself with more growth, as has been experienced by some other countries.

It is seen that the composition of growth has an effect on women's labour force participation rate. Economic growth in India has not been employment intensive. This likely affects women's options more than it affects men. Agriculture and manufacturing sectors are typically labour intensive but have not led the overall economic growth in India. The service sector has been the key driver of growth but requires high skills that a majority of women do not possess. These results clearly point to the fact that growth by itself is not sufficient for increasing women's economic activity. The process of growth is also an important consideration. Policies that incentivize growth in sectors which are "friendly" to women are critical to increasing women's participation in labour markets. The challenge of trying to understand women's economic activity is that it is influenced by both, market (outside forces) as well as by household and family context (inside forces) to a greater degree than men's economic activity. A different set of policies will be needed to encourage women to overcome social and cultural constraints to their joining the labour force. Due to data limitations, the current research is unable to unpack the impact of such variables. This remains an agenda for future research.

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Table 1: Levels and trends in female labour force participation rates by region (%)

Regions	Participation rates, 2009-10			Change in participation rates, 2004-05 to 2009-10			Change in participation rates, 1983-84 to 2009-10		
	Paid	Unpaid	LFPR	Paid	Unpaid	LFPR	Paid	Unpaid	LFPR
North	23.2	12.2	36.0	-14.4	-26.9	-19.3	-16.2	-14.1	-14.3
Centre	22.6	18.4	41.1	-0.4	-38.0	-21.9	-14.1	-30.3	-22.2
North-east	17.3	13.0	31.6	-0.6	-40.4	-21.2	-19.2	120.3	14.9
East	15.3	7.1	22.6	-25.7	-49.6	-36.7	-45.6	-34.9	-42.5
West	30.1	15.1	45.7	-16.4	-32.9	-22.3	-25.1	-19.3	-22.7
South	38.5	11.4	51.0	-7.0	-35.2	-16.0	-15.8	-19.1	-15.3
India	26.0	13.1	39.6	-10.0	-37.9	-22.0	-22.8	-24.3	-22.7

Source: Authors' calculations from several rounds of NSSO unit level data.

Notes: All participation rates used in this paper are based on usual principal and subsidiary activity status (UPSS). LFPR stands for total labour force participation rate (LFPR) and is the sum of paid, unpaid participation rates and the unemployment rate.

Table 2: Levels and trends in sector wise composition of women by sector and region (%)

Regions	Sector wise composition of women in the work force, 2009-10					Change in sector wise composition of women e in the work force, 1983-84 and 2009-10				
	Agriculture	Manufacturing	Construction	Services	Mining	Agriculture	Manufacturing	Construction	Services	Mining
North	70.1	6.4	2.4	20.9	0.2	-15.5	38.8	637.3	73.9	119.5
Centre	76.9	5.5	8.8	8.7	0.2	-11.4	-7.1	806.5	45.2	-61.4
North-east	67.9	4.0	9.6	18.3	0.2	-9.9	-55.0	2686.4	21.4	-37.0
East	59.4	18.7	4.0	17.4	0.6	-23.4	79.4	691.1	57.7	-2.9
West	72.3	5.9	1.8	19.9	0.2	-12.9	3.1	14.5	107.0	32.2
South	61.4	14	5.6	18.5	0.6	-18.6	33.6	428.8	45.8	37.3
India	68.4	9.8	5.6	15.8	0.4	-15.3	23.2	477.1	58.8	-8.1

Source: Authors' calculations from several rounds of NSSO unit level data.

Notes: Definition of Region: North – Jammu & Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi and Chandigarh; Centre – Uttar Pradesh, Rajasthan and Madhya Pradesh; East - Bihar, Orissa and West Bengal; West - Gujarat, Maharashtra and Goa; South – Andhra Pradesh, Karnataka, Tamil Nadu, Puducherry and Kerala; North-East – Sikkim, Assam, Arunachal Pradesh, Nagaland, Mizoram, Manipur and Tripura. Data for states created in 2000 (Jharkhand, Chhattisgarh and Uttarakhand) were merged with the original states to maintain comparability over time periods.

Table 3: Levels and trends in sector wise composition of men in the workforce by sector and region (%)

Regions	Sector wise composition of men in the workforce, 2009-10					Change in sector wise composition of men in the work force, 1983-84 to 2009-10				
	Agriculture	Manufacturing	Construction	Services	Mining	Agriculture	Manufacturing	Construction	Services	Mining
North	26.5	16.1	14.1	41.9	1.4	-44.6	32.2	146.9	23.7	320.9
Centre	50.4	8.7	13.6	25.7	1.5	-22.6	-4.1	347.9	18.5	49.5
North-east	53.8	4.0	7.5	33.5	1.2	-19.0	-2.2	371.8	21.5	291.9
East	50.2	9.2	11.0	28.6	1.1	-18.5	-21.0	485.2	21.7	-25.2
West	40.0	15.2	6.6	37.0	1.2	-21.0	-7.8	102.5	26.5	236.5
South	40.0	12.5	11.2	34.9	1.4	-25.8	-2.8	217.3	21.2	52.6
India	44.7	11.1	11.2	31.7	1.3	-23.2	-5.6	261.4	21.9	45.3

Source: Authors' calculations from several rounds of NSSO unit level data.

Table 4: Levels and trends in type of employment among women in the workforce by region (%)

Regions	Type of employment among women in the work force, 2009-10							Change in type of employment among women in the work force, 1983-84 to 2009-10						
	Self-employment		Contributing family workers		Wage	Casual workers		Self-employment		Contributing family workers		Wage	Casual workers	
	Ag.	Non-ag.	Ag.	Non-ag.		Ag.	Non-ag.	Ag.	Non-ag.	Ag.	Non-ag.		Ag.	Non-ag.
North	33.1	6.1	32.1	2.4	17.0	4.9	4.4	-20.1	49.8	-0.5	53.8	67.1	-43.0	132.9
Centre	13.7	4.7	41.6	3.2	5.5	21.4	9.8	-36.0	29.9	-9.7	-19.0	45.8	16.0	272.7
North-east	12.1	7.3	39.6	3.2	14.2	12.0	11.6	-59.5	-32.8	95.5	125.9	-27.0	-8.6	133.4
East	8.5	13.9	24.4	7.3	10.3	26.1	9.5	-53.9	86.5	6.3	47.0	85.3	-25.7	73.0
West	7.7	7.3	30.3	3.1	12.7	34.2	4.7	-52.7	82.2	4.7	9.7	101.6	-7.8	4.1
South	5.7	9.6	16.5	6.3	12.5	39	10.5	-66.4	35.4	-12.1	30.6	71.1	0.2	67.4
India	10.7	8.0	29.0	4.6	10.5	28.4	8.8	-46.5	44.4	-2.9	14.5	70.3	-5.0	95.0

Source: Authors' calculations from several rounds of NSSO unit level data.

Note: Ag.: Agricultural sector, Non-ag.: Non-agricultural sector

Table 5: Levels and trends in type of employment among men in the workforce by region (%)

Regions	Type of employment among men in the work force, 2009-10							Change in type of employment among men in the work force, 1983-84 to 2009-10						
	Self-employment		Contributing family workers		Wage	Casual workers		Self-employment		Contributing family workers		Wage	Casual workers	
	Ag.	Non-ag.	Ag.	Non-ag.		Ag.	Non-ag.	Ag.	Non-ag.	Ag.	Non-ag.		Ag.	Non-ag.
North	14.9	24.3	5.0	3.0	33.9	5.9	13.2	-52.1	28.9	11.3	129.4	17.7	-38.7	120.7
Centre	28.3	18.8	8.2	2.1	13.9	13.4	15.2	-33.9	25.5	5.0	80.3	-12.4	4.6	234.9
North-east	34.8	20.2	9.1	1.2	17.0	8.3	9.5	-24.3	56.0	240.1	91.4	-22.6	-22.5	84.5
East	20.9	23.4	4.5	1.8	12.4	24.2	12.8	-23.1	48.6	8.0	44.8	-33.0	-15.0	174.0
West	17.5	19.3	5.0	2.5	29.2	17.2	9.2	-29.4	27.6	29.7	104.6	-0.7	-12.1	54.8
South	13.5	19.9	3.1	1.6	22.8	22.8	16.2	-42.1	17.4	0.2	55.0	6.2	-10.5	90.1
India	20.9	20.6	5.5	2.0	19.7	17.7	13.6	-33.1	29.5	13.6	74.8	-6.2	-11.5	131.0

Source: Authors' calculations from several rounds of NSSO unit level data.

Note: Ag.: Agricultural sector, Non-ag.: Non-agricultural sector

Table 6: Per capita net domestic product and growth rates by region (%)

Regions	Per capita net domestic product (2004-05 constant prices, Rs.)		Annual growth in per capita net domestic product			
	1983	2009	1983-84 & 1993-94	1993-94 & 2004-05	2004-05 & 2009-10	1983-84 & 2009-10
North	16,627	47,809	4.0	4.5	7.6	7.2
Centre	10,804	22,862	2.3	3.0	6.0	4.3
East	7,667	20,274	2.4	5.4	6.8	6.3
North-east	12,078	22,575	1.9	3.1	3.5	3.3
West	15,632	54,699	5.3	4.1	11.4	9.6
South	11,608	41,149	4.6	5.9	9.4	9.8
Total	11,500	32,765	3.6	4.4	8.3	7.1

Source: Authors' calculation based on state level Central Statistical Organisation data.

Table 7: Level and change in sectoral composition of NSDP, (%)

Regions	Sectoral composition of NSDP, 2009-10					Change in composition of NSDP, 1983-84 to 2009-10				
	Agri-culture	Mining	Manufac-turing	Constru-ction	Services	Agri-culture	Mining	Manufac-turing	Constru-ction	Services
North	10.5	0.1	9.3	11.4	68.7	-71.2	-52.7	-30.3	108.9	54.3
Centre	22.2	3.0	13.4	10.7	50.7	-58.2	46.5	10.2	163.8	76.3
North-east	22.4	2.0	3.5	16.2	55.9	-47.7	41.3	-25.5	55.2	37.7
East	20.5	3.2	9.3	7.7	59.3	-54.1	63.7	-35.0	33.0	78.5
West	7.8	2.5	23.6	8.9	57.1	-71.0	17.3	-14.1	86.2	47.5
South	11.2	0.7	19.0	10.1	58.9	-63.2	99.6	5.8	-37.2	68.4
India	13.7	1.4	13.0	11.4	60.5	-63.0	24.4	-11.1	35.2	56.5

Source: Authors’ calculation based on state level Central Statistical Organisation data.

Table 8: Economic development and female labour force participation rate (25-59 years), Ordinary Least Squares

Variables	Labour force participation rate				Paid work participation rate	Unpaid work participation rate
	[1]	[2]	[3]	[4]	[5]	[6]
Log per capita NSDP (constant 2004-05 prices)	232.95***	145.741***	155.230***	47.537	2.861	38.658
	(50.064)	(49.356)	(59.479)	(59.944)	(43.012)	(32.244)
Square log per capita NSDP (constant 2004-05 prices)	-11.82***	-6.814***	-8.452***	-2.476	0.069	-2.235
	(2.456)	(2.475)	(2.839)	(2.929)	(2.127)	(1.598)
% women completing secondary school		-0.779***		-0.784***	-0.398***	-0.430***
		0.174		0.177	0.141	0.124
Time fixed effects	No	No	Yes	Yes	Yes	Yes
Region fixed effects	No	No	Yes	Yes	Yes	Yes
Constant	-1097.19***	-714.75***	-662.70**	-171.264	-0.484	-141.072
	(254.244)	(246.907)	(310.724)	(308.388)	(219.151)	(164.219)
Adjusted R-Squared	0.104	0.17	0.207	0.269	0.262	0.358
Model-P-value	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	160	160	160	160	160	160
Number of states	28	28	28	28	28	28

Notes: Significance Levels - * p<0.10, ** p<0.05, *** p<0.01. Dependent variables are the participation rates. Robust standard errors are reported.

Table 9: Region fixed effects

Regions	Labour force participation rate	Paid work participation rate	Unpaid work participation rate
Centre	-3.529	0.268	-4.03
North-east	-8.11	0.153	-8.775***
East	-21.722***	-5.262	-17.178***
West	2.966	4.720*	-2.153
South	3.149	12.329***	-10.401***

Notes: Northern region is the base for comparison across regions.

Significance levels:* p<0.10, ** p<0.05, *** p<0.01.

Table 10: Economic development and female labour force participation rate (25-59 years), dynamic models

Variables	Labour force participation rate			Paid work participation rate	Unpaid work participation rate
	[1]	[2]	[3]	[4]	[5]
First lag of participation rate	0.458***	-0.026	0.172	0.204	-0.225
	(0.163)	(0.525)	(0.262)	(0.206)	(0.375)
Log per capita NSDP (constant 2004-05 prices)	-46.874	-181.695	-239.450*	-75.508	24.967
	(49.584)	(161.59)	(128.933)	(125.236)	(240.593)
Square log per capita NSDP (constant 2004-05 prices)	2.349	8.131	10.121	3.969	-0.294
	(2.336)	(6.869)	(6.036)	(5.258)	(9.529)
% women completing secondary school	-0.021	-0.514	-0.604	-0.323	-0.064
	(0.220)	(0.386)	(0.528)	(0.624)	(1.253)
Time fixed effects	Yes	Yes	Yes	Yes	
# of instruments	11	13	17	17	17
Arellano Bond test for AR(2)	0.974	0.68	0.442	0.419	0.653
Hansen test for overid restrictions	0.874	0.804	0.481	0.262	0.099
Exogenous	Time, education and NSDP	Time and education	Time	Time	Time
Model-P-value	0.000	0.000	0.000	0.000	0.000
Number of states	28	28	28	28	28
Number of observations	107	107	107	107	107

Notes: Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Difference GMM.

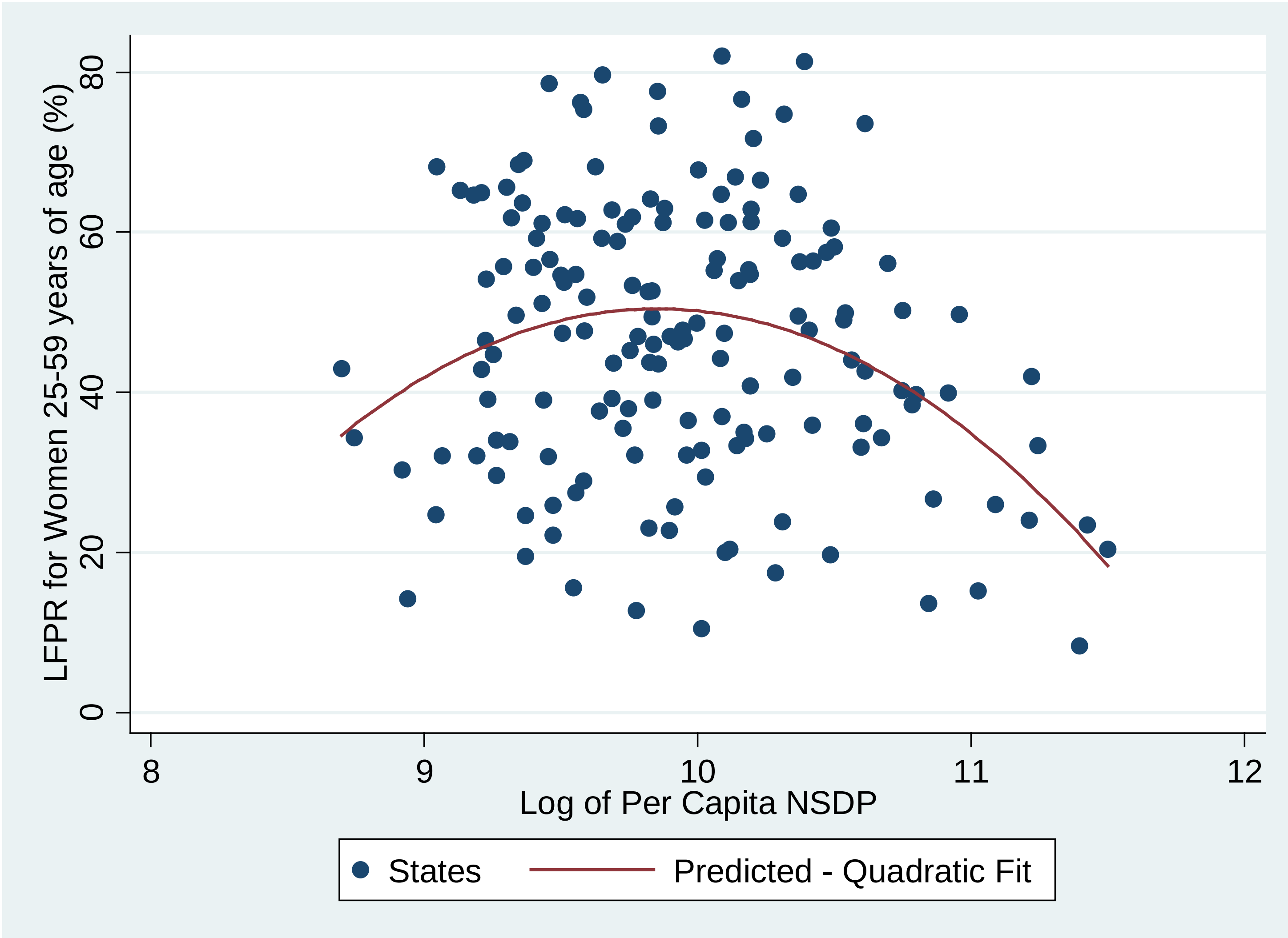
Robust standard errors with Windmeijer's finite-sample correction. Orthogonal deviations are used in the dynamic models.

Table 11: Change in women's economic activity and growth in value shares and employment shares by sectors between subsequent survey years. (1983-84 to 2009-10)

Sectors	Value shares			Employment shares		
	Labour force participation rate	Paid work participation rate	Unpaid work participation rate	Labour force participation rate	Paid work participation rate	Unpaid work participation rate
	[1]	[2]	[3]	[4]	[5]	[6]
Ag. and Allied	0.002	-0.001	0.011	0.018***	0.014***	0.033***
	(0.004)	(0.005)	(0.012)	(0.004)	(0.004)	(0.009)
Mining	-0.011	-0.033	-0.027	0.013	0.005	0.043
	(0.017)	(0.035)	(0.072)	(0.010)	(0.018)	(0.034)
Manufacturing	0.010**	0.015**	-0.001	-0.008	-0.007	0.006
	(0.005)	(0.007)	(0.013)	(0.009)	(0.011)	(0.018)
Construction	-0.002	-0.001	0.008**	0.011	0.013	-0.012
	(0.005)	(0.003)	(0.003)	(0.011)	(0.013)	(0.022)
Trade, hotels and restaurants	-0.016**	-0.009	-0.012	-0.003	-0.005	0.098**
	(0.007)	(0.010)	(0.026)	(0.015)	(0.014)	(0.046)
Public administration	0.022	0.010	0.045	-0.004	-0.001	0.022
	(0.018)	(0.019)	(0.040)	(0.007)	(0.007)	(0.028)
Other services	-0.004	-0.006	-0.009	0.003	0.007	0.021
	(0.005)	(0.006)	(0.015)	(0.009)	(0.010)	(0.017)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.005	0.07	-0.13	0.076*	0.170***	-0.161
	0.082	0.092	0.177	0.045	0.063	0.155
Adjusted R-Squared	0.185	0.017	0.213	0.37	0.114	0.332
Model-P-value	1.00E-08	0.0238	3.40E-10	3.20E-16	2.50E-04	4.70E-10
Number of observations	130	130	127	140	140	136
Hypothesis testing						
All sectoral coefficients are the same	0.0227	0.1147	0.0737	0.0011	0.1087	0.0273
All sectoral coefficients are simultaneously zero	0.0376	0.1726	0.0281	0.000	0.0016	0.0236

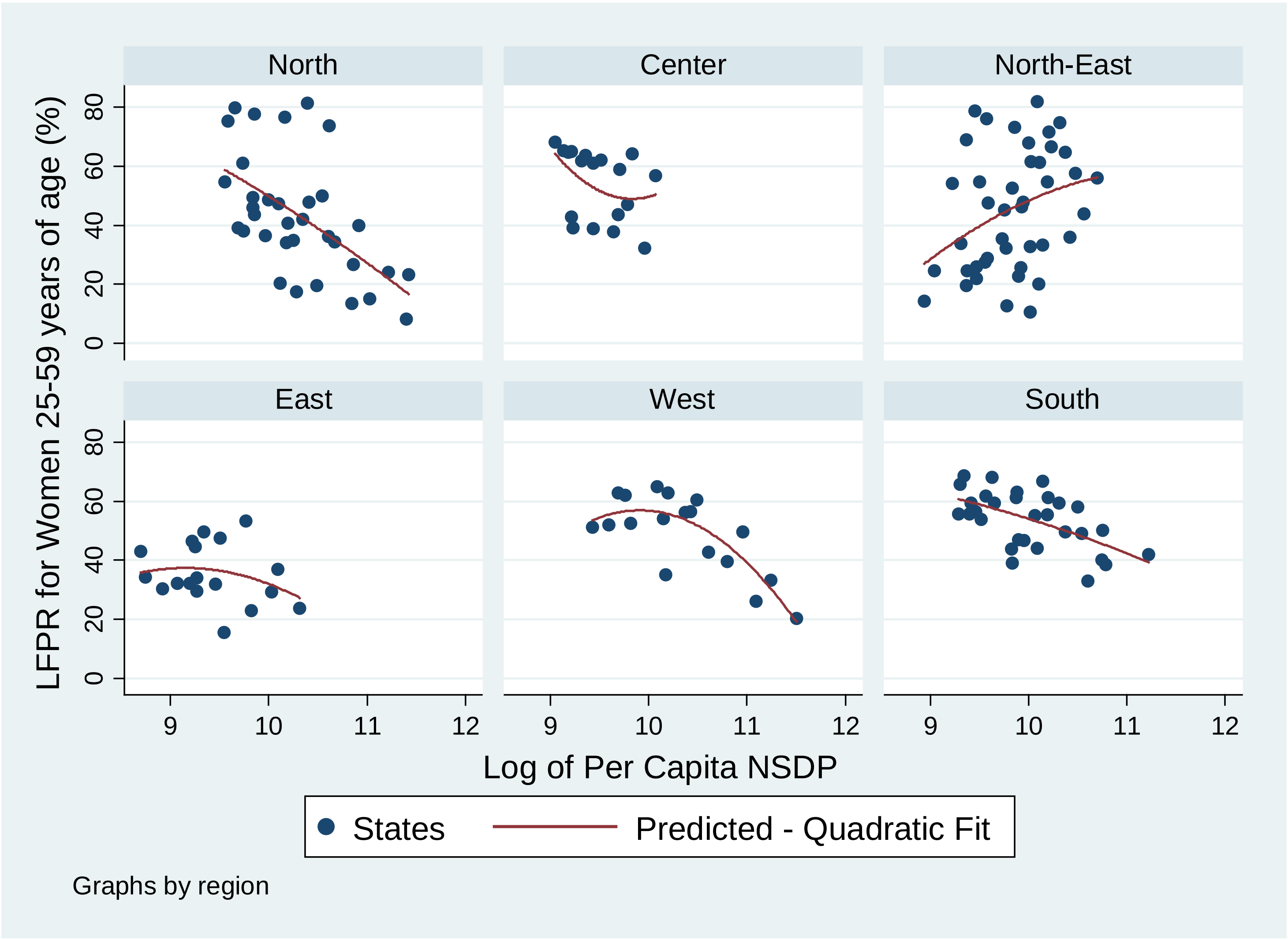
* p<0.10, ** p<0.05, *** p<0.01
Dependent variable is log of change in female labor force participation rate for women in age group 25-59 between subsequent survey years.

Figure 1: Economic development and women's economic activity across states in India, 1983-84 to 2009-10



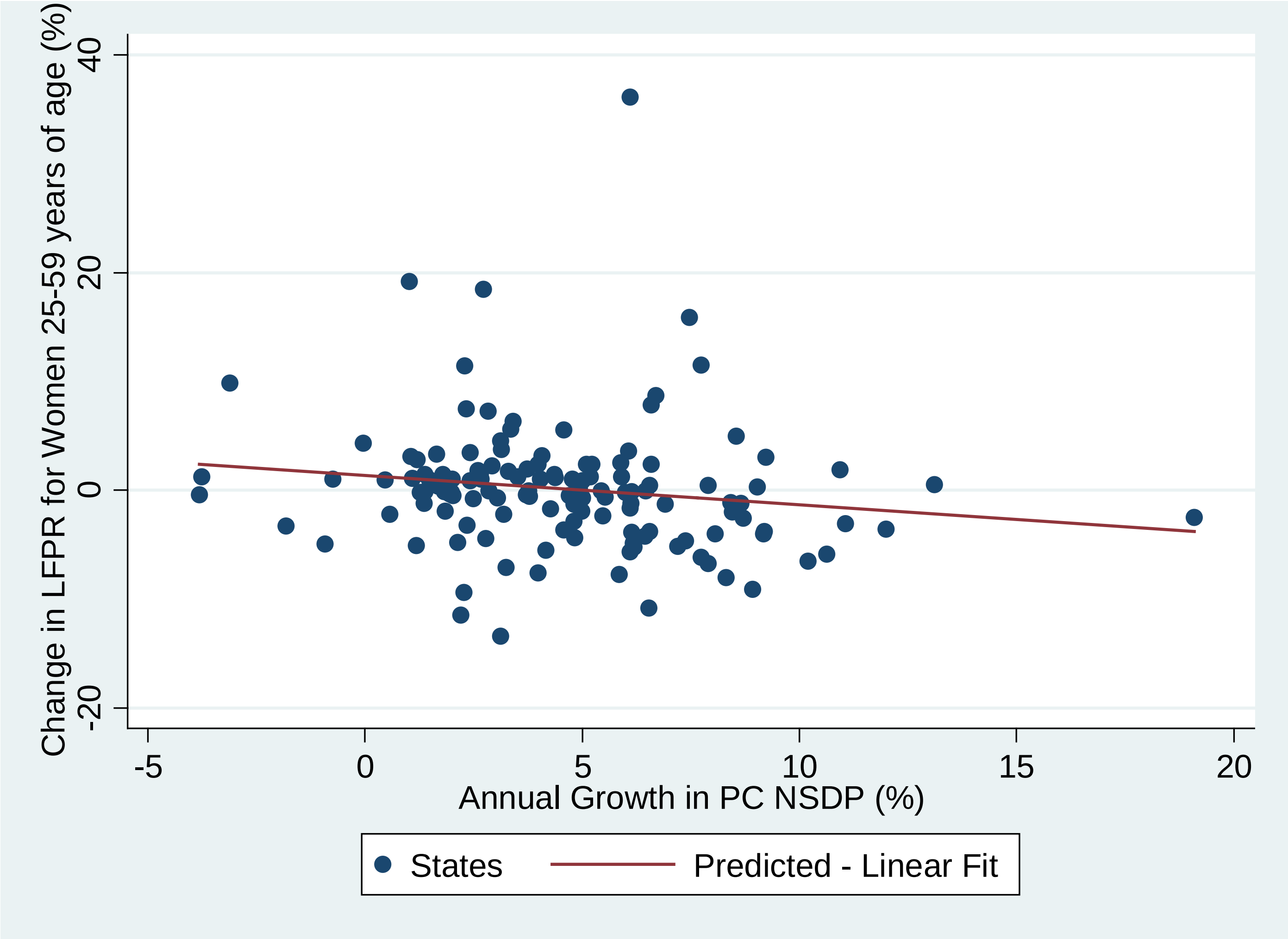
Source: Based on authors' calculations from several rounds of NSSO unit level data and per-capita NSDP data from CSO.

Figure 2: Economic development and women's economic activity across states in India by region, 1983-84 to 2009-10



Source: Based on authors' calculations from several rounds of NSSO unit level data and per-capita NSDP data from CSO.

Figure 3: Economic growth and change in women's economic activity across states in India, 1983-84 to 2009-10



Source: Based on authors' calculations from several rounds of NSSO unit level data and per-capita NSDP data from CSO.

Appendix:

Table A1: Economic development and female labour force participation rate (25-59 years), dynamic models with principal component model used to choose instruments

Variables	Labour force participation rate			Paid work participation rate	Unpaid work participation rate
	[1]	[2]	[3]	[4]	[5]
First lag of participation rate	-0.034 (0.437)	-0.029 (0.397)	0.254 (0.209)	-0.225 (0.207)	-0.035 (0.282)
Log per capita NSDP (constant 2004-05 prices)	-18.789 (50.635)	-65.454 (496.936)	-259.734** (100.286)	-0.689 (72.705)	-204.295 (136.185)
Square log per capita NSDP (constant 2004-05 prices)	0.766 (2.503)	0.749 (23.305)	10.131** (4.736)	-0.666 (2.918)	10.062* (5.239)
% women completing secondary school	-0.155 (0.242)	0.173 (1.347)	-1.105 (0.766)	0.403 (0.635)	-1.829 (1.299)
Time dummies	Yes	Yes	Yes	Yes	Yes
# of instruments	10	8	10	10	10
Arellano Bond test for AR(2)	0.95	0.491	0.601	0.601	0.096
Hansen test for overid restrictions	0.474	.	0.967	0.967	0.116
Exogenous	Time, education and NSDP	Time and education	Time	Time	Time
Model P-value	0.000	0.000	0.000	0.000	0.000
Number of states	28	28	28	28	28
Number of observations	107	107	107	107	107

Notes: Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Difference GMM.
Robust standard errors with Windmeijer's finite-sample correction. Orthogonal deviations are used in the dynamic models.