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Benchmarking Productive Engagement of Females in Villages of India

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Abstract

This paper measures female productive engagement in more than 554 thousand villages of India in 2010 based on an index of productive engagement that considers both extent and intensity of productive engagement. The analysis reveals that Indian villages can be grouped into nine clusters having different level of female productive engagement and there is distinct regional pattern. Female productive engagement is found to be lower in villages having higher level of female literacy than in villages having lower level of female literacy. It appears that opportunities for productive engagement of educated females were in Indian villages. Creating these opportunities is necessary not only for transforming village economy but also for empowering women. The analysis serves as the benchmark for analysing progress in female productive engagement in villages since 2010.

Introduction

The ability to earn an income by engaging in productive activities is widely regarded as an important dimension women empowerment, although productive engagement, by itself, is not a sufficient condition to ensure an increase in the bargaining power of the woman and her substantial decision-making role within the family and the society (Bardhan, 1985; Bennet, 1992; Mencher and Saradamoni,1982; Nagaraj, 1989; Sinha, 2005). However, productive engagement as a major factor in their economic flexibility has been considered as an indicator of overall well-being and status of women in the society (Mammen and Paxon, 2000). Productive engagement of women has also been widely recognised as a driver of economic growth and, therefore, indicates the potential for economic growth (Verick, 2014).

Productive engagement of women, however, is influenced by a host of economic, social and cultural factors that interact in a complex fashion within the household and in the society. Global evidence suggests that key factors that influence productive engagement of women include educational attainment, age at entry into marital union, fertility, degree of urbanisation and social norms that determine the role of women in the family and the society. In India, it is argued that the increase in the educational enrolment of young females, lack of participation opportunities and household income are some of the factors that influence engagement of females in productive activities (Chaudhary and Verick, 2014; Kapsos et al, 2014). Social norms that decide the role of the woman in the public domain continue to affect the outcomes for women. Variation in productive engagement of women across India has been found to be influenced by a wide gamut of demographic, social,

household and regional factors, although none of them are mutually exclusive and can independently explain variation in female work participation rates across India (Jose, 1989; Sinha, 2005). Previous studies also suggest that there is no universal set of factors that explains the variation in female work participation rate across Indian states (Dholakia and Dholakia, 1978; Gulati, 1975; Nath, 1970; Sundaram, 1989).

An important factor that determines the productive engagement of women is the engagement opportunities in the social and economic production system. These opportunities are contingent upon the size and the structure of the social and economic production system. Every human settlement – village or town – has its own distinct production system which emerges from the interaction between the residents of the settlement and their surroundings. Engagement opportunities for women are not uniform across human settlements, and this variation has an impact on productive engagement of women. Understanding the dynamics of productive engagement of women, therefore, requires analysis at the level of the human settlement – village or town – to account for the variation in engagement opportunities for women. However, such analyses in India have generally been carried out at national and state levels (Chandrasekhar and Ghosh, 2011; Chaudhary, 2011; Rangarajan et al, 2011; Vinoj, 2013; Das et al, 2015; Sanghi et al, 2015; Mehrotra and Parida, 2017). There are very few studies that have analysed productive engagement of women at the local, village level in India (Sinha, 2005; Rogers, 2012). These studies highlight how productive engagement of women is influenced by the size and the structure of the village social and economic production system or the village economy. However, a pan-India analysis of productive engagement of women in the villages of the country has never been carried out despite the fact that more than 70 per cent of the Indian population lived in villages according to the 2011 population census.

The above considerations constitute the rationale for the present analysis which analyses the productive engagement of women in more than 554 thousand villages of India having at least 50 females at the time of the 2011 population census. The productive engagement has been measured in terms of an index of productive engagement that has been developed for the purpose and that considers both the extensiveness and the intensiveness of productive engagement. The paper also explores how productive engagement of women varies across villages based on a set of village-specific population characteristics following the data mining approach which permits extracting information and transforming information from big data into an easy to understand and interpret patterns that are useful from the perspective of policy analysis and programme interventions (Hastie et al, 2013).

The paper is organised as follows. The next section of the paper describes the data used in the analysis. The analysis is based on the primary census abstract of the 2011 population census which is the only source of data pertaining to the productive engagement of the people in the village social and economic production system in India. Section three of the paper describes the productive engagement index that has been developed for the purpose. The productive engagement index considers both the extensiveness and the intensiveness of productive engagement. Section four presents and discusses findings of the analysis while the fifth and the last section of the paper summarises main findings of the analysis and discusses their implications in the context of improving productive engagement of women in the villages of India.

Index of Productive Engagement

The productive engagement of people in an administrative area is commonly measured in terms of the ratio of the total number of workers to the total population in that area or the worker population ratio (WPR) and in terms of labour force participation rate (LFPR) which is defined as the ratio of the total number of workers to the total working-age population which is usually taken as population aged either 15-59 years or 15-64 years. Both WPR and LFPR are head-count ratios or prevalence measures. They reflect the number of persons in any administrative area engaged in a productive activity or work at a particular point in time which is usually a year – the higher the WPR or the LFPR the higher the engagement of the people in productive activities. These measures capture only one dimension of productive engagement, the dimension of extensiveness of engagement. They do not take into consideration the second dimension of productive engagement, the intensiveness of productive engagement which may be captured through the duration of the productive engagement in a specific period – the longer the duration of productive engagement the higher the intensity of the engagement in productive activities. It is obvious that that output of productive engagement depends upon both extensiveness and intensiveness of the engagement. It has, therefore, been argued that a fuller measure of productive engagement should take into consideration both extensiveness and intensiveness of engagement (Heckman, 1993; Blundel et al, 2011).

Let the number of persons in an administrative area who are engaged in productive activities in a year is L and the average number of days of engagement in productive activities per person in a year is A. Then the total duration of productive engagement, D, in the year is

$$D = L \times A \tag{1}$$

Equation (1) suggests that if e is the index of extensiveness of productive engagement and i is the index of intensiveness of productive engagement, then and index of productive engagement, p, that incorporates both extensiveness, and intensiveness of productive engagement may be constructed as

$$p = e \times i \tag{2}$$

Both index e and index i vary between 0 and 1 so that the index of productive engagement, P, varies between 0 and 1. The index of productive engagement, p, may be calculated for different productive activities also. If e_j is the index of extensiveness and i_j is the index of intensiveness of engagement in the productive activity j, then the index of productive engagement in the productive activity j, p_j, may be defined as

$$p_j = e_j \times i_j \tag{3}$$

It is obvious that

$$p = \sum_j p_j = \sum_j e_j \times i_j \tag{4}$$

Equation (4) suggests that the change or the difference in both e and i contribute to the change or the difference in p. It can be shown that

$$\partial p = p_2 - p_1 = \sum_j e_{2j} \times i_{2j} - \sum_j e_{1j} \times i_{1j} = \sum_j \{(e_{2j} \times i_{2j}) - (e_{1j} \times i_{1j})\} \tag{5}$$

Now, following Kitagawa (1955)

$$\left(e_{2j} \times i_{2j}\right) - \left(e_{1j} \times i_{1j}\right) = \left(e_{2j} - e_{1j}\right) \times \bar{\imath}_j + \left(i_{2j} - i_{1j}\right) \times \bar{e}_j \quad (6)$$

where

$i_j = \frac{i_{2j}+i_{1j}}{2}$

and

$\bar{e}_j = \frac{e_{2j}+e_{1j}}{2}$

In other words,

$$\partial p = p_2 - p_1 = \sum_j \left(e_{2j} - e_{1j}\right) \times \bar{\imath}_j + \sum_j \left(i_{2j} - i_{1j}\right) \times \bar{e}_j \quad (7)$$

$$\partial p = \partial e + \partial i \quad (8)$$

$\partial e = \sum_j \left(e_{2j} - e_{1j}\right) \times i_j$

$\partial I = \sum_j \left(i_{2j} - i_{1j}\right) \times \bar{e}_j$

Estimation of the index of productive engagement, *p*, requires estimation of the index of extensiveness, *e*, and the index of intensiveness, *i*, of productive engagement. It may be noticed that the index of extensiveness, *e*, is nothing but the proportion of the population engaged in productive activities. On the other hand, the index of intensiveness, *i*, may be measured in terms of the ratio of the average number of days of productive engagement in a year per person to the maximum possible number of days of productive engagement in the year per person. Assuming that the maximum possible number of days of productive engagement in a year per person is *M*, and the average number of days of productive engagement in a year per person is *A*, then the index of the intensiveness of productive engagement, *i*, may be calculated as

$$i = \frac{A}{M} \quad (9)$$

The index *i* ranges from the minimum value of 0 to the maximum value of 1. It cannot be more than 1. It is obvious that the higher the index, *i*, the higher the intensity of the productive engagement. Indexes *e* and *i* determine the extent of engagement in the productive activities.

Methods

We have estimated the index *p* to measure the productive engagement of females at the village level in India. It is logical to assume that the index *p* as well as indexes, *e* and *i* of a village are influenced by a host of the defining characteristics of the village population. These characteristics include but are not limited to 1) the size of the population of the village; 2) level of education of the village population; 3) level of fertility in the village; 4) gender composition of the village population; and 5) social class structure of the village population. In order to explore how village population characteristics influence female productive engagement, we have followed the classification modelling or the segmentation

approach. This approach classifies or segments villages into mutually exclusive and exhaustive groups or cluster of villages in such a manner that within-cluster homogeneity with respect to the index *p* is the maximum. The classification modelling or segmentation approach is different from the regression-based approach (Chaurasia, 2012). Unlike the regression-based approach, there is no restriction or limitation on the structure of the explanatory variables in the classification modelling exercise. In the most general terms, classification or segmentation of villages emanating from the classification modelling exercise is based on a set of *if-then* logical conditions that permit segmenting villages into mutually exclusive, yet exhaustive groups or clusters.

We have used the Decision Tree procedure to classify villages into different mutually exclusive groups or clusters so that villages in a group or cluster are as homogenous as possible in terms of the index *p*. The procedure can be used for many purposes, and we have used it here for segmenting villages in terms of the index *p* (IBM Corporation, 2012). Among different Decision Tree methods that are available, we have used the classification and regression tree (CRT) method (Breiman et al, 1984) which is a nonparametric recursive partitioning method. CRT splits villages into groups that are as homogenous as possible with respect to the dependent variable – the index of female productive engagement, *p*. A terminal node or cluster in which all villages have the same value for the dependent variable is called a homogeneous or "pure" node. The heterogeneity in a cluster is an indication of impurity of the node or cluster in terms of the dependent variable. There are different impurity measures available. If the dependent variable is continuous, impurity is measured in terms of least-squared deviation which is computed as the within-node variance adjusted for frequency weights or influence variables as the case may be (IBM Corporation, 2012). The tree-growing process is continued until either the pure node is reached, or the prescribed stopping criterion is met (Ambalavanan et al, 2006; Lemon et al, 2003).

Classification modelling is an exploratory data analysis procedure. It has a number of advantages for segmenting the population into mutually exclusive yet exhaustive sub-groups. The main advantage is that it makes no assumption about the underlying distribution of the dependent variable or the independent variables used in the analysis. Moreover, explanatory or the independent variables can be a mix of categorical, interval, and continuous or scale variables. Another advantage of CART is that results of the analysis are not affected by the quality of data such as presence of outliers, collinearity among the explanatory variables, heteroscedasticity, or distributional error structures that normally affect the parametric procedures.

Data

The analysis is based on the primary census abstract of the 2011 population census (PCA 2011) in India which provides data on the productive engagement of all persons enumerated at the time of the census. Those persons who reported that they were engaged in a productive activity even for a day during the one year prior to the census were also asked about the duration of productive engagement grouped into three categories – at least 6 months, 3-6 months and less than 3 months. Persons who reported that they were productively engaged even for a day during the year prior to the census were also

categorised by the type of productive engagement into four categories – cultivators, agricultural labourers, household industry workers and other workers. The population census is the only source in India which provides data pertaining to both extensiveness and intensiveness of productive engagement at the village level. Data related to the status of the productive engagement of the population are also available from other sources too such as the National Sample Survey (Government of India, 2015) and Periodic Labour Fource Survey (Government of India, 2024) but these surveys do not provide village level data. Moreover, data available from these surveys are confined to the extensiveness of productive engagement only. These surveys do not provide data related to the extensiveness of productive engagement so that estimation of the index of productive engagement, p, is not possible from the data available from these surveys.

Productive engagement or work, at the 2011 population census, was defined as participation in any economically productive activity with or without compensation, wages or profit (Government of India, 2011). Participation may be both physical and mental. Work involved not only actual work but also supervision and direction. Part-time help or unpaid work on farm, family enterprise or in any other economic activity had also been classified as work at the 2011 population census. Persons who were engaged in cultivation or milk production even solely for domestic consumption were also classified as workers. Workers were also classified into four categories depending upon the nature of productive engagement – cultivators; agricultural labours; household industry workers and other workers. A worker, at the 2011 population census was classified as cultivator if she or he was engaged in cultivation on his or her own land or land owned by other individuals or institutions including government for payment in terms of money, kind or share. Cultivation included effective supervision or direction in cultivation. A person who had given out her/his land to another person or other persons or institution(s) for cultivation for money, kind or share of crop and who did not even supervise or direct cultivation of land, was not treated as cultivator. Similarly, a person working on the land of other person or persons for wages in cash or kind or a combination of both was not treated as cultivator. Cultivation involved ploughing, sowing, harvesting and production of cereals and millet crops including wheat, paddy, jowar, bajra, ragi, other crops including sugarcane, tobacco, groundnuts, tapioca, and pulses, raw jute and kindred fibre crop, cotton, cinchona and other medicinal plants, fruit growing, vegetable growing or keeping orchards or groves. Cultivation did not include tea, coffee, rubber, coconut and betel-nuts (areca). On the other hand, a person who worked on the land of another person for wages in money or kind or share was classified as agricultural labourer. She or he had no risk in the cultivation but merely works on the land of another person for wages. An agricultural labourer had no right of lease or contract on the land on which she/he worked. Similarly, a worker was classified as household industry worker if she or he was engaged in a household industry which was an industry conducted by one or more members of the household at home or within the village in the rural areas and only within the precincts of the house where the individual lived in the urban areas. The household industry was not run on the scale of a registered factory. In the urban areas, even if household members ran an industry by themselves but at a place away from the precincts of their home, it was not considered as a household industry. Household industry was related to production, processing, servicing, repairing or making and selling (but not merely selling) of goods. It did not include professions such as Pleader, Doctor, Musician, Dancer, Waterman, Astrologer, Dhobi, Barber, etc., or merely trade or business. Lastly, all

workers who were not classified as either cultivators or agricultural labourers or household industry workers were classified as other workers. They included, among others, government servants, municipal employees, teachers, factory workers, plantation workers, workers engaged in trade; commerce; business; transport; banking; mining; construction; political or social work, priests, entertainment, artists, etc.

The definition of a village adopted in the population census in India is different from the commonly used concept of the village as a human settlement (Doxiadis, 1968). In the population census, urban areas are first identified based on a clearly laid down definition of a standard urban area and population living in these urban areas is classified as the urban population. Population not classified as the urban population is classified as rural population and is organised into administrative areas following the administrative boundaries of revenue villages. A village, identified in the population census, therefore, is an administrative unit with well-defined administrative boundaries and population of the village is the number of persons enumerated within the administrative boundaries of the village. A village, in this approach, may have only one human settlement or more than one human settlement or may have no human settlement at all in which case population of the village is zero. If there are more than one human settlements in a village then PCA 2011 provides combined data of all human settlements in the village. This approach pays no attention to permanent or temporary nature of human settlements as the enumeration is carried out on the *de-facto* basis and not on the *de-jure* basis. There is always a possibility that human settlements within the boundaries of a village are permanent or temporary or both.

At the 2011 population census, there were 640949 villages in India, out of which 43330 or around 6.8 per cent villages had no population so that the number of inhabited villages was 597619. In 41283 inhabited villages, total female population enumerated at the time of the 2011 population census was less than 50 so that these villages have been excluded from the present analysis. In addition, there were 1718 villages in which there was no female worker at the time of the 2011 population census. These villages have also been excluded from the present analysis. The present analysis, therefore, is restricted to 554618 or around 86.5 per cent of the villages of the country identified at the time of the 2011 population census. Total population of the villages included in the present analysis accounted for almost 99.7 per cent of the rural population of the country enumerated at the 2011 population census.

The index of extensiveness of female productive engagement, e, in a village has been estimated from the data from the population census as the ratio of the total number of female workers to the total female population in the village. It is not possible to estimate LFPR at the village level because the distribution of the village population by age and the distribution of workers by age are not available from the population census. Therefore, only a crude measure of the index of extensiveness of female productive engagement can be calculated at the village level in India. In other words, an index e, measuring the extensiveness of female productive engagement may be calculated as

$$e = \frac{Number\ of\ female\ workers}{Total\ number\ of\ females} \qquad (10)$$

On the other hand, estimation of the index of intensiveness of female productive engagement, i, requires estimation of the average number of days of productive

engagement in a year per female in the village. Data related to the actual duration of engagement in productive activities in a year are not available from the 2011 population census. Instead, population census classifies a person enumerated at the census into three categories based on the work status of the person – non-worker, main worker and marginal worker. The main worker is classified as a worker who has worked for at least 6 months during the year prior to the census or during the year 2010. All other workers are classified as marginal workers. Marginal workers are further classified into categories depending upon the duration of productive engagement – marginal workers who had worked for 3-6 months during the year prior to the census and marginal workers who had worked for less than 3 months. The last category includes all those persons who had worked for even a day during the year prior to the census.

For estimating the index of the intensiveness of productive engagement, we have assumed that the maximum number of days of productive engagement in a year is 270 days (mid value of the interval 180-365 days). We have also assumed that the average number of days of productive engagement of workers who were productively engaged for a period of 3-6 months during the year prior to the census is 135 days (mid value of the interval 90-180 days) and the average number of days of productive engagement of workers who worked for less than 3 months during the year prior to the census is 45 days (mid value of the interval 1-90 days). Based on these assumptions, the average number of days of productive engagement in a year (*ade*) by a female during the year prior to the census is calculated as

$$ade = \frac{(270 \times F_M + 135 \times F_G + 45 \times F_L)}{F} \quad (11)$$

where F_M is the number of females who were engaged in a productive activity for at least 6 months during the year preceding the 2011 population census, F_G is the number of females who were engaged in a productive activity for 3-6 months, F_L is the number of females who were engaged in a productive activity for less than 3 months in the year preceding the population census and F is the total number of females in the village. The population census does not provide the distribution of the population and the distribution of workers by age. Once, *ade* is estimated, the index of intensiveness of productive engagement, *i*, is calculated as

$$i = \frac{ade}{270} \quad (12)$$

Finally, we have measured the level of female education in the village in terms of female literacy rate which is defined as the proportion of the females aged 7 years and above in the village who were able to read and write with understanding to the total number of females aged 7 years and above in the village at the time of the 2011 population census. On the other hand, the level of fertility in the village is surrogated by the ratio of the children aged 0-6 years to the females aged 7 years and above in the village. This ratio is very similar to the familiar child-woman ratio which is a crude indicator of fertility in the population (Shryock and Siegel, 1980). It has been assumed that the higher this ratio, the higher the level of fertility in the village. Similarly, the gender balance in the village is measured in terms of the ratio of the males aged 7 years and above to the female aged 7 years and above in the village while the social class structure of the population is measured in terms of the proportion of Scheduled Tribes females to total females in the village at the time of 2011 population census.

Female Productive Engagement in Villages

The total number of females enumerated at the 2011 population census who were engaged in any productive activity during the year prior to the 2011 population census in 554618 villages included in the present analysis was 404755217 out of which 121479177 females were reported to have engaged in some productive activity during the year prior to the census. This means that around 30 per cent of the females in these villages were engaged in a productive activity during the year 2010. The proportion of females engaged as a cultivator was around 8.6 per cent; as an agricultural labourer was around 15 per cent; as a household industry worker was 1.5 and as any other worker was 5.3 per cent. The average number of days for which a rural female was engaged in some productive activity during 2010 was around 202 days, 213 days for cultivators, 193 days for agricultural labourers, 192 days for household industry workers, and 209 days and for all other workers. This means that the index of female productive engagement, *p*, in the rural areas of the country was 0.224 in 2010. The index of the extensiveness of female productive engagement, *e*, was 0.300, but the index of the intensiveness of female productive engagement, *i*, was 0.748. Both *e*, and *i*, vary across different categories of productive engagement so that the index *p*, was the lowest in household industry workers but the highest in agricultural labourers (Table 1).

Table 1: Index of productive engagement *p*, index of extensiveness of productive engagement, *e*, index of intensiveness of productive engagement, *i*, and average duration of engagement of rural females in India, 2010.

Category of productive engagement	Index of productive engagement	Index of extensiveness of productive engagement	Index of intensiveness of productive engagement	Average number of days of productive engagement in the year
	p	*e*	*i*	*ade*
All	0.224	0.300	0.748	202
Cultivators	0.068	0.086	0.790	213
Agricultural labourers	0.104	0.146	0.717	193
Household industry workers	0.011	0.015	0.711	192
All other workers	0.041	0.053	0.775	209

Source: Author

The variation in the index, *p*, across different categories of productive engagement is due to the variation in the index *e* and the index *i*. The index *p* is the highest in agricultural labourers because of relatively the highest index *e* as the index *i* is the second lowest in this category of productive engagement. On the other hand, the index *p* is the lowest in household industry workers because both index *e* and index *i* are the lowest in this category of engagement across the four categories of engagement. In case of all other workers, the index *e* is also very low but the index *i* is the second highest in this category of productive engagement. The average number of days of productive engagement during the year preceding the 2011 population census or in 2010 was 202 days – highest in cultivators but the lowest in household industry workers.

The female productive engagement index, p, is found to vary widely across the 554618 villages included in the analysis (Table 2). There is only one village – Sampanphi in sub-district Machi of Manipur – where the index p is estimated to be 1 which means that all females of the village were engaged in some productive activity for 270 days on average during the year preceding the 2011 population census. In more than 45 per cent villages, however, the female productive engagement was very low as the index p is estimated to be less than 0.200 (Table 1 and Figure 1). On the other hand, in around 11 per cent villages, the productive engagement of females in 2010 may be termed as very high as the index p was at least 0.500 in these villages. In almost two-third villages included in the present analysis, the engagement of females in productive activities was below the average ($p<0.300$) during the year preceding the 2011 population census. The kernel density plot shows that the distribution of the villages in terms of the female productive engagement index, p, is positively skewed which means that in majority of the villages included in the present analysis, the engagement of females in productive activities during the year preceding the 2011 population census was below the average. There were only around 20 per cent villages in which the engagement of females in productive activities during the year preceding the 2011 population census was above the average.

Table 2: Distribution of 554618 villages of India by in terms of indexes p, e and i according to the 2011 population census.

Distribution of villages by index of productive engagement (p) and index of extensiveness of productive engagement (e)			Distribution of villages by index of intensiveness of productive engagement (i)	
Level	p	e	Level	i
Very low (< 0.200)	45.5	32.3	Very low (< 0.500)	13.9
Low (0.200-0.300)	18.3	11.1	Low (0.500-0.600)	17.0
Average (0.300-0.400)	14.5	11.4	Average (0.600-0.700)	12.5
High (0.400-0.500)	10.8	15.8	High (0.700-0.800)	12.7
Very high (≥0.500)	10.9	29.4	Very high (≥0.800)	43.8
N	554618	554618		554618

Source: Author

The female productive engagement village is determined by both extensiveness and intensiveness of the productive engagement. Table 2 and Figures 2 and 3 show that the distribution of villages in terms of the extensiveness and in terms of the intensiveness of female productive engagement during the year 2010 was markedly different. In about one third of the villages included in the present analysis, the extensiveness of female productive engagement was very low ($e<0.200$) whereas in almost 30 per cent villages, it was very high ($e\geq0.500$). By contrast, intensiveness of female productive engagement was above the average ($i\geq0.600$) in more than 56 per cent of the villages whereas it was below the average ($i<0.600$) in around 30 per cent villages. Females in these villages were engaged in productive activities for around 162 days, on average, during the year preceding the 2011 population census. On the other hand, in close to half of the villages included in the present analysis, the intensiveness of productive engagement was very high ($i\geq0.800$) during the year preceding the 2011 population census. Females in these villages were engaged in productive engagement for at least 215 days during the year preceding the 2011 population census.

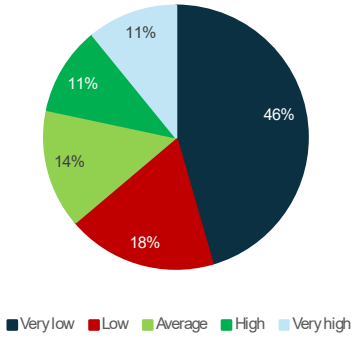
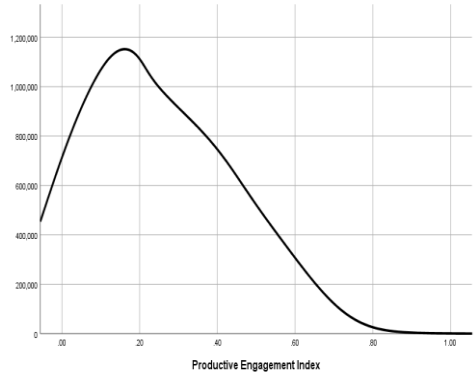


Figure 1: Distribution of villages by index *p*.
Source: Author



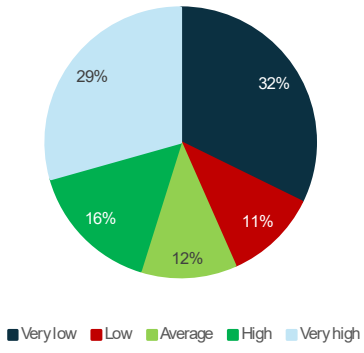
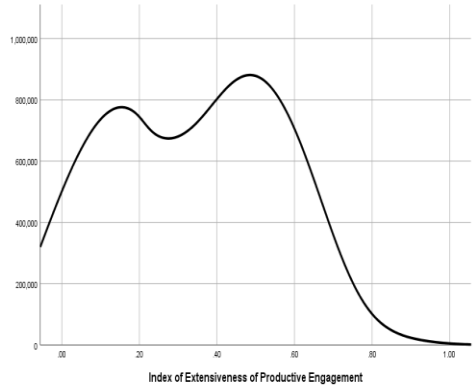


Figure 2: Distribution of villages by index *e*.
Source: Author



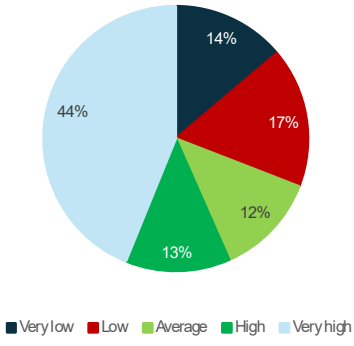


Figure 3: Distribution of villages by index *i*.
Source: Author

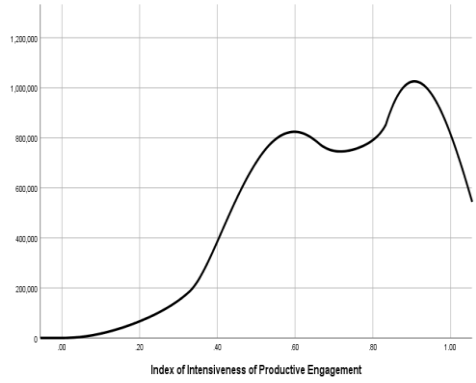


Table 3 gives the distribution of villages by both the level of the index of extensiveness, *e*, and the level of the index of intensiveness, *i*. In around 15 per cent villages, the intensiveness of the productive engagement of females was very high but the extensiveness of female productive engagement was very low. On the other hand, in about 13 per cent of the villages, both extensiveness and intensiveness of productive engagement of females was very high. In more than one-tenth of the villages, both intensiveness and extensiveness of the engagement of females in productive activities was below the average whereas in almost one fourth of the villages, both extensiveness and intensiveness of the engagements of females in productive activities was above the average according to the 2011 population census.

Table 3: Joint distribution of 554618 villages of India in terms of the index *e* and the index *i*, in the year 2010.

Index of extensiveness of productive engagement (*e*)	Index of intensiveness of productive engagement (*i*)					
	Very low	Low	Average	High	Very high	All
Very low	3.1	3.9	5.0	5.4	14.8	32.3
Low	1.7	2.2	1.7	1.5	4.0	11.1
Average	1.8	2.1	1.5	1.4	4.6	11.4
High	2.4	2.9	1.7	1.7	7.0	15.8
Very high	4.8	5.9	2.6	2.7	13.3	29.4
All	13.8	17.0	12.5	12.8	43.8	100.0

Source: Author

Table 4 gives the distribution of villages in according to the index *p*, index *e* and index *i* for the four categories of productive engagement – cultivators, agricultural labourers, household industry workers and all other workers – as defined at the 2011 population census. In 46806 (8.4 per cent) villages of the country, there was no female who was productively engaged as cultivator during the year prior to the 2011 population census or during the year 2010. In the remaining 507812 villages, productive engagement of females as cultivators was above the average in only around 5 per cent of the villages. Similarly, in 54120 (9.8 per cent) villages, there was no female who was productively engaged as agricultural labourer during the year prior to the census. In the remaining 500498 villages, the productive engagement of females as agricultural labourers was above the average in just around 3 per cent of the villages included in the analysis. On the other hand, in 253086 (45.6 per cent) villages, there was no female who was productively engaged as the household industry worker during the year 2010. In the remaining 301532 villages, the productive engagement of females as the household industry worker was above the average in only a negligible proportion (0.1 per cent) of the villages. Finally, in 36610 (6.6 per cent) villages, there was no female who was productively engaged in activities other than cultivator, agricultural labourer and household industry worker. In the remaining 518009 villages, the productive engagement of females as workers other than cultivators, agricultural labourers and household industry workers was above the average in only 0.4 per cent of the villages. In more than 99 per cent villages in which there was at least 1 female engaged as household industry worker in the year 2010, the female productive engagement index was estimated to be very low according to the 2011 population census.

Table 4: Distribution of female productive engagement index across villages by the category of engagement, 2010.

Index	Very low	Low	Average	High	Very high	N	No engagement
			Cultivators				
p	82.9	7.4	4.4	3.0	2.4	507812	46806
e	77.6	7.0	5.4	4.8	5.2		
i	13.8	8.2	7.3	9.2	53.1		
			Agricultural labourers				
p	79.0	12.1	5.4	2.3	1.2	500498	54120
e	67.0	12.2	9.1	6.7	5.0		
i	24.3	14.4	9.0	8.7	33.8		
			Household industry workers				
p	99.3	0.5	0.2	0.1	0.0	301532	25306
e	98.6	0.7	0.4	0.2	0.1		
i	17.2	4.9	4.4	5.5	22.3		
			All other workers				
p	97.5	1.5	0.6	0.3	0.1	518008	36610
e	95.3	2.5	1.2	0.7	0.4		
i	7.3	6.9	9.2	13.2	56.8		

Source: Author

Classification of Villages by Extensiveness and Intensiveness of Female Productive engagement

Table 5 classifies Indian villages included in the present analysis based on the index of extensiveness, *e*, and the index of intensiveness, *i* of female productive engagement The classification and regression tree method (Breiman et al, 1984) has been adopted for the purpose of classification. This method divides villages into mutually exclusive and exhaustive groups such that the within-group homogeneity in terms of the index of female productive engagement is the maximum. The results of the classification exercise are presented in table 5 which suggest that 554618 villages of the country can be grouped into 14 groups or clusters depending upon the index of extensiveness, *e*, and the index of intensiveness, *i* of female productive engagement. The average of the index of female productive engagement, *p* in villages of different groups or clusters is different. In more than 16 per cent villages, the average index of female productive engagement, *p*, was the lowest among the 14 mutually exclusive groups or clusters of villages. In villages of this cluster, less than around 8 per cent of the females were engaged in some productive activities according to the 2011 population census. This means that opportunities for productive engagement of females were extremely limited in these villages. In another 11 per cent villages, the index of female productive engagement, on average was less than 0.100, again because of the very low index of extensiveness of female productive engagement. In other words, close to 30 per cent villages included in the present analysis may be termed as the hotspot villages as far as productive engagement of females is concerned according to the 2011 population census.

Table 5: Classification of villages in terms of the index *e* and the index *i* distribution of villages in different clusters.

Cluster (Node)	*e*	*i*	*p*		
			Mean	SD	N
7	≤0.081		0.034	0.017	91085
8	>0.081 ≤0.164		0.086	0.027	63714
9	>0.164 ≤0.335	≤0.727	0.135	0.040	57973
15	>0.164 ≤0.248	>0.727	0.181	0.028	24414
16	>0.248 ≤0.335	>0.727	0.261	0.034	25090
11	>0.335	≤0.427	0.168	0.055	22069
17	>0.335 ≤0.524	>0.427 ≤0.728	0.251	0.045	62505
23	>0.524	>0.427 ≤0.589	0.313	0.040	38654
24	>0.524	>0.589 ≤0.728	0.397	0.053	17201
19	≤0.427	>0.728	0.346	0.041	31194
20	>0.427 ≤0.514	>0.728	0.432	0.046	43248
25	>0.514 ≤0.614	>0.728 ≤0.898	0.458	0.036	17974
26	>0.514 ≤0.614	>0.898	0.545	0.032	26155
14	>0.614	>0.728	0.619	0.074	23323

Source: Author

At the other extreme, there are only around 4 per cent villages in which female productive engagement was relatively the highest. In all these villages, the extensiveness of female productive engagement was more than 61 per cent. At the same time, the average number of days of female engagement in productive activities in the year preceding the 2011 population census was at least 197 days. The classification exercise also suggests that it is the extensiveness of the engagement of females in productive activities which is around three times more important than the intensiveness of the engagement in productive activities in deciding the level of female productive engagement in the village. The conventional worker population ratio depicts the extensiveness of the engagement of females in productive activities only. It does not reflect the intensiveness of the engagement which has also been found to vary widely across the villages as revealed through the data available from the 2011 population census.

Female Productive Engagement by Village Characteristics

We have also grouped villages in terms of five key characteristics of the village population to analyse how female productive engagement varies by village population characteristics. The village characteristics included in the exercise are: 1) population size; 2) gender balance measured in terms of the ratio of the number of males aged 7 years and above to the number of females aged 7 years and above; 3) social class composition measured in terms of the proportion of Scheduled Tribes females to total females; 4) female literacy rate measured in terms of the proportion of females aged 7 years and above who were able to read and write with understanding; and 5) level of fertility measured in terms of the ratio of the population aged 0-6 years to females aged 7 years and above. This exercise revealed that 554618 villages of India can be grouped into 9 clusters in terms of the five village characteristics and the average female productive engagement index across

the nine clusters varies from a minimum of just 0.162 to a maximum of 0.383 as shown in table 6 and depicted in the figure 5. The female productive engagement index was the lowest in villages having a population of at least 611 persons, villages having virtually no Scheduled Tribes population and villages with gender balance favourable to males (Node 10). They constitute almost one fourth of the villages included in the present analysis.

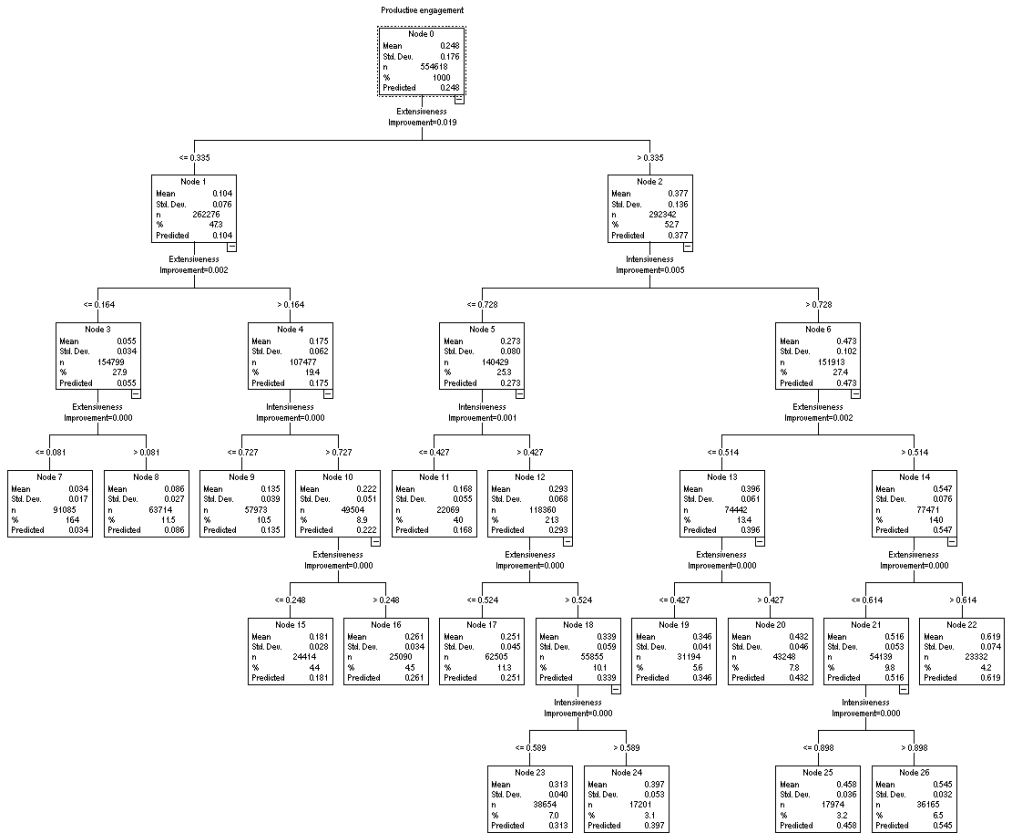


Figure 4: Classification of villages in terms of index *e* and index *i*.
Source: Author

On the other hand, female productive engagement index was the highest in villages where Scheduled Tribes females were less than 64 per cent of the total females, fertility was very low as reflected through the ratio of children aged 0-6 years to females aged 7 years and above and less than 52 per cent of the females aged 7 years and above were able to read and write with understanding (Node 15). These villages constitute less than 3 per cent of the villages included in the present analysis. Female productive engagement index was also high, on average, in villages where Scheduled Tribes female constituted more than 64 per cent of the total females (Node 6) and in villages where the gender balance in population aged 7 years and above is favourable to females and female literacy is low (Node 13).

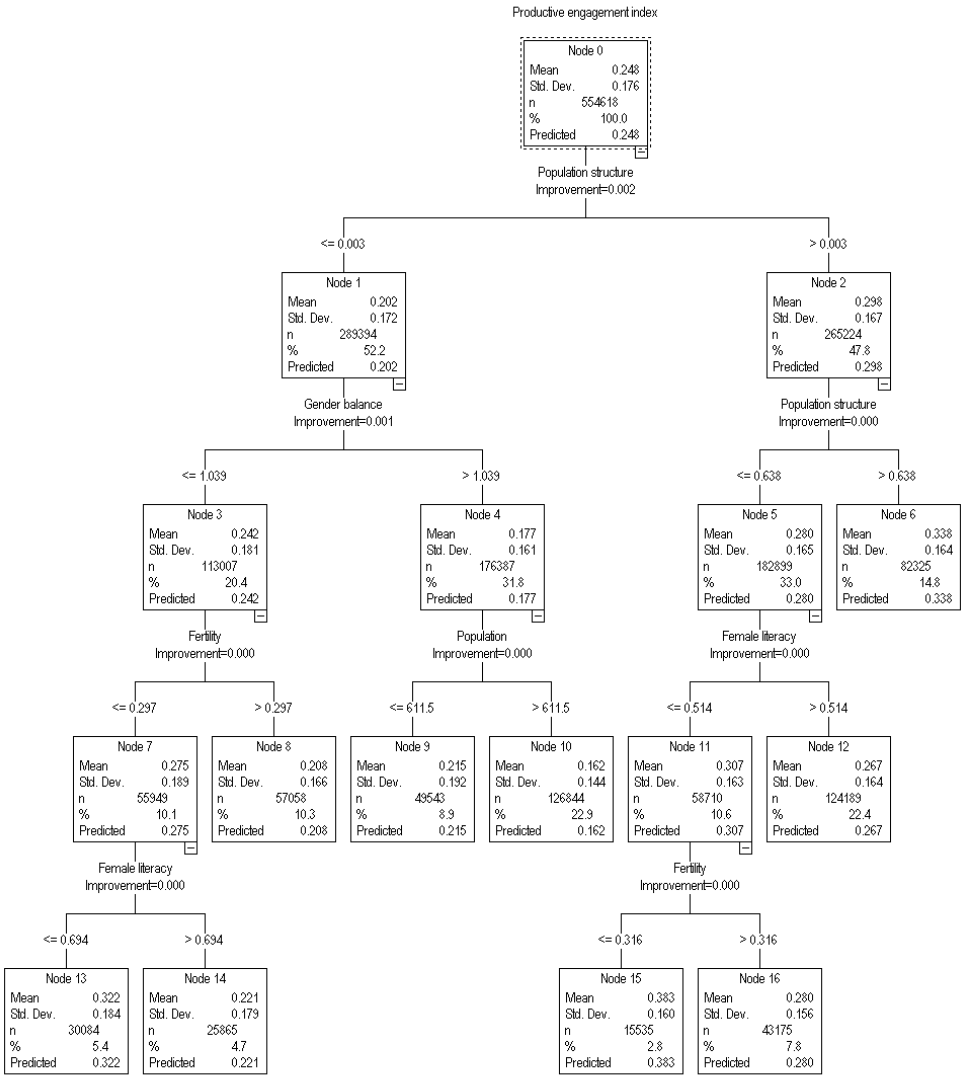


Figure 5: Classification of villages by selected characteristics of the village population. Source: Author

An interesting observation of the figure 5 is that female productive engagement is lower, on average, in villages in which female literacy is high compared to villages in which it is low. In villages where there was virtually no Scheduled Tribes population, gender balance was favourable to females, fertility was low and effective female literacy rate was low, the index p was 0.322 ± 0.184 (Node 13) compared to 0.221 ± 0.179 in villages where effective female literacy was more than 69 per cent (Node 14). Similarly, in villages where

Scheduled Tribes females constituted less than 64 per cent of the total females, the index *p* was 0.307±0.163 in villages in which the effective female literacy rate was less than 51 per (Node 11) compared to 0.267±0.164 in villages in which effective female literacy rate was more than 51 per cent (Node 12). It appears that opportunities of productive engagement for literate females was limited in the villages.

There also exists a negative association between fertility and female productive engagement. In villages having virtually little Scheduled Tribes population and gender balance favourable to females, the index *p* was 0.275±0.189 in villages in which the ratio of children aged 0-6 years to females aged 7 years and above was less than 0.300 (Node 7) compared to 0.208±0.166 in villages in which this ratio was more than 0.300 (Node 8). Similarly, in villages in which Scheduled Tribes females were less than 64 per cent of total females and effective female literacy was less than 51 per cent, the index *p* was 0.383±0.160 in villages in which the ratio of children aged 0-6 years to females aged 7 years and above was ≤ to 0.316 (Node 15) compared to villages in which this ratio was >0.316 (Node 16). The index *p* was also high in villages in which gender balance was favourable to females than in villages in which it was favourable to males (Nodes 3 and 4). The size and the social class composition of the village population has also been found to be influenced the female productive engagement in the village.

The patterns of female productive engagement in different clusters (Nodes) are presented in table 7. The variation in the index *p* across clusters is due to both variation in the index of extensiveness of productive engagement, *e*, and variation in the index of intensiveness of productive engagement, *i*. There are three clusters where more than 40 per cent of females were found to be engaged in productive activities whereas there is only one cluster where this proportion was less than 25 per cent. On the other hand, there are only two clusters in which the intensity of engagement in productive activities was more than 80 per cent which means that average number of days of female productive engagement in villages of these clusters was more than 215 days, on average. By comparison, there is only one cluster in which the intensity of engagement of females in productive activities was less than 70 per cent. This cluster is the only cluster in which average number of days of female productive engagement was less than 190 days during the year preceding the 2011 population census.

More specifically, the weighted average of the index *p* was the highest in cluster 15. Both index of extensiveness, *e*, and index of intensiveness, *i*, were the highest in this cluster. A female, in villages of this cluster was productively engaged for about 227 days out of the maximum possible 270 days of productive engagement in a year, on average. On the other hand, female productive engagement was the lowest in villages of cluster 10, on average, because of the lowest index of extensiveness of female productive engagement, *e*, although the index of intensiveness of female productive engagement, *i*, was not the lowest in this cluster. The index of the intensiveness of the female productive engagement, *i*, was the lowest in villages of cluster 8, on average. In villages of cluster 8, a female, on average, was productively engaged for only about 188 days in the year preceding the 2011 population census. Female productive engagement was also very low, on average, in villages of cluster 9 because of very low index of extensiveness of female productive engagement, *e*, although the index of intensiveness of female productive engagement, *i*, was high in the villages of this cluster.

Table 6: Classification of villages according to village characteristics and average female productive engagement index in different clusters of villages.

Node	Social class composition	Gender balance	Fertility	Literacy	Population	Productive engagement index (p)			Number of villages
						Unweighted average	SD	Weight average	
10	≤0.003	>1.039			>611	0.162	0.144	0.151	126844
8	≤0.003	≤1.039		>0.297		0.208	0.166	0.185	57058
9	≤0.003	>1.039			≤611	0.215	0.192	0.208	49543
14	≤0.003	≤1.039	>0.694	≤0.297		0.221	0.179	0.194	25865
12	>0.003 ≤0.638			>0.514		0.267	0.164	0.249	124189
16	>0.003 ≤0.638		>0.316	≤0.514		0.280	0.158	0.260	43175
13	≤0.003	≤1.039	≤0.694	≤0.297		0.322	0.184	0.335	30084
6	>0.638					0.338	0.164	0.335	82325
15	>0.003 ≤0.638		≤0.316	≤0.514		0.383	0.160	0.408	15535
All						0.248	0.178	0.224	554618

Source: Author

Table 7: Female productive engagement, effectiveness and intensiveness of engagement in different village clusters.

Index	Node/Cluster									
	6	8	9	10	12	13	14	15	16	All
Social class composition	*>0.638*	*≤0.003*	*≤0.003*	*≤0.003*	*>0.003 ≤0.638*	*≤0.003*	*≤0.003*	*>0.003 ≤0.638*	*0.003-0.638*	*All*
Gender balance	*All*	*≤1.039*	*>1.039*	*>1.039*	*All*	*≤1.039*	*≤1.039*	*All*	*All*	*All*
Fertility	*All*	*All*	*All*	*All*	*All*	*≤0.694*	*>0.694*	*≤0.316*	*>0.316*	*All*
Literacy	*All*	*>0.297*	*All*	*All*	*>0.514*	*≤0.297*	*≤0.297*	*≤0.514*	*≤0.514*	*All*
Population size	*All*	*All*	*≤611*	*>611*	*All*	*All*	*All*	*All*	*All*	*All*
					All workers					
p	0.335	0.185	0.208	0.151	0.249	0.335	0.194	0.408	0.260	0.224
e	0.470	0.266	0.295	0.213	0.316	0.405	0.252	0.486	0.368	0.300
i	0.712	0.697	0.705	0.709	0.787	0.826	0.771	0.840	0.706	0.748
ade	192	188	190	191	212	223	208	227	191	202
					Cultivators					
p	0.140	0.062	0.089	0.044	0.065	0.099	0.050	0.101	0.090	0.068
e	0.176	0.085	0.119	0.059	0.079	0.116	0.068	0.111	0.117	0.086
i	0.797	0.735	0.744	0.751	0.826	0.855	0.727	0.906	0.768	0.790
ade	215	198	201	203	223	231	196	245	207	213
					Agricultural labourers					
p	0.154	0.076	0.075	0.063	0.122	0.171	0.064	0.244	0.127	0.104
e	0.236	0.117	0.114	0.095	0.160	0.211	0.084	0.298	0.190	0.146
i	0.653	0.654	0.655	0.667	0.763	0.810	0.766	0.816	0.669	0.717
ade	176	177	177	180	206	219	207	220	181	193
					Household industry workers					
p	0.007	0.012	0.009	0.010	0.011	0.013	0.012	0.021	0.009	0.011
e	0.011	0.017	0.013	0.015	0.015	0.016	0.016	0.024	0.013	0.015
i	0.620	0.677	0.654	0.684	0.736	0.807	0.764	0.861	0.654	0.711
ade	167	183	177	185	199	218	206	232	177	192

Index	Node/Cluster									
	6	8	9	10	12	13	14	15	16	All
Social class composition	*>0.638*	*≤0.003*	*≤0.003*	*≤0.003*	*>0.003 ≤0.638*	*≤0.003*	*≤0.003*	*>0.003 ≤0.638*	*0.003-0.638*	*All*
Gender balance	*All*	*≤1.039*	*>1.039*	*>1.039*	*All*	*≤1.039*	*≤1.039*	*All*	*All*	*All*
Fertility	*All*	*All*	*All*	*All*	*All*	*≤0.694*	*>0.694*	*≤0.316*	*>0.316*	*All*
Literacy	*All*	*>0.297*	*All*	*All*	*>0.514*	*≤0.297*	*≤0.297*	*≤0.514*	*≤0.514*	*All*
Population size	*All*	*All*	*≤611*	*>611*	*All*	*All*	*All*	*All*	*All*	*All*
					Other workers					
p	0.034	0.035	0.036	0.033	0.050	0.052	0.069	0.043	0.034	0.041
e	0.048	0.047	0.049	0.044	0.062	0.062	0.085	0.052	0.048	0.053
i	0.711	0.741	0.740	0.749	0.810	0.831	0.811	0.826	0.717	0.775
ade	192	200	200	202	219	224	219	223	193	209
Number of villages	82325	57058	49543	126844	124189	30084	25865	15535	43175	554618

Source: Author

Table 8: Decomposition of the difference between all clusters average index of female productive engagement, p, and index of female productive engagement index in a cluster.

Node	∇p	Difference attributed to													
		∂e	∂i	Cultivators			Agricultural labourers			Household industry workers			Others		
				∇p	∂e	∂i	∇p	∂e	∂i	∇p	∂e	∂i	∇p	∂e	∂i
10	-0.074	-0.064	-0.010	-0.024	-0.021	-0.003	-0.041	-0.035	-0.006	0.000	0.000	0.000	-0.008	-0.007	-0.001
8	-0.039	-0.025	-0.014	-0.006	-0.001	-0.005	-0.028	-0.020	-0.008	0.001	0.002	-0.001	-0.006	-0.004	-0.002
14	-0.030	-0.036	0.006	-0.019	-0.014	-0.005	-0.040	-0.046	0.006	0.001	0.001	0.001	0.027	0.025	0.003
9	-0.017	-0.004	-0.013	0.020	0.025	-0.005	-0.030	-0.022	-0.008	-0.002	-0.001	-0.001	-0.005	-0.003	-0.002
12	0.024	0.012	0.012	-0.003	-0.006	0.003	0.018	0.010	0.007	0.000	0.000	0.000	0.009	0.007	0.002
16	0.036	0.050	-0.014	0.022	0.024	-0.002	0.023	0.031	-0.008	-0.002	-0.001	-0.001	-0.007	-0.004	-0.003
13	0.110	0.083	0.028	0.031	0.024	0.007	0.067	0.050	0.017	0.002	0.001	0.001	0.010	0.007	0.003
6	0.110	0.124	-0.014	0.072	0.071	0.001	0.050	0.062	-0.012	-0.004	-0.003	-0.001	-0.007	-0.004	-0.003
15	0.184	0.148	0.036	0.033	0.021	0.011	0.139	0.117	0.022	0.010	0.007	0.003	0.002	-0.001	0.003

Remarks: $\nabla p = \partial e + \partial i$

Source: Author

Table 7 also presents the distribution of the index *p* by different categories of productive engagement. The index *p* in cultivators was the highest in cluster 6 whereas in other workers, it was the highest in cluster 14. In case of agricultural labourers and household industry workers, the index *p* was the highest in cluster 15. Table 7 shows wide variation in indexes *e* and *i* in different categories of productive engagement across the nine clusters. The relative contribution of the two indexes to the index *p* has also been different in different categories of productive engagement in different clusters of villages identified through the classification modelling exercise.

Table 8 decomposes the difference between the index *p* in a cluster and in all clusters combined into the difference attributed to the index *e* and the index *i*. In three clusters 10, 8 and 9, both extensiveness and intensiveness of female productive engagement contributed to lower the index *p* relative to the average. Similarly, in clusters 12, 13 and 15, both extensiveness and intensiveness contributed to higher index *p* relative to the average. In the remaining three clusters, the contribution of the difference in the extensiveness of female productive engagement to female productive engagement was higher relative to the average but the contribution of the difference in the intensiveness of female productive engagement to the difference in female productive engagement was lower relative to the average. In these clusters, female productive engagement was lower than the extensiveness of female engagement in productive activities.

Table 8 also reveals that the magnitude of the contribution of the difference in the index *e* is substantially higher than that of the index *i* in all but two clusters. One reason may be the way the index *i* has been calculated because of the data constraints. At the 2011 population census, data pertaining to actual number of days of productive engagement was not collected from those who were productively engaged even for a day during the year preceding the census. Instead, every worker enumerated at the census was asked whether she or he was productively engaged either for 6 months and more or for 3-6 months or for less than 3 months during the year prior to the census. Estimate of the average number of days of productive engagement per female has, therefore, been derived by assuming that the number of days of productive engagement of a worker during the year prior to the census is either 270 days or 135 days or 45 days only. As such, the variation in the intensiveness of female productive engagement across villages is substantially limited.

Regional Pattern in Female Productive Engagement

Table 9 presents the distribution of villages by the index *p* in different states/Union Territories of the country. In 17 states/Union Territories, the index *p* was very low in more than half of the villages. In Chandigarh, female productive engagement was very low in all villages whereas in Delhi, Punjab and Andaman and Nicobar Island, it was very low in more than 80 per cent of the villages. By contrast, in eight states/Union Territories, female productive engagement was very low in less than 20 per cent of the villages. Nagaland and Andhra Pradesh are the only two states/Union Territories where female productive engagement was very low in less than 10 per cent of the villages. In Sikkim, Chhattisgarh, Maharashtra and Tamil Nadu also, female productive engagement was very low in 10-15 per cent villages. On the other hand, female productive engagement was found to be very high in more than one third villages in only Maharashtra and Andhra Pradesh. In Himachal

Pradesh, Uttarakhand, Nagaland, Manipur, Mizoram and Tamil Nadu, female productive engagement was very high in more than 20 per cent villages. In majority of the states/Union Territories, however, female productive engagement was very high in only a small number of villages. In Chandigarh, Delhi, Daman and Diu, Lakshadweep and Puducherry, there was no village where female productive engagement was very high. In 11 states/Union Territories, female productive engagement was very high in a negligible proportion of villages. There was substantial variation in female productive engagement across villages in each state/Union Territory. This variation in female productive engagement across villages shows that local, village-specific, social, economic and cultural factors play a decisive role in deciding female productive engagement.

Viewed differently, more than 40 per cent of the villages in which female productive engagement was very low in 2010 are located in Uttar Pradesh (28.7 per cent), Bihar (11.1 per cent) and Jharkhand (10.9 per cent) only whereas almost 54 per cent of the villages in which female productive engagement was very high are located in Maharashtra (22.5 per cent), Andhra Pradesh (13.9 per cent), Rajasthan (8.9 per cent) and Karnataka (8.4 per cent). Similarly, almost half of the villages in which female productive engagement was high are located in Maharashtra (15.1 per cent), Madhya Pradesh (12,3 per cent, Rajasthan (11.8 per cent) and Andhra Pradesh (10.6 per cent). On the other hand, more than one third of the villages in which female productive engagement was low were located in Madhya Pradesh (11.6 per cent), Uttar Pradesh (11.6 per cent) and Rajasthan (10.6 per cent) whereas around one third of the villages in which female productive engagement was average were in Madhya Pradesh (12.1 per cent), Uttar Pradesh (11.5 per cent) and Maharashtra (9.5 per cent). In Kerala, female productive engagement was either low or very low in all but few villages.

Conclusions

Engagement in productive activities is commonly measured in terms of the worker population ratio (WPR) and the labour force participation rate (LFPR) which are unidimensional indicators of engagement as they are based on the extent of engagement only. Both the indicators have limitations in measuring the true productive engagement as they do not consider the intensity of the productive engagement. In this paper, we have constructed an alternative index of productive engagement that considers both extensiveness and intensiveness of engagement to provide a better understanding of productive engagement. The index has been used to measure female productive engagement in more than 554 thousand villages of India during the year 2010 for which the data are available through the 2011 population census. The population census is the only source in India which provides data related to the productive engagement of the people in the villages of the country, although in a limited context. The next population census in India is going to be conducted in the year 2027. The findings presented in the present paper may, therefore, serve as a benchmark to measure the progress in the engagement of females in productive activities in the villages of the country. Since, engagement of females in productive activities is a widely used indicator of women empowerment, the present analysis also serves as benchmark to measure the progress in women empowerment at the village level in India.

Table 9: Distribution of villages in different states/Union Territories of the country by the level of female productive engagement (index *p*) as revealed through the 2011 population census.

State/Union Territory	Proportion (per cent) of villages in the state/Union Territory in which the index of female productive engagement, *p*, was					Number of villages
	Very low <0.500	Low 0.500-0.550	Average 0.550-0.600	High 0.600-0.650	Very high ≥0.650	
Jammu & Kashmir	78.2	13.8	5.1	1.8	1.2	6074
Himachal Pradesh	31.4	15.6	22.7	9.1	21.3	13402
Punjab	87.6	6.7	2.9	1.3	1.5	11612
Chandigarh	100.0	0.0	0.0	0.0	0.0	5
Uttarakhand	29.3	17.6	14.1	16.2	22.7	11534
Haryana	73.7	16.2	6.9	2.1	1.2	6487
Delhi	97.0	2.0	1.0	0.0	0.0	101
Rajasthan	20.5	26.3	22.7	17.3	13.2	40734
Uttar Pradesh	78.2	12.7	5.1	2.5	1.4	92686
Bihar	74.3	15.1	5.9	3.0	1.7	37678
Sikkim	14.6	26.1	25.3	18.9	15.1	403
Arunachal Pradesh	20.1	16.3	19.6	26.4	17.6	2826
Nagaland	5.3	10.0	19.6	33.8	31.4	1336
Manipur	20.1	16.7	18.7	21.6	22.9	2268
Mizoram	17.9	14.1	17.4	27.7	22.9	672
Tripura	57.9	24.9	11.4	4.0	1.9	859
Meghalaya	28.6	21.7	19.4	21.7	8.6	5362
Assam	58.4	17.6	12.3	6.8	4.9	23280
West Bengal	74.0	15.3	7.0	2.2	1.4	35739
Jharkhand	45.7	27.2	14.6	7.5	5.0	26813
Odisha	51.5	22.9	15.0	5.6	5.0	42089
Chhattisgarh	14.5	23.1	26.5	20.6	15.3	18864
Madhya Pradesh	29.7	23.9	19.9	15.0	11.5	49165
Gujarat	38.2	25.6	19.9	9.4	6.9	17561
Daman and Dieu	68.4	15.8	15.8	0.0	0.0	19
Dadra & Nagar Haveli	35.4	35.4	23.1	4.6	1.5	65
Maharashtra	11.3	12.8	19.2	22.6	34.1	39794
Andhra Pradesh	8.2	12.8	20.0	25.4	33.6	24987
Karnataka	19.7	19.4	23.4	17.7	19.7	25707
Goa	69.5	24.9	3.9	1.3	0.3	305
Lakshadweep	75.0	25.0	0.0	0.0	0.0	4
Kerala	71.1	23.1	4.5	0.9	0.4	1016
Tamil Nadu	14.5	20.5	22.8	21.2	20.9	14818
Puducherry	66.7	22.2	10.0	1.1	0.0	90
Andaman & Nicobar Islands	82.9	9.5	4.9	1.1	1.5	263
India	45.5	18.3	14.5	10.8	10.9	554618
Villages excluded from the analysis						

Source: Author

The present analysis reveals that female engagement in productive activities in the villages of the country was far from satisfactory around the year 2010. There are very small proportion of villages in which female engagement in productive activities may be termed as satisfactory. More specifically, there was only a nominal engagement of females in household level productive activities in all but a few villages. One reason may be very limited village level household level productive activities in India. Female engagement in productive activities in villages appears to be largely confined to engagement as agricultural labour which suggests that opportunities for productive engagement of females outside the agriculture sector are very limited in the villages of the country.

The analysis also suggests that female productive engagement in Indian villages is influenced by the size, social class structure and gender composition of the village population along with the level of female education, level of fertility. Female productive engagement is associated positively with the proportion of Scheduled Tribes population in the village but negatively with the level of fertility, level of female education and the size of the village population. The female productive engagement was also relatively lower in those villages where the gender balance was not in favour of females as compared to villages where the gender balance was in favour of females. When these five defining characteristics of the village are taken into consideration, more than 554 thousand villages of the country can be grouped into nine mutually exclusive groups or clusters, each having significantly different level of female productive engagement with strong regional pattern.

A revealing finding of the present analysis is that female productive engagement in a village is negatively associated with the level of female education in the village. This negative association contradicts the widely held argument that female education increases opportunities of engagement of women in productive activities and may be attributed to very limited opportunities of productive engagement of educated females in villages. Productive engagement opportunities in India villages is largely confined to the agriculture sector and that too in the form of agricultural labour. It is argued that females prefer women-centric work which can be discharged from the household or within the household premises in the nature of self-employment (Sanghi et al, 2015). Such opportunities of productive engagement, especially for females, appeared largely absent in the villages of the country according to the 2011 population census.

The present analysis refers to the situation that prevailed in Indian villages the year 2010. There has been no information about the participation in productive activities in the villages of the country after the 2011 population census because other sources of data on employment such as National Sample Survey and Periodic Labour Force Survey do not provide village level data on productive participation. There has, however, been very marked growth and expansion of the social and economic production system in India since the 2010 population census, and it may be expected that there would have also been significant change in the social and economic production system of the villages of the country since 2010. It is also expected that the change in the village social and economic production system would have influenced a change in the engagement of females in productive activities at the village level. The forthcoming 2027 population census will provide the village level data that will help in assessing the change in the village level social and economic production system and the productive engagement of females in the villages of the country against the benchmark presented in the present analysis. The comparison of

the situation that prevailed in 2010 with the situation that emerges from the 2027 population census data will facilitate analysing the impact of the policies and programmes directed towards women empowerment in India as female productive engagement is an integral component of all women empowerment efforts.

The main limitation of the present paper is the availability of data on productive engagement in India villages. The primary census abstract released after every decennial population census of the country is the only source that provides limited village level data about participation of the people in productive activities. The primary census abstract does not provide data related to the age composition of the population so that it is not possible to estimate refined estimates of productive engagement of the people at the village level. Another limitation of the census data is that information about the actual duration of productive engagement is not available. The present analysis, therefore, is based on crude measures of participation only.

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