A Segmentation-based Determination of Factors Influencing Women's Labor Force Participation

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Most of the studies in India on labor force participation of women considered the country as a whole ignoring the vast diversity within India.This study narrows its scopeon one state,viz. Maharashtra. Within Maharashtra, there are disparities among different regions.The study uses data from the National Sample Survey Office (NSSO) 68th Round for analysis.The paper offers two competing Probit models; first takes into account the impact of 7 variables – sub round, sector, gender, region, relation to the household head, religion and education.The second model includes marital status and the social group consisting of 54 micro segments, based on all possible combinations using the values of four variables – sector, marital status, social group and education.

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Introduction & Literature Review

Internationally,women's labor force participation (LFP) has received a lot of research attention, especially in developed countries. Killingsworth & Heckman(1986) and Schultz (1990) were two early papers in this regard, which noted the trends in female labor supply largely in the developed world. Moghadam(1999) added a new dimension of the impact of globalization at the turn of the millennium. Recently, Cooke (2010) further localized this topic by focusing on a comparative study of 4 Asian countries – China, India, Japan and South Korea.

But, in the Indian context, this topic had not received enough attention until recently. Of late, with successive governments steadily pushing towards improving employment opportunities and workforce participation, academicians have also started focusing on these areas.Here, the main challenge is to understand the Indian context independently of the scenarios of other countries (especially developed ones). As Dunlop & Velkoff (1999) suggest, "India is a multifaceted society where

no generalization could apply to all of the nation's various regional, religious, social, and economic groups. Nevertheless, certain broad circumstances in which Indian women live affect the ways they participate in the economy."Since the participation of citizens in economic activities is a vital macroeconomic indicator, research in this area has been gaining ground in India.

This paper extends the work of previous papers in two ways. While a majority of earlier studies are at an aggregated country level, this paper studies one particular state viz. Maharashtra. Another feature is that instead of a general study on the female and male genders together, we narrow the scope to one gender. We recognize a need to study the LFP of women separately for 2 important reasons. Firstly, women constitute nearly one half of the potential labor force, so an improvement in this statistic will significantly improve the economic output. Secondly, the factors which affect women's LFP are different from those for men. They are not only economic, but also socio-cultural. Although the traditional gender-based division of roles has ceased to exist in Western Europe, North America and such developed nations, it persists across most of Asia and Africa. For this reason, LFP is also correlated to gender equality. In a society with a high degree of gender equality, women have the encouragement to seek economic opportunities and thus, the LFP is high. Conversely, one can argue that a high LFP indicates a society with high gender equality. Yadav(2014) notes that "UNIFEM (the United Nations Development Fund for Women) considers that women's economic empowerment is essential for poverty alleviation and defines this as having access to and control over the means to make a living on a sustainable and long term basis." This makes the study of work participation of women a more complex matter than is often recognized.

Women's economic empowerment is essential for poverty alleviation.

The stark difference between women and men in India is apparent in the distribution of their usual principal status. As per the data of the 68th round of NSSO, in the age group of 15 – 64 (which represents potential earners), 22% women were employed and nearly 77% women were out of the labor force. On the other hand, among men in the same age group, almost 78% were employed and less than 20% were out of the labor force.It suggests that for males, the primary concern is about finding gainful employment, while for women, it is about being available for gainful employment in the first place. Hence, our approach should be to treat these two aspects differently.

The motivation of this paper is to understand the key factors which influence women's LFPin one state and to find their relative importance. Also, we want to compare the results with those which have come through similar studies. Hence, the paper begins with a review of relevant literature on the economic activities of women.

Srivastava & Srivastava (2010) notes the key difference between the participation of women and men. Whereas only economic reasons matter in the case of men, other factors such as proximity of the workplace, flexible hours are likely to be important driving forces in the case of women. Chakrabarti (1977) mentions a number of other factors, like inability of women to adapt themselves to quick economic transformation and low level of educational attainment.There was a puzzling decline in women's LFP in India after 2004 – 2005. Neff, Sen & Kling (2012) attempts to explain this using four standard explanations: that more women in rural areas are now pursuing higher education and are therefore not available for work (education effect), that household incomes are rising quickly enough that there is a tendency for women to withdraw from the labor force to attend to domestic duties (income effect), that employment opportunities for women are decreasing, and that social and cultural factors may be interacting with these three factors. Dutta et al (2012) gives a critique of India's Employment Guarantee Scheme (EGS) as to why, contrary to expectations, it has not resulted in a sustained increase in women's LFP. Taking this ahead, Verick (2016) notes that a significant proportion of women usually engaged in domestic duties reported their willingness to accept work if the work was made available at their household premises. Similarly, Chevalier & Viitanen (2002) establishes a causality between women's LFP and the availability of childcare. One can argue that if it is applicable in developed countries, it is even more applicable in South Asia and especially in India, where the fertility rate is higher.

Beneria (1979) elaborates that the focal point of women's economic activities is their special role in the reproduction of labor force, thus establishing causality from reproduction to production. Lim (2004) probes this viewpoint further. It examines the elusive or ambiguous relationship between fertility and women's labor force participation in those developing countries with intermediate levels of fertility. Cooke (2010) compares four major Asian economies: China, India, Japan and South Korea. While all these countries share considerable similarities in terms of social and cultural value, the paper singles India out as being different from the rest from an economic outlook. China, Japan and South Korea all follow an export-oriented economy, especially in large-scale manufacturing industries, which is naturally conducive to women's employment. On the other hand, our economy relies more on domestic demand, which is one of the reasons for the decline in women's LFP in both, the organized and unorganized sectors. Ghosh& Roy(1997) also agrees with this point. In terms of widening the scope of coverage, one of the comprehensive papers is from Besamusca et al (2015), spanning 117 countries. It investigates the effects of economic conditions, families, education, and gender ideologies in eleven age groups. It finds that women are more likely to participate when paid maternity leave schemes exist, enrolment in pre-primary education is higher, and countries are less religious. Schultz (1990) assesses patterns arising out of

the composition among wage earners, self-employed and unpaid family workers. It seems that women are the main group that loses ground due to labor-market regulations and distortions in low-income countries.

Our approach is different from the methods of earlier studies because of a detailed analysis on one state, as opposed to a broad one at a national level. Moreover, we recognize that even within one state (Maharashtra), there is significant regional variations. Hence, we introduce a new categorical variable called 'region' and use it to compare different regions in the state.Secondly, whereas other research studies have developed only one Probit model and tested its validity, the present paper evaluates two models. We measure the key statistics of both. Also, one observes that previous works have restricted themselves and considered only 2 or 3 factors. The most common of these are 'income', 'education level' and 'sector' (rural or urban). Here, we present a consolidated Probit model, which takes into account the joint impact of as many as 7 variables – sub round, sector, gender, region, relation to the household head, religion and education level. Finally, the main contribution of this paper is in probing deeper into some factors. Instead of confining ourselves to the overall effect of variables, we analyze the differences in their values. We create micro segments using the values of four variables – sector, marital status, social group and education level. There are 54 such micro segments, which satisfy the condition of 'mutually exclusive and collectively exhaustive' (MECE). This approach helps to identify the likelihood of LFP corresponding to various sub-segments of women.

Analytical Framework

From the above survey of available research, we see that the main influencing factors to test are: level of education, gender, economic status, location (urbanization), marital status, number of children and age. Except for number of children and age, the rest are categorical variables.The dependent variable (Y) we have chosen is Labor Force Participation (LFP), which is binary. It has only two possible values – 0 (which stands for non participation) and 1 (which stands for participation). Since the dependent variable is binary, a linear regression using ordinary least squares (OLS) is not applicable, as Singh (2016b) points out.

Hence, we prefer a Probabilistic Regression (Probit) framework. This is similar to the approach of Gandhi Kingdon & Unni (2001) which studies the effect only of education on LFP. It finds that in the few empirical studies within India, there is no consistent evidence of a positive relationship between education of females and their probability of LFP. Education has a U-shaped relationship with participation in employment, although the relationship is much stronger for women. Sebastian & Navaneetham (2008) uses Multivariate Logistic Regression to establish a U-shaped relationship with urbanization, age and marital status. Panda (1999) also uses a similar Logistic Regression and finds a U-shaped relationship with economic status. Singh

(2016a) uses multivariate regression with a fixed effect and random effect model.

Based on the above research techniques, our choice of analytical tool is Probit. On similar lines, this paper extends the scope of study of the existing research with the inclusion of more variables.Using the comparative technique of Singh (2017a) we build two competing models and compare them for their validity.

The Probit model is as follows:

$$\mathbf{P\ (LFP = 1 \mid X_1, X_2, X_3, \ldots, X_n) = \Phi}\ (b_0 + b_1 . X_1 + b_2 . X_2 + \ldots + b_n .X_n)$$

whereX_1, X_2, X_3, …, X_n are the predictor variables under consideration,

Φis the cumulative density function of the normal distribution.

Since the R-squared statistic is not directly available in a non-linear model like Logistic Regression or Probit, we resort to a Pseudo R^2statistic to test the validity. The 3common forms of this are McFadden, Cox & Snell and Nagelkerke.

R^2(McF)= 1 – (LL_1/ LL_0)

R^2(CS)= 1 – exp (- 2 * (LL_1 – LL_0) / N)

R^2(Ngl)= R^2(CS)/ (1 – exp (- 2 * LL_0 / N)),

where R^2(McF) is the Pseudo R^2as per McFadden,

R^2(CS) is the Pseudo R^2as per Cox & Snell,

R^2(Ngl) is the Pseudo R^2as per Nagelkerke,

LL_0 is the log likelihood of the intercept-only model,

To run a Probit model, we use IBM SPSS Statistics 22 toper form analyses in 2 stages:

1. Combination of variables – First, we run a series of regressions using different combinations of independent variables, so that we identify the most important variables in building our model.

2. Dummy variables of exhaustive combinations– After listing the possible values of each key variable, we develop an exhaustive list of combinations of these values and then create a dummy for each combination. Then, we run a comprehensive regression, taking care to avoid the dummy trap.

For the first analysis, we shall consider data of all citizens (female and male) of earning age in Maharashtra (N = 24,321). Then, for the next two, we shall segregate and focus only on data for females (N = 11,848). Throughout all analyses in this paper, the dependent variable (Y) is LFP.

Description of Data

The data are from the official Government of India source, NSSO's 68th round (2011 – 2012). Particularly, we refer to Schedule 10 on 'Employment and Unemployment' and in particular, we focus on two files, which are called Block 4 (demographic particulars of household

members) and Block 5.1 (Usual Principal Status).The most vital variables are 'hhid', which identifies a household and the member number within a household. Using a combination of these two, we are able to find required details on each member. Although the datasets contain data from all India, this paper restricts its scope to only one state viz. Maharashtra, since India is a multi-faceted and heterogeneous country. Even within a state, there are so many variations that it becomes necessary to capture them. Among the various states, Maharashtra stands for its wide socio-economic disparity (Singh, 2017a). The region around Mumbai-Pune is comparable to Manhattan and the eastern region of Vidarbha is comparable to Sub-Saharan Africa. That is the reason we introduce a variable called 'region', based on the 37 districts of the state. In this paper, we define 7 regions – Greater Bombay, Deccan, Konkan, Marathwada, Khandesh, East Vidarbha and West Vidarbha. Appendix 1 carries the details.

We create a proxy variable for level of education, to shrink the number of categories to 3. This will make the analysis concise. The 3 categories are – 'niraakshar' (literally meaning 'illiterate or equivalent'), 'shaala' (literally meaning 'school or equivalent') and dip/grad (which is equivalent 'a diploma or higher certificate'). Appendix 2 carries the details.

Regarding the dependent variable, if usual status is 'employed' or 'unemployed', it implies that LFP is 1 (indicates 'participation'), else if the value is 'out of labor force', LFP is 0 (indicates 'non-participation'). All possible combinations of values of 4 key variables viz. sector (urbanization), marital status, level of education and social group give us 2 * 3 * 3 * 3 = 54 segments. We create dummies for each segment, taking care to avoid the dummy variable trap. Finally, we run a Probit regression on these dummy variables.

Combination of Variables with Interaction Effects

For better relevance, we consider individuals only in the age group of potential earners (ages 15 – 64). The sample size of such cases is 24,321. From earlier studies and after conducting tests on individual variables, we see that the significant variables are sub-round, sector, gender, region, relation with respect to head, religion and education level. So, we combine them into a single Probit regression. Each of these variables has a reference category, against which we introduce dummy variables for other categories. Here, the reference is urban male Hindu head of the household from West Vidarbha, who is illiterate or equivalent and whose data are from sub-round 4.

Table 1 Reference Categories of Each Variable in the Model

Num	Variable	Reference Category value
1	Sub-round	4
2	Sector	Urban
3	Gender	Male
4	Region	West Vidarbha
5	Relation wrt head	Head
6	Religion	Hinduism &similar
7	Education level	Niraakshar

Besides these categorical variables, we include an important variable, viz. household size,as a covariate in the Probit model.

The following table shows the estimates derived from this regression model.

Table 2 Estimates of the Probit Regression (with 1 continuous variable)

Parameter	B (Coefficient)	Std. Error	t statistic
(Intercept)	1.529	.0471	32.46
Sector=rural	.397	.0226	18.50
Sector=urban	0	.	25.52
Sub-Round=1	.148	.0267	19.80
Sub-Round=2	.092	.0269	20.61
Sub-Round=3	.058	.0272	21.05
Sub-Round=4	0	.	22.28
Region=Deccan	.007	.0306	21.88
Region=East Vidarbha	.180	.0455	16.10
Region=Greater Bombay	.184	.0401	18.35
Region=Khandesh	.172	.0355	18.14
Region=Konkan	-.077	.0347	22.42
Region=Marathwada	.236	.0330	18.18
Region=West Vidarbha	0	.	21.75
relwrthead=daugh/gran	-1.163	.0550	25.28
relwrthead=dinlaw	-.939	.0545	21.33
relwrthead=other relative	-1.017	.0448	24.29
relwrthead=servant	-.578	.2298	3.73
relwrthead=son/grans	-1.256	.0312	32.86
relwrthead=spouse	-.871	.0458	24.41
relwrthead=head	0	.	14.70
religion=buddhism	-.024	.0522	16.48
religion=christianity	.236	.1187	7.14
religion=islam	-.060	.0337	22.01
religion=jainism	-.189	.0792	13.33
religion=hinduism	0	.	27.03
edulevel=diplo	-.558	.0342	28.85
edulevel=gradu	-.086	.0401	18.47
edulevel=postgrad	.348	.0659	9.98
edulevel=shaala	-.364	.0267	26.67
edulevel=niraakshar	0	.	18.86
gender=female	-1.395	.0452	37.12
gender=male	0	.	12.46
hh-size	.013	.0043	

The predicted probability P of participation in the labor force is as follows:

P (LFP = 1) =Φ (1.529 household size + 0.397 rural + 0.148 sub-round1 + 0.092 sub-round2 + 0.058 sub-round3 – 1.397 female + 0.07 Deccan + 0.18 East Vidarbha + 0.184 Greater Bombay + 0.172 Khandesh – 0.077 Konkan + 0.236 Marathwada – 1.163 daughter/granddaughter – 0.939 daughter-in-law – 1.017 other relative – 0.578 servant – 1.256 son/ grandson – 0.871 spouse – 0.024 buddhism + 0.236 christianity – 0.060 islam – 0.189

jainism – 0.558 diploma – 0.086 graduate + 0.348 postgrad – 0.364 shaala)

where Φis the cumulative density function of the normal distribution.

Table 3 Pseudo R^2Values Using Different Methods (Combination of Variables)

N	LL_0	LL_1	McFadden	Cox & Snell	Nagelkerke
24,321	-11,703	-6,526	0.44	0. 35	0.56

Here, we observe that the Pseudo R^2 values using McFadden and Nagelkerke are both rather high, suggesting that this model is a good fit. While analyzing the Average Marginal Effect (AME), one finds that the Estimated Grand Mean value is 0.38, with a standard error of 0.017. The t-statistic comes to 22.35, whose level of significance is 0.000. This implies sufficient confidence in the model.

Household size is positively correlated with LFP.

Compared to the reference, we observe that the continuous variable household size is positively correlated with LFP. Each unit increase in this brings an increase of 0.013 in the z-value of our dependent variable. Sub -rounds 1, 2 and 3 all increase the chance of LFP. Konkan is the region with the lowest probability participation. In a household, the head is most likely to participate as compared to any member. The effect of religion seems quite less and only Christianity causes a higher LFP than Hinduism. School and Diploma levels of education reduce the probability of LFP, but once a person completes graduation, the probability of LFP increases again.But, SPSS shows a warning that the log-likelihood value cannot be further improved, which could be due to interactions among these variables. To remove these, one must make micro segments within these variables, which we explain the following pages.

Dummy Variables of Exhaustive Combinations

Earlier in our analysis, we included aggregate data on females and males in Maharashtra, within the eligible earning age (15 – 64). Since the coefficient for 'gender' is high, it suggests that there is a stark difference between female LFP and male LFP.Hence, we further segregate the data and consider only the female gender. The sample size of such cases is 11,848.

There is a stark difference between female LFP and male LFP.

Here, we consider 4 variables – sector, marital status, social group and education level. In order to eliminate discrepancies arising due to interaction effects among these, we create micro segments, which are mutually exclusive and collectively exhaustive (MECE) on the basis of the possible values of the variables. In this manner, each micro segment has a 4-letter code. The first letter (R or U) represents the sector. The second letter (M, D or S) represents the marital sta-

tus. The third letter (S, O or G) represents the social group. The fourth letter (N, S or D) represents the level of education. There are 2 * 3 * 3 * 3 = 54 possible segments, which are MECE. Hence, the regression contains 53 dummy variables. Along with these, we take the continuous variable household-size.Table 1 shows the estimates derived from this regression model.

Table 4 Estimates of the Probit Regression on Micro Segments among Women

Parameter	B (Coefficient)	Std. Error	t statistic
(Intercept)	-1.489	14.9273	-0.1
rmsn=1	302	.3070	983.713
rmss=1	-.030	.3043	-0.1
rmsd=1	-.466	.4117	-1.132
rmon=1	.187	.3017	0.62
rmos=1	-.262	.2984	-0.879
rmod=1	-.149	.3237	-0.460
rmgn=1	.326	.3006	1.084
rmgs=1	-.277	.2981	-0.929
rmgd=1	-.363	.3305	-1.098
rdsn=1	.323	.3487	0.926
rdss=1	.191	.3880	0.492
rdsd=1	*6.519[b]**	.	—-
rdon=1	*.203*	.3260	0.623
rdos=1	.465	.3275	1.42
rdod=1	.578	.8066	0.717
rdgn=1	-.004	.3175	-0.013
rdgs=1	.367	.3197	1.148
rdgd=1	*6.529[b]**	.	—-
rssn=1	-.548	.7416	-0.739
rsss=1	*-1.041**	.3322	-3.134
rssd=1	-.084	.4695	-0.179
rson=1	-.292	.4766	-0.613
rsos=1	*-1.318**	.3126	-4.216
rsod=1	-.356	.3758	-0.947
rsgn=1	-1.035	.6397	-1.618
rsgs=1	*-1.263**	.3126	-4.040
rsgd=1	-.522	.3743	-1.395
umsn=1	-.349	.3202	-1.09
umss=1	*-.824**	.3051	-2.701
umsd=1	-.099	.3295	-0.300
umon=1	-.571	.3151	-1.812
umos=1	*-1.002**	.3023	-3.315
umod=1	-.467	.3135	-1.49
umgn=1	-.579	.3063	- 1.890
umgs=1	*-1.067**	.2990	-3.569
umgd=1	-.502	.3028	-1.658
udsn=1	-.165	.3519	-0.469
udss=1	.117	.3461	0.338
udsd=1	-.687	.7053	-0.974

udon=1	-.249	.3519	-0.708
udos=1	-.055	.3401	-0.162
udod=1	.466	.5396	0.864
udgn=1	-.219	.3250	-0.674
udgs=1	-.176	.3126	-0.563
udgd=1	.624	.4220	1.479
ussn=1	-.037	.5606	-0.066
usss=1	*-1.063**	.3272	-3.249
ussd=1	-.012	.3704	-0.032
uson=1	-.301	.5244	-0.574
usos=1	*-1.170**	.3165	-3.697
usod=1	.179	.3277	0.546
usgs=1	*-1.012**	.3035	-3.334
usgd=1	-.068	.3100	-0.219
Hh-size	.010	.0057	1.754

Note: b Hessian matrix singularity occurs due to this parameter. Hence, the standard error is not available. The parameter estimate at the last iteration is displayed.
* Significant at the 5% level.

The reference segment is *usgn* (urban, single, general, niraakshar), which forms the intercept. We observe that with respect to its effect, the coefficients corresponding only to 11 of the 54 segments are significant at the 5% level, which we have highlighted in italics in the table. Hence, for simplicity, we will include only these in the model.

The predicted probability P of female participation in the labor force is as follows:

P (Female LFP = 1) =Φ (6.519rdsd + 6.529rdgd–1.041rsss–1.318 rsos – 1.263 rsgs – 0.824 umss – 1.002 umos – 1.067 umgs – 1.063 usss – 1.170 usos – 1.012 usgs)

where Φ is the cumulative density function of the normal distribution.

Table 5 Pseudo R^2 Values Using Different Methods (Female Mcro Segments)

N	LL_0	LL_1	McFadden	Cox & Snell	Nagelkerke
11,848	-1,616	-841	0.48	0.123	0.514

Here, we observe that the Pseudo R^2 values using McFadden and Nagelkerke are both rather high, suggesting that this model is a good fit. However, while analyzing the Average Marginal Effect (AME), one finds that the Estimated Grand Mean value is 0.78, with a standard error of 2.139. The t-statistic comes to 0.36, whose level of significance is 0.72. This implies very low confidence in the model.

From the above results, our interpretation is that rural single women who have completed only school education are less likely to participate in the labor force,

Rural single women who have completed only school education are less likely to participate in the labor force.

as is apparent from their negative coefficients. Similarly, the LFP is likely to reduce for urban married women who have completed only school education and urban single women who have completed only school education.

Conclusion & Future Scope

Through a two-model analytical framework, we have identified some factors which influence women's Labor Force Participation in Maharashtra. The factor which has the largest positive influence on LFP is household size, which is visible from the coefficient associated with it. In the case of women, daughter/granddaughter and daughter-in-law all have a large negative influence on LFP. Confirming the results of previous studies, we see that the level of education is a major factor. This paper extends other research by adding one factor viz. region. In this sense, it goes one level deeper than state-level analysis. The region which shows the lowest probability of participation is Konkan. There is scope to probe this further in a follow-up study, by concentrating on only one or two regions within Maharashtra (say, Marathwada and Vidarbha), which could increase the accuracy of results. Another factor which is additional in this paper is the that of 'relation to the household head'. By studying multiple relationships within a family, this paper brings out observations which reflect the influences of society. This is a key factor in the economic activities of women.

In the second part of our analysis, we formed mutually exclusive and collectively exhaustive micro segments among women in Maharashtra. This ensures that there is no interaction effect among the variables due to multi-collinearity. Single women (whether rural or urban) who have completed only school education are less likely to participate in the labor force. Considering the marginal effects of the variables in the two analyses, we find that the t-statistic in the first case – containing a combination of variables – is 22.35, whose level of significance is almost 0.000. So, it is highly significant. For the second model – where we create micro segments using all possible values of 4 variables – the t-statistic is 0.36, which is not significant at the 0.05 level. However, the validity is established because the Nagelkerke Pseudo R^2 value is in excess of 0.5 in both cases.

Single women (whether rural or urban) who have completed only school education are less likely to participate in the labor force.

Our study has a limitation in that it relies on secondary data. While reporting results of studies based on official government records, that too, those related to employment, researchers have to be wary of measurement issues. Schultz (1990) notes in this regard that "… cultural variation in interpreting what is productive work compounded by differences in statistical definitions of who is in the labor force are responsible for much ambiguity in measuring women's productive roles that straddle home and market economic activities". Anker (1983) and Hirway (2002) stress on the

same point of the challenge in measuring women's work accurately.

Nonetheless, one can argue in favor that NSSO data are reliable and are the main source for a majority of studies. Our paper improves on other papers since it probes one level deeper by introducing a variable called 'region'. This is due to the fact that Maharashtra is a large state with considerable regional variations. The paper studies the effect of the 7 regions of the state – Greater Bombay, Deccan, Konkan, Marathwada, Khandesh, West Vidarbha and East Vidarbha. It has large implications because the size of the work force is a major factor which determines productivity, as Singh (2018) mentions. Another unique contribution of this study is in the detailed analysis of certain variables with the creation of micro segments using all possible combinations of values of variables. Being mutually exclusive and collectively exhaustive, these micro segments tell us that within the sample, 5 micro segments in the rural sector and 6 micro segments in the urban sector are most significant for female LFP. What is puzzling is that in very few segments, the criterion of diploma or higher education is an influencing factor. We believe that this issue deserves further attention. Once we are able to pinpoint the different influencing factors in different segments, it will aid in government policy making because it will enable administrations to design specific schemes in a more efficient manner.

References

Beneria, Lourdes (1979), "Reproduction, Production and the Sexual Division of Labor", *Cambridge Journal of Economics*, 3(3): 203 –25.

Besamusca, Janna, Tijdens, Kea, Keune, Maarten& Steinmetz, Stephanie (2015), "Working Women Worldwide, Age Effects in Female Labor Force Participation in 117 Countries", *World Development*, 74(C): 123 –41.

Bhalla, Surjit & Kaur, Ravinder (2011), Labor Force Participation of Women in India: Some Facts, Some Queries, London School of Economics.

Chakrabarti, Asok (1977), "The Causes of Women's Unemployment in India', *Economic Affairs*, 22(5): 177 –83.

Chevalier, Arnaud & Viitanen, Tarja (2002), "The Causality between Female LFP and the Availability of Childcare", *Applied Economics Letters*, 9(14): 915 –18.

Cooke, Fang (2010), "Women's Participation in Employment in Asia: a Comparative Analysisof China, India, Japan and South Korea", *The International Journal of HRM*, 21(12): 2249 – 70.

Cox, Sir David& Snell, Joyce (1989), The Analysis of Binary Data, 2nd ed, London, Chapman and Hall.

Dunlop, John & Velkoff, Victoria (1999), Women in the Economy of India, US Department of Commerce, *Bureau of the Census*, International Programs Center

Dutta, Puja;Murgai, Rinku; Ravallion, Martin & van de Walle, Dominique (2012), Does India's Employment Guarantee Scheme Guarantee Employment?',*World Bank Policy Research.*

Gandhi Kingdon, Geeta&Unni, Jeemol (2001), "Education and Women's Labor Market Outcomes in India", *Education Economics*, 9(2): 173 –95.

Ghosh, Robin& Roy, Kartik (1997), "The Changing Status of Women in India: Impact of Urbanization and Development", *International Journal of Social Economics*, 24(7/8/9): 902 –17.

Hirway, Indira (2002), "Employment and Unemployment Situation in 1990s: How Good Are NSS Data?" *Economic and Political Weekly,* 37(21): 2027 –36.

Killingsworth, Mark& Heckman, James (1986), "Female Labor Supply: A Survey", in Handbook of Labor Economics, Elsevier SciencePublishers, Vol. 1: 103 – 197

Lim, Lin Leam (2004), "Female Labor-force Participation", Current Issues in Economics and Finance, Gender Promotion Program (GENPROM), International Labor Office

Mehrotra, Santosh & Parida, Jajati (2017), 'Why is the Labor Force Participation of Women Declining in India?', *World Development,*98 (10): 360 –80.

Moghadam, Valentine (1999), "Gender and globalization: Female Labor and Women's Mobilization", *Journal of World-Systems Research*, 5(2): 367 –88.

Nagelkerke, N. J. (1991), "A Note on a General Definition of the Coefficient of Determination", *Biometrika,* 78(3): 691 – 92.

Neff, Daniel;Sen, Kunal& Kling, Veronika (2012), The Puzzling Decline in Rural Women's Labor Force Participation in India: A Reexamination, German Institute of Global and Area Studies,Institute of Asian Studies, Hamburg,No. 196.

Panda, Pradeep (1999), Poverty and Young Women's Employment: Linkages in Kerala,Centre for Development Studies, Thiruvananthapuram.

Schultz, Paul (1990), "Women's Changing Participation in the Labor Force: A World Perspective", *Economic Development and Cultural Change*, 38(3): 457 –88.

Sebastian, Alice& Navaneetham, K. (2008), Gender, Education and Work: Determinants of Women's Employment in Kerala, *Indian Statistical Institute,*Calcutta.

Singh, Awadhesh (2016), "Do Technology Spillovers Accelerate Performance? Unraveling a Puzzle", *University Dunarea de Jos of Galati,* 22(3): 108 – 120

Singh, Awadhesh (2016), "R&D Spillovers& Productivity Growth: Evidence from Indian Manufacturing", *Indian Journal of Industrial Relations*, 51(4): 563 –79.

Singh, Awadhesh (2017), 'Keeping It Simple: Comparative Analysis of TFP across Manufacturing Industries and Major States of India", *Theoretical Economics Letters*, 7(6): 1821.

Singh, Awadhesh (2017),"Merge or Acquire-A Strategic Framework", *Annals of the University Dunarea de Jos of Galati: Fascicle:* XVII, *Medicine*, 3: 125 – 139

Singh, Awadhesh(2018), "Does Size Matter? – The Effect of Size of Production Workers, Management Staff and Proprietors on Productivity", *Theoretical Economics Letters*, 8(11): 2290

Srivastava, Nisha & Srivastava, Ravi (2010), "Women, Work and Employment Outcomes in Rural India", *Economic and Political Weekly,* 45(28): 49 – 63.

Verick, Sher (2016), Women's Labor Force Participation in India: Why Is It So Low?, International Labor Organization.

Yadav, Sarita (2014), "The Status of Women's Employment and Empowerment", *The Indian Journal of Research*, 8(6): 6 – 9.

Appendices

Appendix 1: Region Names of Maharashtra as per District

Number	District Names	Region
1	Mumbai City,Mumbai Suburban	Greater Bombay
2	Ahmednagar,Kolhapur,Pune,Sangli,Satara,Solapur	Deccan
3	Thane,Palghar,Raigad,Ratnagiri,Sindhudurg	Konkan
4	Aurangabad,Beed,Hingoli,Jalna,Latur,Nanded,Osmanabad,Parbhani	Marathwada
5	Dhule,Jalgaon,Jalna,Nandurbar,Nashik	Khandesh
6	Akola,Amravati,Buldhana,Nagpur,Wardha,Washim,Yavatmal	West Vidarbha
7	Bhandara,ChandrapurGadchiroli,Gondia	East Vidarbha

Appendix 2 Proxy Variable for Level of Education

Number	Education	Educ level
1	Illiterate,Literate without schooling,Others	Niraakshar
2	Literate below primary,Primary school,Middle school,Secondary school,Higher Secondary school	Shaala
3	Diploma,Graduate,Post Graduate,TLC	Dip/grad