



RESEARCH ARTICLE

A COMPARATIVE STUDY ON THE EFFECTS OF SOCIO-ECONOMIC FACTORS FOR CHILDREN EVER BORN

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ABSTRACT

The purpose of this study is to identify the socio-economic determinants of cumulative fertility-number of children ever born to women at the end of their reproductive period. The data on the explanatory variables is obtained from census 2001 and 2011. The multiple regression technique is used to study the relationship between the dependent variable children ever born and the explanatory variables and to predict the average parity for the year 2011. Variance inflation factor is used to test for multicollinearity. SPSS 17.0 is used for statistical analysis. The bivariate correlation analysis indicates that Children ever born has a significant positive correlation with urban population, per capita income, Below poverty line and a significant negative correlation with Average household size, female literacy rate ($p < .05$). The multiple regression analysis shows that the largest significant contribution for lowering the cumulative fertility is the proportion of urban population. The other significant determinants are Work participation rate and below poverty line ($p < .05$).

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INTRODUCTION

India is in later half of third stage demographic transition with 121 crores population which is likely to yield rich demographic dividend in future decades. An indicator of growth rate is the children ever born to women at the reproductive age group 45-49. In the recent years researchers have shown widespread interest in the relationships between socio-economic factors and fertility. Fertility behavior of a given time gives shape to the future age, sex structure. Therefore, studying the fertility behavior has an implication on the overall welfare planning process it produces the alternatives in the study of population. Abu Jafer Mohammed Sufian (2013) has identified socio economic determinants of number of children ever born to women at their reproductive period by analyzing national level secondary data using multivariate techniques. Gulimoto & Rajan (2002) gives the district level estimates of fertility from India's 2001 census using census data to explain the interregional variation. This paper aims at identifying explanatory variables likely to impact the children ever born using multiple regression analysis.

The variables considered are percentage of population living in urban areas, Average household size, Per capita income, population density per square kilometer, Female literacy rate, dependency ratio, and proportion of people living below poverty line and Work participation rate. A comparison is made in these estimates using data from census 2001 and 2011.

Data and methodology

Variables and their measures

Data was collected from census 2001 and census 2011 on Indian states and union territories. The dependent variable (CEB: Y) is the mean number of children ever born to women reaching the end of their reproductive period (women aged 45 to 49 years) which is an indicator of cumulative fertility. The explanatory variables used in the study are: percentage of population living in urban areas (X_1), Average household size (X_2), Per capita income (X_3), population density per square kilometer (X_4), Female literacy rate (X_5) defined as the percentage of females aged 7 and above who knows how to read and write, dependency ratio (X_6) defined as the percentage of population aged less than 15 years and more than 60 years, proportion of people living below poverty line (X_7), Work participation rate (X_8) which is the percentage of total workers (Main and marginal) to total population.

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Analytical technique

The multiple regression analysis is used to model the number of children ever born using the eight predictors described in section 2.1. The equation is $Y = \beta_0 + \sum_{i=1}^8 \beta_i X_i + U$ where β_0 is the intercept and β_i 's are the regression coefficients that need to be estimated and U is the error term which are assumed to be normally distributed with constant variance. To detect whether multicollinearity is present in the data or not, simple bivariate correlations and variance inflation factors VIF have been examined. Residual analysis is used to check the validity of the model fitted. SPSS 17.0 is used for statistical analysis.

Analysis

Table 1 shows the mean and standard deviation of the dependent variables and the explanatory variables. From the table the average number of children per woman is 3.1, varying from lows of 2.38 children in Tamil Nadu and 2.61 children in Chandigarh to highs of 3.66 children in Nagaland and 3.51 children in Lakshadweep as per census 2001.

Table 1. Descriptive Statistics of the number of children ever born and the eight explanatory variables

Variables	Mean	Std. Deviation
urban population (proportion)	31.75	19.47
mean hhsz	5.1600	.60
Meanchilborn	3.1	.33
percapita net state domestic product (rupees)	21326.88	10671.89
Female literacy rate (%)	59.93	13.66
density of population(per sq km)	912.77	1994.15
BPL	21.52	12.39
work participation rate(persons)	40.39	5.93
Dependency ratio	69.82	12.13

Table 2 gives the correlation coefficient between the dependent variable and regressors.

Table 2. Correlation coefficients among variables

Variables	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	Y
Urban population X ₁	1	-.358*	.841**	0.11	-.513**	-0.215	.819**	-.433**	.568**
Mean hhsz X ₂		1	-.522**	0.043	0.158	-.340*	-0.202	.728**	-.462**
Per capita net state domestic product X ₃			1	0.143	-.640**	-0.16	.689**	-.527**	.670**
Female literacy rate X ₄				1	-0.141	0.137	0.05	0.076	-0.017
Density of population X ₅					1	-0.014	-0.336	.365*	-.395*
dependency ratio X ₆						1	-.342*	0.011	-0.127
BPL X ₇							1	-0.29	.340*
work participation rate X ₈								1	-0.259
Children ever born Y									1

*. Correlation is significant at the 0.05 level (2-tailed).
 **. Correlation is significant at the 0.01 level (2-tailed).

Table 3. Unstandardised and Standardized coefficients of regression of number of children ever born on the explanatory variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-2.435	.613		-3.973	.001
urban population (proportion)	-.005	.003	-.301	-1.611	.122
mean hhsz	.479	.079	.870	6.052	.000
percapita net state domestic product(rupees)	.00001	.000	.464	2.424	.024
Female literacy rate (%)	.012	.003	.488	3.907	.001
density of population(per sq km)	.00001	.000	.080	.515	.612
Below Poverty Line (BPL)	.011	.003	.402	3.339	.003
work participation rate(persons)	.024	.006	.409	4.151	.000
Dependency ratio	.012	.005	.429	2.439	.024

From Table 2, There is a significant positive correlation between children ever born and urban population, per capita income, Below poverty line and there is a significant negative correlation between children ever born and Average household size, female literacy rate ($p < .05$). Also there is a negative correlation between populations Density, Age dependent ratio with children ever born to women. The results of fitting the ordinary least squares regression model are presented in Table 3. The overall regression model is highly significant ($F=18.71$, $p < .05$) and the value of R^2 is very high ($R^2=84.8\%$). This indicates that the variables chosen to explain the variability in the number of children ever born are valid explanatory variables. The residual analysis Fig.1 did not show any evidence of model misspecification nor of any serious violations of model assumptions.

The residual plot shows that model is a good fit.

Variance inflation factor(VIF) given by $VIF=1/(1-R_i^2)$ where R_i^2 is the square of the multiple correlation coefficient obtained from the regression of the i^{th} explanatory variable on all other explanatory variables is an indicator for the presence of multicollinearity. Usually, a VIF in excess of 10 is considered as an indication that multicollinearity may cause problems in estimating the parameters. A small value of the ratio $Q = \frac{\sum VIF}{p}$ where p is the number of regressors indicates that interdependence among explanatory variables is not a problem.

From Table 4 all variance inflation factors are less than 10 as well as the value of Q (=3.2129) are less than 5. Hence the OLS estimates used to describe the relation between Y and the explanatory variable is reliable.

Normal P-P Plot of Regression Standardized Residual

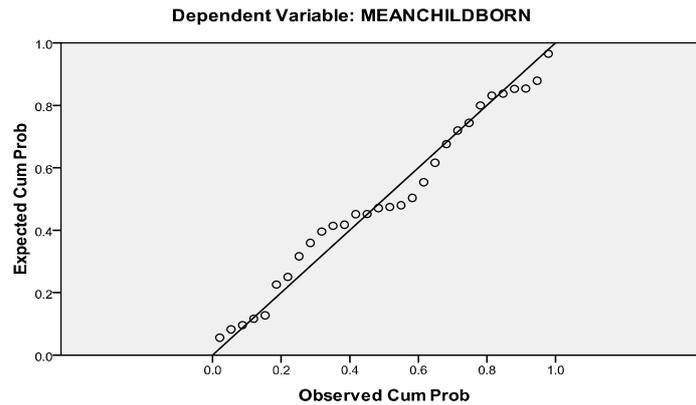


Fig. 1. Residual Plot for model adequacy

Table 4. Variance Inflation Factors (VIF)

X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈
5.901	3.485	6.18	2.63	4.055	2.444	1.639	5.23

Table 5. Determinants of CEB for 2001 & 2011

Variables	2001	2011
Urban Population (Proportion)	27.8	31.2
mean house hold size	5.3	4.8
Mean children ever born (CEB)	3.03	-
Per captia income (Rs)	17,800	61,564
Female literacy rate (%)	53.7	64.6
Density of population(Per sq km)	325	382
Age dependency ratio	68.02	60.08
Below Poverty Line (BPL)	26.1	21.92
Work Participation rate (Persons)	39.1	39.8

Table 6. Determination of children ever born

States	2001	Predator 2011
Jammu & kashmir	3.25	3.07
Himachal pradesh	3.14	3.33
Punjab	2.95	2.97
Chandigarh	2.61	3.06
Uttaranchal	3.40	3.40
Haryana	3.35	3.41
Delhi	2.85	3.72
Rajasthan	3.44	3.22
Uttar pradesh	3.46	3.11
Bihar	3.15	3.20
Sikkim	3.25	3.68
Arunachal pradesh	3.38	3.43
Nagaland	3.66	3.38
Manipur	3.09	3.20
Mizoram	3.57	3.28
Tripura	2.97	2.72
Meghalaya	3.44	3.48
Assam	3.19	3.02
West bengal	3.00	2.70
Jharkhand	3.06	3.25
Orissa	3.03	2.77
Chhattisgarh	3.24	3.12
Madhya pradesh	3.47	3.00
Gujarat	2.87	3.25
Daman & diu	2.92	2.10
Dadra & nagar haveli	2.87	2.53
Maharashtra	2.88	3.29
Andhra pradesh	2.50	2.54
Karnataka	2.86	2.76
Goa	2.57	3.49
Lakshadweep	3.51	2.14
Kerala	2.67	2.77
Tamil nadu	2.38	2.73
Pondicherry	2.68	2.61
Andaman & nicobar islands	2.88	2.60

The model (2.3.1) is therefore given as follows:

$$Y = -2.435 - .005X_1 + .479X_2 + .00001X_3 + .012X_4 + .00001X_5 + .012X_6 + .013X_7 + .031X_8$$

Or, $CEB = -2.435 - .006 \text{ urban} - .005 \text{ mean household size} + .00001 \text{ per capita income} + .007 \text{ Female}$

$\text{Literacy rate} + .0000334 \text{ Population density} + .009 \text{ Age dependency ratio} + .013 \text{ Below}$

$\text{Poverty line} + .031 \text{ Work participation rate} \dots\dots\dots (2.3.1)$

The coefficients show that a one percent increases in the urban population significantly decreases the number of ever born by .005. A unit increase in the mean household size significantly ($p < .05$) increases the number of ever children ever born by .479. A one percent increase in people living below poverty line and work participation rate significantly increases the children ever born by .011 and .024 respectively. Other explanatory variables like per capita income, Female literacy, population density and age dependency ratio contributes to the slight increase in the children ever born by .000, .012, .000 and .012 and respectively. Since the different variables are measured in different units to evaluate the importance of the explanatory variables in determining fertility, the standardized coefficients (Table 2) are examined. It shows that average household size has maximum impact (.87) on the number of children ever born followed by female literacy rate (.488), per capita income (.464), dependency ratio (.429), work participation rate (.409), Percentage below poverty line (.402). The largest contribution for lowering fertility is the distribution of population in urban areas.

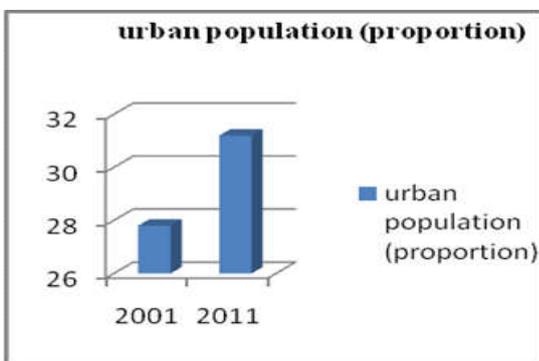


Fig. 2. Proportion of Urban Population

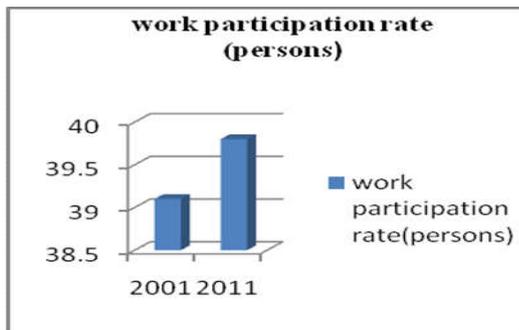


Fig. 3. Work Participation Rate

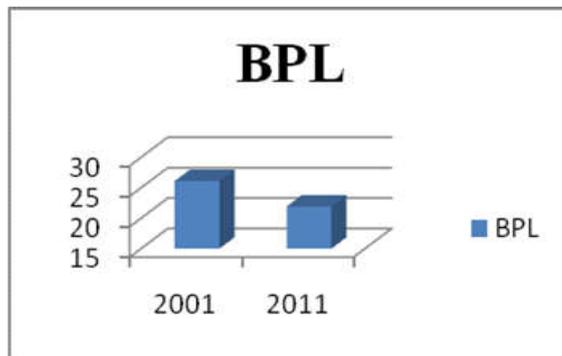


Fig. 4. Below Poverty Line (BPL)

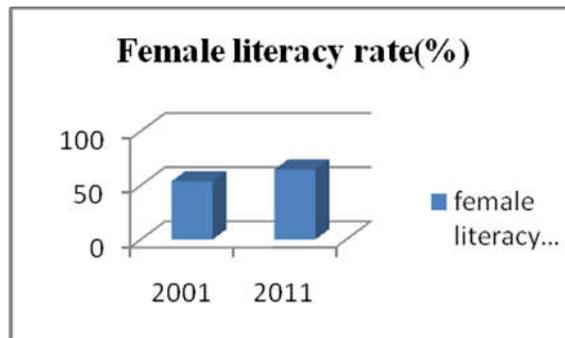


Fig. 5. Percentage of Female Literacy rate

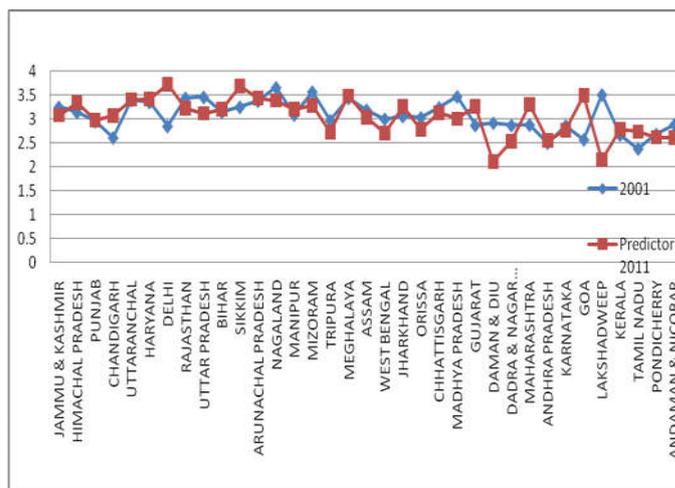


Fig. 6. Children ever born in 2001-2011

Prediction of Children ever born in 2011

Data related to the explanatory variables are taken from census 2011. Table 5 shows the determinants of CEB 2001 and 2011. Fig 2: Gives the proportion of urban population. Number of workers is given in Fig 3. Below Poverty line is represented in the Fig 4 and percentage of female literacy rate is given in the Fig 5. Fig 2 & 3. shows the distribution of Proportion of urban population and Work Participation rate. Fig 4 & 5. shows the distribution of BPL and female literacy rate. Below poverty line is declined from 26.1 to 21.9 in the year 2011. Table 6 gives the predicted children ever born in the year 2011. The Table 6 shows the children ever born predicted in 2011 is more in Delhi, Sikkim, Gujarat, Maharashtra, Goa and Tamil Nadu

than in 2001. Also the predicted values in 2011 in other states are less than 2001 census data.

Summary and Conclusion

In this paper we try to identify the indirect socioeconomic determinants for the number of ever born children to women at the end of their reproductive period, which is a measure of cumulative fertility based on census 2001. The explanatory variables considered are percentage of population living in urban areas, Average household size, Per capita income, population density per square kilometer, Female literacy rate, dependency ratio, and proportion of people living below poverty line and Work participation rate. There is a significant positive correlation between children ever born and urban population, per capita income, below poverty line. There is a significant negative correlation between children ever born and Average household size, female literacy rate. Also there is a negative correlation between populations Density, Age dependent ratio with children ever born. The multiple regression technique is used to identify the significant factors that impact average parity. The analysis shows that the female literacy rate comes out significant in predicting children ever born.

The coefficient on the variable urban (% of population living in urban areas) is negative and significant. Increasing Urbanization changes the pattern of average parity. The Percentage of population below poverty line is significant. Work participation rate is also a significant determinant of children ever born. This study considers only the indirect determinants of children ever born. A better prediction can be made with the inclusion of demographic factors like effective age at marriage, contraceptive prevalence rate etc.

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