

ESTIMATE THE REGRESSION COEFFICIENTS OF VARIABLES SPL. REFERENCE TO FERTILITY

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ABSTRACT

In this investigation the impact of female participation in the labor force, per capita income, female literacy rate, infant mortality rate, government expenditure on education, government expenditure on health services, number of girl's school, on fertility has been studied through simultaneous equations model by using four equations. The study although limited in scope, clearly points to the need for improving these fertility determinants, all of which will result in the reduction of fertility after improvement.

INTRODUCTION

Fertility is an important correlate of child survival (Chowdhury, 1988; Schultz, 1978). Like child survival, the total fertility rate (TFR) is influenced by economic and cultural factors [Bongaarts, 1978]. In India total fertility rate, or average number of children per mother, is still at 2.9 level (Sample Registration System Bulletin, 2004) which is far greater than ideal number at replacement level (2.1 children). Rural total fertility rate is still 2.56 children which is higher than urban TFR of 1.91. India supports about 16 per cent of world population. According to the United Nations Population Fund (UNFPA) estimates, out of an annual increase of 76 million in world population, India alone accounts for as much as 16 million making a sizeable (21 per cent) contribution.

“Fertility decline indicates how people's mindset is changing. This change is reflected not just within the educated class but also illiterate people”, as remarked by Gopal Krishan, Honorary director, Population Research Centre (Times of India, 2007).

The higher the proportion of women in a state who are formally educated, the lower is the fertility of that state (Rafiqul Huda Chaudhary, 1996). Women who work for someone else (as opposed to working on a family farm or business or being self employed) often work outside the home and tend to have lower fertility and higher rates of contraceptive use, in part because work competes with childcare for their time and attention. According to 1981 census the percentage of women workers to their total population is reported to have increased from 14.22 in 1971 to 20.85 in 1981, which positions better than males in whose case a slight increase in the work participation rate from 52.75 per cent in 1971 to 53.19 per cent in 1981 was reported. The position of

increase in female work participation rate in Haryana was 2.41 in 1971 to 4.82 in 1981 and further 13.38 in 2001(SRS).

The higher the proportion of women in a state who are working outside the home for someone else, the lower is the fertility rate of that state.

In fact there are many factors those contribute to the decline or increase in fertility rate, economic as well as demographic factors. Our main objective is to estimate the regression coefficients of variables (factors) on which fertility rate depends and on the basis of which parameters estimates go for prediction of further value of dependent variable. Accuracy of prediction depends on selection of appropriate model and use of appropriate estimation procedure to estimate the regression coefficients. To estimate the parameters of a single-equation linear model, on which the major quantitative approach of economics heavily depends, the ordinary least squares method is widely used. Under the spherical assumptions, it gives best linear unbiased estimates (BLUE) of the parameters, by the use of Gauss-Markov theorem. But most of the economic theory like fertility model, involves a set of relationships and, hence in these cases the use of single-equation cannot be justified. Actually in economics single equation models do not present the real picture of the economic problems thus we have to study the relationships for the simultaneous equations model.

When a relationship is a part of the system, some regressors will be random variables and will not be independent of error term i.e. $E(X\varepsilon) \neq 0$. Then Ordinary Least Squares estimation method will provide biased and inconsistent estimators for the parameters of a structural equation in a simultaneous equation system. The solution of this problem is to apply other methods of estimation by using simultaneous equations model which give better estimates of the parameters i.e. consistent.

Keeping in view the above problems the present investigation will be undertaken with the following objectives:

- 1. To construct and estimate the parameters of simultaneous equation dynamic model for fertility in Haryana.**
- 2. To find out the fertility patterns in Haryana over time.**

To understand the fertility patterns in the Haryana state, especially during the last 42 years, a four-equation dynamic model, which includes a Fertility Equation, Female Participation Equation, Income Equation and Education Equation, will be postulated. The model will be estimated in simultaneous equations system on the basis of aggregate data for Haryana. Since application of OLS under – or over – estimate the total effects of changes in fertility determinants, thus the model will be estimated by both OLS and 2SLS and then their results will be compared to find which method is more efficient.

RESULTS & DISCUSSION

In the model, the estimates of the parameters are obtained after establishing the identification of the equations.

MATHEMATICAL COMPLETENESS OF THE MODEL:

The system is complete as it contains four equations in four endogenous variables (TFR_t, FWPR_t, PY_t, FLR_t).

IDENTIFICATION

Some times it is difficult to express the structural coefficients as explicit functions of reduced form coefficients. Thus, to determine whether there is one -to-one correspondence between the structural coefficients and the reduced form coefficients, identification is performed.

After the identification conditions are satisfied then the estimate of the parameters in the model under consideration are found by proper method. There are two criteria for the identification of each equation in the model.

Order condition for identification:

Considered model has

$K = 14$ (total number of variable in the model] $G =$

4 (total number of equations)

- i) Consider the Fertility Equation of the model

This equation has

$M = 8$ (total number of variables in the equation) $K -$

$M = 6$

$G - 1 = 3$

Therefore, $(K-M) > (G-1)$

- ii) Consider the Female Participation Equation

This equation has

$M = 6$

$K - M = 8$

$G - 1 = 3$

Therefore, $(K - M) > (G - 1)$

i.e., Female Participation Equation is identified.

ii) Consider the Income Equation

This equation has

$$M = 6$$

$$K - M = 8$$

$$G - 1 = 3$$

Therefore, $(K - M) > (G - 1)$

i.e., Income Equation is identified.

iv) Consider the Education Equation

This equation has

$$M = 6$$

$$K - M = 8$$

$$G - 1 = 3$$

Therefore, $(K - M) > (G - 1)$

i.e., Education Equation is identified

Since order condition for identification is necessary, but not sufficient, thus rank condition for identification is checked.

For present investigation, two-stage least squares method was used with the help of software package SPSS. By using SPSS, firstly all the four equations were estimated by applying OLS method of estimation with four endogenous and ten predetermined variables.

For two-stage least squares method, estimation was done in two stages:

Firstly the OLS method of estimation has been applied to reduced-form equations, to estimate the reduced-form coefficients. Secondly, again OLS method has been applied to the transformed equation, which has obtained by changing the original endogenous variables with their predicted (estimated) value and thus estimates of regression coefficients by two-stage least squares method has obtained.

Microsoft Office Tool, Excel is also used for plotting the residual plot.

In this analysis, the following statistical measures were derived:

1. Regression coefficients of four structural equations were computed to measure the effect of each independent variable on the dependent variable.
2. A measure of the proportion of total variation of dependent variable explained by all the independent variables i.e. R^2 value (coefficient of multiple determination).
3. Value of t-statistic at 5% level of significance to test the statistical significant effect or non-significant effect of independent variables on the dependent variable.
4. Standard error of estimate to test the statistical reliability of parameters.
5. Durbin-Watson statistic value to test the existence of autocorrelation.
6. Residual plots by using standardized residual for each endogenous variable for detecting the outlier cases.

CONCLUSION

By estimating the regression coefficients of each equation of the four equations dynamic structural equation model by OLS and 2SLS method, it is concluded that:

1. Female participation rate has statistically negative effect on fertility. The higher the proportion of women in a state who are working outside the home for someone else, the lower is the fertility of that state.
2. Infant mortality rate has highly inter-relationship with fertility. It is one of the main fertility determinants. The higher the infant mortality levels of a state or the lower the chances of survival of children, the higher is the fertility of that state.
3. Female literacy rate also has high significant effect on fertility. The higher the proportion of women in a state who are formally educated, the lower is the fertility of that state.

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