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FERTILITY DIFFERENTIAL, POPULATION GROWTH AND FISCAL OPERATIONS

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The alarming rate of growth in population in different parts of the world, particularly in developing countries, has been a cause of much concern in formulation of the fiscal policy in recent times. As the growth of population depends upon the total fertility rate in a country, much emphasis has been laid on providing larger allocations for policies which aim at reduction of fertility rates. Hence, the study of factors which influence fertility rates has occupied a significant place from the point of fiscal operations.

Leibenstein (1957) and Becker (1960) in their pioneering work have addressed the determinants of fertility behaviour within the framework of consumer theory. Since then, the economists have treated fertility as a matter of choice rather than an exogenous process. The choices that couples make about their family size play a significant role in determination of fertility and hence the rate of growth of population. Consequently, the socio-economic characteristics and fiscal policy variables that influence fertility choices are central to the study of fertility and population growth.

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The literature on fertility choice which extends to various facets is extensive. [Nerlove, Razin and Sadka (1967), Willis (1987), Lesthaeghe and Surkyn (1988), Ahmed (1991), Hirschmah, et. al. (1991) and Dev and Rao (1992)]. The economic theory of fertility choice has centred on the issue that parents invest in progeny primarily because of old age security considerations or because this adds directly to their parental welfare [Easterlin (1973), Easterlin, et.al. (1980), Barro and Becker (1989), Behrman and Taubman (1989) and Srinivasan (1988)]. Other approaches to the theory of fertility choice have emphasised variables like education, particularly of women, labour force participation and status of women [Duraiswami, (1988) Ahmed (1991)]. In empirical studies, individual fertility is usually treated as endogenous variable determined by social variables, individual socio-economic characteristics and provision of relevant infrastructure. Along these lines only, the total fertility of a country or State is also posited as an endogenous variable determined by public expenditure on policy variables at a macro-level.

An important recent shift in demographic work is to emphasise the role of contextual variables as against individual characteristics [(Smith (1989), Hirschman and Guest (1990)]. Macro variables like government expenditure do not yet form part of the analysis, even though they may qualify for being contextual variable. Also, private fertility decisions taken in whatever manner, may not be found socially optimal. Hence, governments in most countries have adopted fiscal policy measures to influence the private fertility decisions. Such measures include tax incentives for family planning and public expenditure on health, education and family welfare. These and other related fiscal measures would influence the fertility choice of parents. This would be reflected in the changed total fertility rate in the society. Thus, both the level and the pattern of public expenditure can affect fertility rates and influence demographic

changes. It is, therefore, necessary to provide the impetus for including such variables as policy control variables aimed at fertility reduction.

However, fiscal operations as described above, are both a cause and effect of demographic changes. Whereas demographic changes are considerably affected by differentials in fertility rates among different segments of education or income, the population growth rate is influenced by per capita income. The latter in turn, has some relationship with variables like government expenditures, the fiscal operations are *inter-alia* influenced by differentials in fertility rates, although the other factors are no less important.

The interaction between fiscal operations and demographic changes should, therefore, be viewed as one where the fiscal operations, as signified by the government revenue and expenditure, and the total fertility rate which is the key factor behind demographic changes are determined simultaneously. The interrelations among fertility differentials, population growth and fiscal operations could, therefore, be captured within the framework of a simultaneous equations model.

We develop in Section II a simultaneous equations model consisting of three endogenous variables, *viz.*, total fertility rate, total government revenue and total government expenditure. Section III presents four sets of estimates of the model based on (a) inter-country data for all countries with a dummy variable for less developed countries, (b) inter-country data for developed countries, (c) inter-country data for developing (less developed) countries, and (d) inter-State data from different Indian States. Finally, Section IV presents a summary of results and policy prescriptions.

II. The Model

In this section, we present a structural model in which the jointly dependent variables are the total fertility rate (TFR), the level of public expenditure (GEXP) and the total government tax revenues (GREV). The three equations of the model which may be called the fertility equation, the government expenditure equation and the government revenue equation are specified as follows:

(1) The total fertility equation:

TFR = f(GEXP, LITRF, POV, HEXP, D)

(2) The total government revenue equation:

GREV = f(DOP, PCY, POV, TFR, D)

(3) The total government expenditure equation:

GEXP = f(MANS, POV, TFR, URB, D).

where D = Dummy variable 1, if the country is a less developed country (low income on lower-middle income country according to the classification adopted by the World Development Report, 1991).

DOP = Degree of openness in the economy measured by the share of imports in GDP.

GEXP = Government expenditure as a share of GDP for all countries and some of State Domestic Product in the case of Indian States.

HEXP = Government expenditure on health as a percentage GDP for all countries and as a percentage of SDP in the case of Indian States.

LITRF = Female literacy rate

MANS = Share of manufacturing sector in GDP.

PCY = Per capita GDP /per capita State Domestic Product.

POV = Income share of top 40 per cent for all countries except for Indian States where it is percentage of population below poverty line

TFR = Total fertility rate

URB = Urbanisation measure (percentage of urban population in total population).

Due to the changing age composition of population and the consequent increases in the demand for health care in developed economies, there has been a growing concern among the economists about the methods of financing such expenditures particularly because of the distributional implications of such financing methods [Gottscbalk, Wolfe and Hareman (1989)]. In developing countries, however, the concern is not so much for the distributional impact of methods of financing but more with the impact of public expenditure policies in general and expenditure on health and family welfare programmes in particular on the gross fertility rates both directly and indirectly.

The direct effects come through the role of public expenditures in increasing the awareness of the population about the need for adoption of family planning methods and provisions of health infrastructure facilities [HIPA (1991)]. The indirect effects come from the public expenditures relating to the promotion of socio-economic correlates of fertility, like increasing the education of women, raising their social status [Ahmed (1991)]. Similarly, the concern of the economists of the developed countries has been on the revenue implications of the changing age structure of constant or decreasing population [Ritzen (1989)]. However, in developing countries, the problem is quite the opposite. High fertility rates result in higher dependency ratios and lower per capita income levels. Tax revenue implications in such a scenario are quite adverse. In this paper, therefore, we have postulated a model with variables that are relevant for developing countries.

The data for inter-country comparison have been taken from *World Development Report* 1991 of the World Bank, and *Government Finance Statistics* (1991) of the International Monetary Fund. The inter-State data for a case study of the States are taken from various *Census Publications* of the Government of India and also from various *Statistical Abstracts* from the State Bureaux of Economics and Statistics.

III. The Results

The results of the two-stage least square estimation clearly lend support to our view that fiscal operations and fertility have simultaneity. The estimated coefficients of the fertility equation, as given in Table 1, indicate that while the fertility rates are generally higher for less developed countries, the government expenditure and the health expenditure have a direct impact on the reduction of the fertility rate (coefficient of GEXP and HEXP being negative in all the four regressions). The female literacy rate emerges as another important determinant of fertility rate. Hence, promotion of public expenditure policies like subsidy for promotion of female education are indicated (sign of LITRF being negative in all the four regressions). Interestingly, the poverty variable (defined as the share of the top 40 per cent of population) is statistically insignificant and not suitable for interpretation.

Table 2 gives the estimates of the total revenue equation. As seen from the results, the coefficients of total fertility rate (TFR) are negative in all the four regressions, indicating our hypothesis that increase in TFR adversely affects fiscal operations. The coefficients of the variable indicating degree of openness are positive indicating thereby that government revenues are elastic with respect to the degree of openness in the economy.

The coefficients of TFR in the government expenditure (Table 3) are negative in all the four regressions again confirming our hypothesis of TFR adversely affecting fiscal operations.

Table 1

Two-Stage Least Square Estimates of Total Fertility Equation

Variables	Coefficients and t-Values			
	All Countries	Developed Countries	Less Developed Countries	Indian States
Constant	5.7296 (2.69)	3.4834 (2.49)	9.4263 (1.02)	6.3925 (3.27)
GEXP	-0.0487 (-1.81)	-0.0305 (-1.76)	-0.148 (-0.19)	-0.1822 (-0.54)
LITRF	-0.0334 (-2.08)	-0.0213 (-1.93)	-0.0500 (-0.63)	-0.0301 (-2.12)
POV	-0.0141 (-0.74)	0.0036 (0.29)	-0.0567 (-0.39)	-0.0069 (-0.34)
HEXP	-0.0001 (-0.16)	-0.0002 (-0.47)	-0.0005 (-0.15)	0.7368 (0.57)
LDC	0.9617 (1.28)	-	-	-
R2	0.77	0.27	0.36	0.66

Note: Figures within parentheses denote t-values

Data Source: World Bank (1991) **World Development Report, 1991** Oxford University Press; Government of India, **Census 1981 Documents and Statistical Abstracts of India.**

Table 2

Two-Stage Least Square Estimates of Total Government Revenue Equation

Variables	Coefficients and t-Values			
	All Countries	Developed Countries	Less Developed Countries	Indian States
Constant	39.0668 (1.26)	93.3858 (1.72)	75.8415 (4.41)	79.9352 (2.72)
TFR	-0.5506 (-0.08)	-22.5842 (-1.22)	-1.4704 (-1.22)	-4.0511 (-1.01)
PCY	-0.0005 (-0.91)	-0.0014 (-1.40)	0.0052 (1.80)	-0.0145 (-2.30)
DOP	48.9362 (2.68)	23.8716 (0.83)	42.4142 (4.00)	- -
POV	-0.0779 (-0.36)	-0.0153 (0.05)	-0.8979 (-3.69)	0.5437 (2.37)
LDC	-21.5135 (-1.62)	-	-	-
R2	0.69	0.01	0.81	0.30

Note: Figures within parentheses denote t-values

Data Source: World Bank (1991) **World Development Report, 1991** Oxford University Press, Government of India, **Census 1981 Documents and Statistical Abstracts of India.**

Table 3

Two-Stage Least Square Estimates of Total Government Expenditure Equation

Variables	Coefficients and t-Values			
	All Countries	Developed Countries	Less Developed Countries	Indian States
Constant	59.6832 (1.93)	14.7341 (0.34)	-5.0783 (-0.07)	35.3232 (2.28)
TFR	-7.0865 (-1.25)	-15.3435 (-1.63)	-0.7084 (-0.19)	-3.4589 (1.04)
URB	-0.0011 (-0.005)	0.3597 (1.10)	-0.3637 (-1.35)	0.2105 (0.85)
MANS	0.0352 (0.07)	0.3323 (0.57)	-0.0417 (-0.05)	-0.4169 (-1.38)
POV	-0.1539 (-0.48)	0.2172 (0.55)	0.6439 (0.77)	-0.0942 (-0.74)
LDC	0.6288 (0.04)	-	-	-
R2	0.41	0.01	0.36	0.26

Note: Figures within parentheses denote t-values

Data Source: World Bank (1991) **World Development Report, 1991** Oxford University Press, Government of India, Census 1981 Documents and Statistical Abstracts of India.

IV. Policy Imperatives

Numerous studies have shown that at micro level the individual's life time fertility or the acceptance of family planning methods is considerably influenced by various socio-economic characteristics like education, income and social strata [HIPA, (1991)]. In this regard, the fertility equation estimated in this paper brings out the fact that the total fertility rate in macro setting and in inter-country comparison (as well as in inter-State comparisons for a case study) is also affected by the proportion of the educated women in population. Similarly it suggests that the income inequality and the level as well as the proportion spent on health and family welfare has a direct impact on the gross fertility rate.

The policy prescriptions, therefore, flow from the fact that reduced total fertility rate is conducive to higher levels of government expenditures (GEXP) and government revenues (GREV) as is evident from the estimated negative coefficient of GEXP and GREV in the fertility equation. It, therefore, follows that the fiscal policies that result in lower gross fertility rates and higher fiscal operations have to be pursued with vigour. Accordingly, the following policy imperative emerge:

a. the coefficients of public expenditure (GEXP) as well as public expenditure on health and welfare (HEXP) are negative, indicating that an increase in the level of public expenditure as well as the fraction of public expenditure devoted to health and family welfare is conducive for decreasing the total fertility rate.

b. the coefficient of LITRF is negative indicating thereby that increase in the proportion of educated females in the population is another factor favouring reduction in the total fertility rate. Hence, public

support for educational programmes particularly, those of universal and compulsory primary education for women should be an important policy objective.

c. The estimated coefficient of income inequality (POV) is negative (for all countries and Indian States) although not statistically significant. This again points out that fiscal policies which are aimed at reduction in inequality of incomes are critical for achieving low total fertility rate and hence higher economic growth. Such fiscal policies may encompass both progressive tax policies as well as public expenditure policies which aim at poverty alleviation programmes.

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