

**ECONOMIC FACTORS AFFECTING HUMAN FERTILITY IN THE DEVELOPING AREAS OF SOUTH AFRICA: A POLICY PERSPECTIVE**

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1. Introduction

High population growth has been a major factor inhibiting economic development in third world countries. Africa has been the focus of world attention in recent years because of high growth rates. Rates exceeded 4% in Kenya and Mozambique between 1970-1982 (The World Bank, 1984). South Africa's traditional sector faces a similar growth rate which is estimated as being 3.5% (de Graaff, 1987), and 46% of the population of 15 000 000 are younger than 15 (Development Bank of Southern Africa, 1987).

This study examines how the economic conditions of traditional households may be manipulated to encourage smaller family sizes; thus facilitating fertility decline and the raising of living standards. The approach to family size decision-making emphasizes the theory of opportunity costs of time (Mincer, 1963), the quantity-quality trade off (Becker, 1960, 1965) and child investment theory (Schultz 1973, 1981). Data were collected from Umlomo (rural) and Umzimkhulu (urban) in KwaZulu. One hundred and seventy five women were interviewed. The simultaneous model was estimated by two-stage least squares regression analysis. Dummy dependent variables were estimated by probit analysis. Child education, women's opportunity cost of time and formal market participation were negatively related to fertility, reflecting substitution from numbers of children (time-intensive goods) to fewer, more educated children (less time intensive) as opportunity costs rise. Child labour was positively related to fertility. Strategies to reduce population growth exist should therefore include improvements in women's education and employment opportunities to raise their time costs, and time saving devices to reduce demand for child labour.

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**Sources:**
- Directorate Agricultural Economic Trends (AAS), Central Statistical Service (SAS), Maine Board (MB), South African Sugar Association, Potato Board (PB), Meat Board (MTB), South African Reserve Bank (Q), International Monetary Fund (IFS).
probability sampling (PPS). Within these blocks households were approached systematically until women fulfilling the criteria were interviewed. The full model specified is:

\[
\text{TOTY} = \sum_{i=1}^{NOC} \left( \text{CLAB}, \text{EDW}, \text{EDC}, \text{TODT}, \text{TOTY} \right) \\text{INVES} \left( \text{P}, \text{T}, \text{EDW}, \text{EMPW}, \text{INTL} \right)
\]

4.3. Woman's labour market participation

4.3.1. Control variables

Control variables (\(v\)) are necessary to account for various facets of parents' tastes for child quality. They include an estimate of standard of living of the family (STAT), their financial commitment to children measured by their use of credit facilities (CREC), and finally the father's formal education level (INTL) which reflects the family's desire for education.

The behavioral models propose that within a society different status levels exist and that society determines the standard of living. Hence, child bearing and rearing. Difficulties in measuring and discounting lifetime expenses persuaded neoclassical theorists (Becker, 1965; Willis, 1973; De Tray, 1973 and others) to use a proxy of expenditure, namely "quality" of children measured by the level of formal schooling they receive. This measure is considered to be a substitute good for numbers of children and is indicated in Becker's concept of parents' opportunity cost of time. As parents' opportunity cost of time increases, they are less willing to sacrifice quantity of children; as it is less time costly. Therefore when specifying the simultaneous model endogenous estimates for quality of children (EDC) and price of women's time (PWT) is included in the fertility demand function as a substitute good and cost respectively (negative). The price of child labour input into the household (PWT) was anticipated with higher levels of education.

Creche usage, especially in rural areas, was associated with good performance at school and was therefore considered as preliminary education rather than a substitute for mother's time. Whichever interpretation of CREC is accepted however, it is hypothesised that as incomes rise, a normal income effect causes more CREC to be used. The variable STAT was used to control for the different status groups that have different child supporting expenditure patterns. As incomes rise, the availability of financial help from other sources (EDH) and the dummy representing married couples (MSDI) should be positively related to EDC.

These results are anticipated with higher levels of education. A positive relationship is expected to be positively related to quality on child care attending school a shortage of household labour. In this situation, the number of adult relatives in the household (REL) may act as a complement to quality by allowing children to attend school without sacrificing household activities or drawing mothers from more productive employment. Therefore REL and EDC should be positively associated.

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probability sampling (PPS). Within these blocks households were approached systematically until women fulfilling the criteria were located. A post stratification was imposed on those blocks which were not selected by PPS. Within Unit A, the lists were numbered and 30 randomly selected. In both Units, a list of all female household members was made with the help of the block leaders. A post stratification was imposed on those blocks which were not selected by PPS. Within Unit A, the lists were numbered and 30 randomly selected. In both Units, a list of all female household members was made with the help of the block leaders.

4.1 Fertility demand equation

The quantity of children demanded depends on the costs and benefits the child provides to the household's lifetime income stream. These aspects are discussed below.

In addition to social and psychological qualities, children are productive assets to the household. Schultz (1973) believes child benefits are a motivating factor in fertility decision. The demand for child benefits is represented by an equation of the form

\[
y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \epsilon
\]

In this equation, \(y\) is the number of children desired by the household, \(x_1\) is the child's contribution to the household's lifetime income stream, and \(x_2\) is the child's contribution to the household's lifetime consumption.

Control variables \(v\) are necessary to account for various facets of parents' tastes for child quality. They include an estimate of standard of living of the family (STAT), financial commitment to child's education by their use of creche facilities (CREC), and finally the father's formal education level (INT11) which reflects the family's desire for education.

The behavioral models propose that within a society different status levels exist and that society determines the standard of living for each status group. Therefore a positive relationship is expected with both or neither.
come is reduced. Larger numbers of children should reduce the probability of labour market participation by women as household demands increase.

4. Opportunity cost of women's time

Woman's price of time (PWIT), like participation, is derived from the full income constraint in the simultaneous model. It is estimated that any extra cost to the household's stock of human capital will increase her price of time. Consequently both husband's and wife's education, and the latter's employment experience should increase her opportunity costs. Labour force participation which distinguishes formal from informal market work is also expected to positively influence opportunity costs. Children, being time intensive for mothers, is negatively associated to women's price of time.

4.5 Permanent family income

A lifetime utility function is maximised, therefore it is important to measure income excluding transitory components which are irrelevant for making lifetime decisions (Ainsworth, 1989). The method chosen was to estimate permanent family income which adjusts for age and other socio-economic characteristics. Ages of parents (AGEH, AGEW), their education (EDW, INTll), marital status and number of children were included. A constraint of no intercept was imposed since if all the exogenous variables are zero, the income will be zero by definition (Box, 1980). Income should increase whenever parents have a decreasing rate as they retire. Husband's age is expected to be less important because his contribution to income was under control. Education should raise income but married common law unions are expected to be negatively associated with income. Inclusion of children should also be associated with a reduction in family income.

5. Estimation techniques

The model has simultaneous relationships, therefore estimation by ordinary least squares regression analysis (OLS) provides inconsistent and biased parameter estimates. Two-stage least squares (2SLS) regression analysis was used to estimate the model because, although not OLS efficient, the estimators are consistent (Pindyck and Rubinfeld, 1981). Dummy dependent variables are problematic in 2SLS estimation because when estimated by both stages by OLS, regression assumptions are violated. These violations include nonnormality of residuals, heteroscedasticity and the fact that predicted values may not be within the (0,1) range. Probit analysis is appropriate because the transformation of data using the standardised, cumulative normal distribution function corrects for these violations.

6. Results

Multicollinearity was encountered during 2SLS estimation causing insignificant t-values and incorrect and unstable signs. Therefore, unstable variables were dropped and proxies were used where possible. Usually when forming 2SLS instruments, endogenous variables are regressed on all exogenous variables in the system (Gujarati, 1982). Karlson and Dues (1981), however, suggest using an "adequate set" of predetermined variables for forming instruments as it includes exogenous variables from the structural equation. Using this technique as explanatory instruments, as distinct from the composition of the endogenous, dichotomous variables by probit analysis. This approach is said to support the neoclassical approach. Table 1 shows that parents considered the economic costs and benefits of children when deciding on the number and quality of children to bear.

Table 1. Results of the Simultaneous Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOC</td>
<td>-2.632</td>
<td>0.158</td>
<td>1.79</td>
<td>0.063</td>
</tr>
<tr>
<td>EDCD</td>
<td>-1.339</td>
<td>0.107</td>
<td>1.27</td>
<td>0.205</td>
</tr>
<tr>
<td>TOTY</td>
<td>-0.197</td>
<td>0.179</td>
<td>1.13</td>
<td>0.263</td>
</tr>
<tr>
<td>INVES</td>
<td>1.718</td>
<td>0.596</td>
<td>2.90</td>
<td>0.004</td>
</tr>
<tr>
<td>CI.AB</td>
<td>0.257</td>
<td>0.049</td>
<td>5.39</td>
<td>0.000</td>
</tr>
<tr>
<td>PWT, PARTI, STAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. NOC, EDCD, PARTI, PWIT are instrumental variables.

b. t-values are in parenthesis

c. **p < 0.01

Husband's education, a proxy for tastes for education, is positively related to quantity of children. Woman's age variables have the expected theoretical signs, both being significant at the 1% level. The positive sign shows that older wives with lower parity (number of children already born) but there is a peak in the life cycle which has a correlation of 0.47.

Price of woman's time (PWIT) is negatively related to quantity of children and significant at the 5% level. As expected increasing opportunity costs of time for women cause a substitution away from numbers of children because child rearing is time intensive. Labour market participation (PARTI) is also significantly, negatively related to family size because it competes with child rearing. The negative coefficient for EDCD proves that as opportunity costs rise, numbers of children are replaced with better quality children. It is this trade off that suggests a policy for mothers to work and not have too many children.

The opportunity cost of time equation reports that any increase in woman's opportunity cost. The positive coefficients for parents' education (EDW/INTll) and woman's work experience confirms this. Work experience is measured by the respondent's market participation and years of experience in her current job (EMP). Both are the most important. More offspring reduce opportunity costs because time taken to bear and rear children competes directly with time spent in the money market.

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In extended households adults' and child's time are substitutes in production. Reducing the supply of child labour by introducing legislation on and providing for compulsory schooling would cause a shift to child labour substitutes including mother's and other adult family members' time. This shift increases the time costs of the affected family members. The effect of mixing opportunity costs of time for mothers is an important strategy open to policy makers. The model shows that there are a number of ways in which it can be achieved. The first, as suggested, is through compulsory schooling for children. Another approach is to increase the opportunity cost.

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Husband's age (AGEH) controls for husband's tastes for children and positively related to number of children. Women's age variables have the expected theoretical signs, both being significant at the 1% level. The positive sign shows that older women are more capable of earning power (number of children already born) but there is a peak in the life cycle which is captured by the negative AGEWSQ term.

Price of women's time (PWT) is negatively related to quantity of children and significantly at the 5% level. As expected increasing opportunity costs of time was the most important determinant of fertility demand. Provision of water and electricity especially to rural people, would facilitate population growth rate declines. As families move to higher social brackets through increased income, fewer, higher quality offspring is greater than that with respect to quantity.

Finally the use of creche facilities (CREC) has a positive association with quality. As RDT, creche reduces demand for household labour, in particular mother's time. Creche is also viewed as a good preparation for school and therefore may be regarded as a proxy for the household's taste for child education.

The third equation representing mother's labour market participation was again estimated by probit analysis. A mean deviance of 1.3 shows a good fit and all values are greater than zero. Woman's education with age, marriage and employment status negatively related to participation.

The opportunity cost of time equation reports that any increase in the household's stock of human capital is associated with an increase in woman's opportunity cost. The positive coefficients for parents' education (EDFW/INT11) and woman's work experience confirms this. Woman's age, age squared and marriage is the most important. More offspring reduce opportunity costs because time taken to care for additional children increases. Wine's educational level positively related to numbers of children, which is captured by the negative AGEWSQ term. Women's age variables have the expected theoretical signs, both being significant at the 1% level. The positive sign shows that older women are more capable of earning power (number of children already born) but there is a peak in the life cycle which is captured by the negative AGEWSQ term.

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tion between quantity and quality of children. The fertility equation reports significant effects for both variables which shows that opportunity costs affect women who have high potential market earnings and those who have a low shadow price of time, and are not yet formally employed. Improving education will therefore cause women in all economic strata to substitute child quality for number of children as their oppor-
tunity costs rise. This change in tastes as opportunity costs rise can be facilitated by training women to develop marketable skills for employment in expanding trades and professions. Equation 4 shows that women's current labour market ex-
perience is an important factor increasing opportunity costs; consequently provision of employment for those entering the labour market is critical for fertility reduction. Therefore the policy options are clear. Increases in both quan-
tity and quality of education is a prerequisite for reducing family size desires and population growth rates. The strategy should be combined with investments in job creation, provision of services, improved pension schemes and investment options. 

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