

# Birth rates, national income and infant mortality rates



Birth Rate is defined as “ the ratio of number of births in a year over the population in the mid year expressed per 1, 000 population”, Mukherjee (1998). It can be said, that the birth rate is a reasonably crude measure of the fertility because it explains total births in terms of total population without accounting for the age and sex composition of the population.

The socio-economic determinants of fertility have attracted the attention of economists since time immemorial. Adam Smith in 1776 found out that child mortality was more for the poor particularly for those who relied on charity (the poor laws). In 1798, Malthus, like Adam Smith and David Ricardo made his move from the Utilitarian philosophy. Malthus suggested that a causal and positive correlation between income and population always exists. Poor economic conditions will, raise marriageable age and reduce fertility. Malthus proposed that fertility is not a personal choice, but it is basically a result of socio-economic institutions. He also proposed that fertility and mortality are interdependent variables, affecting population growth. Turning to present day population theories, Leibenstein in his book ‘ Economic Backwardness and Economic Growth (1957)’, argues that the demand for an additional child would stop, when the utility of an additional child just matches its disutility. Leibenstein conjectured that, with increasing per capita income the utility of an added child in terms of productive agents decline and at the same time the costs of child rearing increase. A higher life expectancy has just the opposite effect. The famous economist Becker, supports Leibenstein, and additionally points out that income is inversely related to fertility, if contraception is not taken into account.

#### RESEARCH: RELEVANT LITERATURE AND KEY RESEARCH QUESTIONS

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## THE INTER RELATIONSHIP BETWEEN MORTALITY AND BIRTH RATES:

Mortality affects fertility primarily through three mechanisms: affecting the demographic component i. e. the age and sex structure of the population; affecting the biological and behavioural components; and finally building an environment where fertility decisions are made at community levels for e. g., a country with high mortality might not be willing to adopt a fertility-reduction policy.

The main emphasis on the literature has been the key notion in 'demographic theory' that a fall in mortality rates necessarily precedes a fall in fertility rates. Ghazi M. Farooq, in his book 'Fertility in Developing Countries (1985)', takes evidence from the works of eminent economists like Frederiksen, (1969) and Zachariah(1973) to conclude the following, " a reduction in mortality is considered a necessary, although insufficient condition for reduction in Fertility" . He also mentions that, according to WHO report of 1974, countries with high rates of mortality have high birth rates as well. Empirical analysis on the relationship between mortality and birth rates has gained momentum in recent years. For, instance L. A. Hanson and S. Bergstrom have emphasized on breastfeeding as an important factor reducing infant mortality and hence birth rates. Behavioural aspects might include things as efforts on the part of parents to sustain high fertility because of social norms that favour fertility as a reaction of the community to mortality (Rutstein, 1974). The biological and behavioural aspects together bring about a positive relation between infant mortality and birth rates, in which sometimes high mortality might lead to fertility in excess of that needed to restore lost infants.

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The key research questions pertaining to birth rate-mortality relation would include:

What is the magnitude and direction of relationship between birth rates and mortality? What possible reasons could account for this association? Is there any difference in the Birth Rate patterns of developed and underdeveloped countries?

Is mortality a significant determinant of birth rates across countries?

Can parents adjust their fertility behaviour to their expectations about mortality i. e. is a full replacement behaviour possible?

After having understood the strong relationship between mortality and fertility, how should policies be framed so as to reduce birth rates?

#### THE INTER RELATIONSHIP BETWEEN GNI PER CAPITA AND BIRTH RATE:

Historically income has been used as a measure of socio-economic development or more precisely, a measure of modernization. According to demographic transition theory, a pattern of declining birth rates is an inevitable outcome of economic development. At the macroeconomic level income is inversely proportional to birth rates i. e. the poor countries with low per-capita income tend to have high birth rates and vice-versa. Empirical studies however have arrived at mixed results concerning the possible direction of the effect of income on birth rates. For instance Malthus has emphasized on a positive correlation between economic development and fertility, in the short run. Using income as a dependent variable in aggregate studies of fertility is paradoxical to its use in the literature on individual <https://assignbuster.com/birth-rates-national-income-and-infant-mortality-rates/>

fertility. At the micro level, however, there are four possible reasons questioning the inverse relation. Firstly, Becker (1976) questions on the 'quality of children' as a separate subject. Secondly, there is the general notion that high birth rates in a family might boost the income, because, there will be more members earning. This brings up the issue of causality that is ignored in most empirical models. Thirdly, the possibility of wife's earnings might contradict with childrearing, which confuses the relation between birth rates and income. Finally it's the definition of income that plays a pivotal role in explaining a typical relation between income and birth rates. As explained by Ghazi M. Farooq in his book 'Fertility in Developing Countries (1985)', empirical research conducted so far and reviewed by J. L. Simon (1974, 1977), T. W. Schultz (1974) and Fulop (1977a, 1977b) have suggested different association between fertility and income and there is not enough consensus, concerning the sign of the relation.

According to a recent study 'Advances in Development Reverse Fertility Declines (2009)', by Hans-Peter Kohler and Mikko Myrskylä of Pennsylvania's 'Populations Studies Center' and Francesco C. Billari of the University of Bocconi in Milan, development-fertility relationship is inverse when HDI levels are below the range of 0.85-0.9 and this relationship becomes positive once the HDI level becomes higher than 0.9, which basically means that economic development might reverse fertility declines.

Key Research Questions pertaining to birth-rate-income association, in my paper would include:

What is the magnitude and direction of relation between GNI per capita and Birth Rates at the macro and micro level? What possible reasons could account for this?

How does income distribution explain fertility differentials- Does a more equal distribution of income lead to reduction in birth rates? (reflecting on the work of Robert Repetto (1979) & Bryan L. Boulier (1982))

Does a J-shaped development-fertility association exist?

Combining the above two studies on mortality and income, the main focus of my paper would be, what percent of the total variations in crude birth rates across different countries is explained by variations in GNI per capita and Infant Mortality rates. If GNI and IMR are closely related, then which of the two variables is statistically more significant in explaining variation in Birth Rates across countries? Does empirical testing suggest that countries still conform to the Demographic Transition Theory? In my paper, I would be answering all the above questions and particularly, studying what kind of Birth rate patterns did the various countries (developed developing and underdeveloped) follow in 2008, in response to changes in income and mortality, and what possible reasons accounted for such patterns.

METHADODOLOGY:

My research paper involves only Cross-Sectional Econometrics. I have picked up the linear regression model from Mukherjee, Chandan, White, Howard and Wuyts, Marc (1998). The model involves Birth Rate as the dependent variable and GNI per capita and Infant Mortality rates as the regressors.

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According to the standard assumptions, the error term in my model will follow a normally distribution with constant variance, zero mean and zero covariance. I will take up a sample of observations for 80 countries in the year 2008, from World Bank tables. I would be regressing Birth rates on Infant Mortality rates and GNI per capita. There are two measures of national income per capita; they are GNI (an atlas measure) and GNI (PPP measure). So I will run two separate regressions on each of them, and do a comparative analysis as to which is a better measure. Since I am dealing with cross-section data, I will carry out a diagnostic testing of the assumptions of my regression model. A normal distribution should have zero skewness and kurtosis equal to 3. To test the normality assumption, I would use the Jarque-Bera statistic, a chi square test with 2 degrees of freedom. To test, whether the error term is homoscedastic, I will use the White's test using the overall LM-statistic to check if the regression is significant or not.

I will use ' Exploratory Data Analysis' as well as ' Sensitivity Analysis' in Econometric modelling. The main purpose of my regression analysis would be to explain the total variation in Birth rates by breaking it down into the explained variation due to the independent variables (mortality and income) and the residual variation. Ideally, it is important that the variables in the model should be rather bell-shaped. In this context, Chandan Mukherjee (1998), throws light on the words of the famous econometrician Granger who stated: " If a variable being explained by a model, the dependent variable, has some dominant features, a minimum condition for the model to be satisfied is that the explanatory variable should be capable of explaining this feature". I will do a graphical analysis of the shape of distribution of each of

the variables and of their pair wise scatter plots, to explain why I would want to transform the model. Therefore, in order to model my data better, I will transform the model in a similar fashion as described in Mukherjee, Chandan, White, Howard and Wuyts, Marc (1998). I will use the logarithm of GNI per capita and the square root of infant mortality rates in the regression model. I will then present a graphical analysis of country wise birth rate differential, as against their GNI per capita and Infant Mortality rates, and go forward with explaining the reasons for such patterns deduced from empirical testing. I will also throw some light on the development-fertility relation explained by Fumitaka Furuoka(2009) in his paper.

#### CONCLUSION:

From our discussion above, the slope coefficient of infant mortality is expected to be positive and that of income variable is expected to be negative. It would be highly interesting to see, that the transformation of independent variables might enable us to adopt an easier model, which may not include GNI any more as a regressor, probably because of its poor significance . This however doesn't connote that income has no consequences on birth rates at all, but it basically would tend to imply that income might not explain significant variation in birth rate, once the impact of infant mortality on birth rate is already taken into consideration. Health seems to influence birth rate more than wealth; hitherto for a country health is invariably and inevitably dependent on wealth. However, there is also a possibility that the regression doesn't illustrate such results as predicted.