The Impact of Human Capital on Fertility:

Evidence from Asia and Africa

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ABSTRACT

This study analyzes the impact of human capital on fertility in Asia and Africa. Although Asia and Africa have relatively lower human capital and a higher fertility rate compared to other regions, the empirical findings show that the impact of human capital on fertility is negative and significant for the whole sample. However, compared to Africa, the impact of human capital on fertility is even lower in Asia—which indicates that there is a higher impact of an increase in human capital on fertility in the case of Asia. Despite very low human capital and a higher fertility rate in both of these regions, the link between the two factors does exist in these regions and therefore there is a need to increase investment in human capital in order to control the fertility rate.

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1. INTRODUCTION

Increasing attention has been paid to controlling the fertility rate in many developed and developing countries in recent years. The United Nations Department of Population Division defined Total Fertility Rate (TFR) as the total number of children born to a woman until the culmination of her childbearing years. According to the World Bank, TFR represents the number of children who would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates. Factors that affect TFR include urbanization, infant mortality, adolescent fertility rate, GDP and human capital. These factors affect TFR at the macro level in such a way that when there is urbanization, this leads to an increase in health and education facilities; therefore, the fertility rate decreases as people have longer lives and become educated about family planning. For human capital, when a country focuses on developing its human capital, the fertility rate decreases as the importance of having fewer children and investing fairly in the human capital of a small number of children increases.

Human capital is defined as the aggregation of the inborn capabilities and the knowledge and skills that individuals acquire and develop throughout their lifetime (Laroche *et al.*, 1999). Human capital generally includes all the skills, experiences and expertise that people possess. When linking human capital and TFR, the work of Becker (1960) stands out. Becker developed the concept of a negative relationship between fertility and human capital. A negative link occurs between the quantity and the quality of children by each family (Lewis and Becker, 1974). By the quality of children, Becker means the quality of skills, knowledge and abilities that children possess. If there are fewer children in a family, parents can focus easily on developing their skills, knowledge and other related dimensions. Becker *et al.* (1994) also identified that when a family makes a relatively higher human capital investment, the rate of return of such investment is high

as compared to the rate of return on the number of children in that family. When this phenomenon works at the societal level, it can be witnessed that societies comprised of higher human capital investments choose to have small families while those with lower human capital choose the contrary. A few studies have been conducted that stress the importance of the relationship between human capital and TFR.

In their study, Becker and Lewis (1974) observed that the quality of children with respect to the number of children in the family exactly determines their shadow prices, where shadow price refers to the projected price of a good or service for which no market price exists. The higher quality of children leads to a higher shadow price. With the rise in the mother's education, there exists a strong negative effect on the number of children, leading to a decrease in fertility. Thus, advancements in birth control techniques and knowledge significantly increase the quality while significantly reducing the quantity of children.

Becker *et al.* (1994) evaluated that with an upswing in the rate of return of human capital, the standard of human capital in a country increases along with the decrease in fertility. Keeping in view the status of human capital in the context of the fertility rate, the present study aims to examine the linkage between human capital and the fertility rate in Asia and Africa separately as well as collectively. Explicitly, the study intends to:

- Analyze the impact of human capital on TFR along with other variables;
- Test the validity of the Becker theory in Asia and Africa;
- Investigate the trends of human capital and TFR in Africa and Asia;
- Draw policy implications based on the findings of the study.

In order to obtain empirical results, secondary data for the time period 1960-2013 is used. The variables explicitly incorporated are infant mortality rate, human capital, population, adolescent fertility rate and GDP Per Capita. To estimate the panel data regression model, the Generalized Method of Moments (GMM) proposed by Hansen (1982) is used.

1.1. Significance of the study

The decline in fertility and mortality, i.e. demographic transition, has been alleged to play a leading role in some Asian economies (Dauda and Aziakpono 2013). However, this study contains the comparison between Asia and Africa, which has not been conducted before. There exist some differences in the TFR and other variables in both regions. The fertility rate in Asia is still low as compared to Africa, and other variables like life expectancy, human capital, and infant mortality are also more positive in Asia in comparison with Africa. Bongaarts (2009) observed that in the late 1960s, a quick decline in fertility started in Latin America and Asia. In contrast, Africa experienced only limited reproductive change. As a result, the level of fertility varied widely among these regions: 2.5 births per woman in Asia and Latin America compared to 5 births per woman in Africa. Asia, as a region, ranked fourth, behind North America, Europe, and Central Asia (Human Capital Report 2013).

This study is organized in five sections. Section 2 reviews the prior studies done regarding the relationship between human capital and fertility. Section 3 provides situational analysis, while Section 4 provides details about the data and methodology, including techniques used to test the hypothesis. This section also contains the econometric model, data source, variable formation and expected relationships. Section 5 gives results and discussion and the last section, section 6, offers the summary and findings of the research work and policy recommendations.

2. LITERATURE REVIEW

TFR plays an important role in the social and economic development of a country. It determines the number of births a woman has during the course of her reproductive years. This clearly determines the economic and social position of a country because when the birth rate is high, it decreases the level of human capital development. Human capital development takes place during the process of gaining education, expertise and skills with estimating the sum of people having these attributes.

To examine the effect of human capital on TFR, various studies have been conducted. In this regard, Section 2.1 discusses the theoretical foundation and Section 2.2 discusses the empirical foundation regarding the relationship between human capital and TFR.

2.1. Theoretical Literature

Becker (1960) presented a theory in order to put emphasis on the linkage between human capital, fertility rate and growth. He discussed the relationship between the number of children and excellence of children and observed that the two are negatively related. Similarly, Becker and Lewis (1974) investigated the quality of children with respect to the number of children and measured their shadow prices, where quality of children refers to the quality of skills, knowledge and abilities that children possess, and shadow price denotes the anticipated price of a good or service for which no market price exists. They found that a higher quality of children leads to a higher shadow price. With the rise in the mother's education, there existed a strong negative effect on the number of children, leading to a decrease in fertility. Similarly, the expansion in birth control techniques and knowledge significantly increases the quality of children while significantly lowering in quantity.

Becker *et al.* (1994) examined the standard of human capital with endogenous fertility. They found that human capital in a country increases along with the decrease in fertility due to the rise in the rate of return of human capital. Lewis and Becker (1974) found a negative relationship between the number of children of each family and the investment made in their education attainment and health services availability.

In addition, Becker *et al.* (1994) observed that when human capital is abundant, rates of return on human capital investments are high relative to the rates of return on children, whereas when human capital is scarce, rates of return on human capital are low. As a result, societies with limited human capital choose large families and invest little in each member; those with abundant human capital do the opposite.

2.2. Empirical Literature

A mother's education also affects TFR. Lavy and Zablotsky (2015) analyzed the link between a mother's education and TFR in Palestine. They used micro level statistics for the period 1983 to 1995 and found a more pronounced association between mother's education and TFR in the Muslim populace where women's education remains relatively low. The results, based on OLS and 2SLS technique, indicated that the impact of the education of the mother on fertility was negative and it explained some of the dramatic decline in the fertility of Palestine's Arab–Muslim population. They also found that by removing the constraint of travelling on the Arabs of Palestine, female education had increased, which resultantly lowered fertility. In addition, the spouse's education and children's excellence played a role in the fertility decline. This study is of much importance because many of the Muslim economies have low labor force participation by females.

Grönqvist and Hall (2013) explored the impact of education policies on primary fertility based on Swedish educational reform. They employed OLS and IVLS (Instrumental Variable Least Square) estimation techniques on data for the period of 1985 to 2007. The analysis was drawn from micro level data of the developed countries population and the results concluded that there was the emergence of new educational agendas for enrolling women. These new educational agendas were the reason why the probability of females giving birth in earlier life was significantly low.

Another study by Cygan-Rehm and Maeder (2013) worked on the impact of education on fertility using data from two corresponding German surveys. The study focused on a reform in German schooling to examine the relationship between a woman's education and the outcomes of her fertility. The estimation techniques used for the analysis was OLS and IVLS. The results revealed that with the increase in education, fertility decreases. It also highlights the fact that in Germany the opportunity cost of childbearing was high.

A study covering 46 low and middle income nations was conducted by Canning *et al.* (2013), which discovered the pragmatic link between fertility and child mortality. The time period for the study was 1986-2010 and it was based on a model incorporating the behavior of an individual's fertility that leads to the fertility behavior on aggregate. They observed that anticipations about mortality and the fertility choice of females were important for individual behaviors towards fertility. It may be said that one woman's fertility decisions affect the fertility decisions of others. The predictions regarding mortality tend to decrease TFR. However, an increase in mortality increases fertility on net, but on aggregate there exists no such concept of net fertility.

Hafner and Foulkes (2013) conducted a study of 72 countries focused on economic development and demographic transitions. They considered relatively long term factors including education, technology and GDP for the empirical analysis using the panel unit root and the cointegration technique. They concluded that income and fertility have a positive and significant relationship within developing countries, whereas, in advanced economies, the demographic transition is complete, so income and human development matter. Higher human capital development, education and a healthy population all lead to lower fertility and there exists long run causation between them. Fertility possesses a negative relation with human development and a positive relation with income in developing countries.

Mishra and Smyth (2010) explored the association between female labor force participation and total fertility rate. The study was conducted for 28 OECD countries while applying panel cointegration, panel unit root, and granger causality along with Fully Modified OLS estimation techniques. The time period for the study was 1980-2005 annual time series data. They concluded that there is an inverse relationship between the total fertility rate and female labor force participation. This result supports the incompatibility hypothesis that explains that this relationship is negative because of the strain of performing the roles of both employee and mother.

Factors playing a role in the determination of fertility rate may also include childcare services, as incorporated by Yasuoka and Miyake (2010). They used a sample of OECD countries for their analysis and formulated a model considering the childcare services to have market equilibrium. They concluded that the charges being collected for childcare services play a significant role in fertility determination. They observed no strong positive relation between income and fertility.

The study of Bongaarts (2009) examined rapidity in the demographic change along with other variables such as population, fertility, mortality and life expectancy as variables of interest for the analysis. They used data for the period 1950-2005 and found that that life expectancy increased and women's fertility declined. While looking at the past trends of these indicators, there exists a mostly young population in the developing world where fertility rate is high and progressively more elder populations in the developed world. Furthermore, modern nations or societies are at different stages of fertility transitions.

In a study by Azarnert (2008), it was observed that human development and TFR are affected by foreign aid. Foreign aid is generally considered to have a negative impact on poverty and a positive effect on economic growth; however, they observed the opposite trend in the case of Sub-Saharan Africa.

Maitra and Pal (2008) linked child health and fertility selection in their study. The study was conducted for Pakistan and India, but they restricted their analysis to households residing in the Punjab province of both countries. The estimation technique used for the analysis was Full Information Maximum Likelihood (FIML) for the period 1992-93 for the Indian province and for 1991-92 for the Pakistani province. The phenomenon of birth spacing and fertility selection was also discussed, where birth spacing is the time difference between the first childbirth and the second childbirth and fertility selection is the decision to have a child. The selection of fertility refers to when to have a child, as when there is lesser time involved in successive births, it is more likely to face the death of a child. Therefore, it was concluded that child mortality and fertility selection are interlinked because of an important role played by the selection of fertility. Within low income countries, high child mortality is linked with high fertility.

Azarnert (2006) also investigated the impact of a decline in child mortality on fertility and economic growth. The human capital of parents was linked with the child mortality. This is because if the parents are educated and well informed, they know the importance of fertility selection and its consequences. At a time when parents are less interested in having more children though they possess enough to feed and educate afterwards, only then does the phenomenon of child mortality work—where they can afford but cannot take the risk of death of a newborn because of low birth spacing. Due to all of this, the fertility rate decrease in line with the child mortality.

Furthermore, the immediate fertility determinants were studied by Tripathy and Sarangi (2004) in India. They used multiple regression equations for the period between 1970 and 1980, including variables like education, age at marriage and first birth. They found a positive and significant association between fertility and female generative span and a negative association of fertility with age at marriage, age at first birth and birth spacing.

A study of Nepal by Acharya (1998) explored the fertility reducing factors. In order to analyze the comparative significance of some socioeconomic and household variables, they used data from two fertility surveys of mid-1976 and mid-1996. In these surveys, the socioeconomic variables include place of residence, religion, husband's education, literacy and occupation. The variables used mainly include contraceptive use and age at marriage. The results of multiple regression analyses confirmed that the decline in fertility in Nepal was due to these two potential factors. The age at the time of marriage had a negative correlation with fertility and fertility had a strong positive relation with contraceptive use.

Siddique (1996) estimated a model of fertility for more than 100 countries for the years 1955-1985. Covariance analysis was used to explore the structural and behavioral differences across different countries. The variables incorporated for the covariance analysis included income,

infant mortality rate, education, dependency, urbanization and family planning. This study addressed the issue of difference in fertility rates across the same ages and the presence of country specific effects in developing and developed countries. The results showed that fertility behavior differs significantly across age cohorts and countries. Also, enhancement in female literacy turns out to be an effective tool in reducing fertility.

Tamura (1996) incorporated the fertility and growth of a country in a coinciding model of generations. He explained that fertility depends on generations in a way that large families will have more children in the future as well, whereas those with fewer children were observed to have fewer children. In the same way, children receive human capital investment from their parents and parents choose family size, investment in the education of their children and their own consumption. Hence, it was observed that parents should rationally choose either a high fertility steady state or a balanced growth path.

3. SITUATION ANALYSIS

3.1. Introduction

With the aim of establishing a link between human capital and TFR, this section intends to explain the trends of human capital and fertility rate. The data for this purpose have been accessed from WDI (2014) from 1960 to 2013. This section is divided into the following two sub sections.

3.2. Trends of Human Capital

Human Capital is an important input for the economy and it works as fuel for the economy. In this subsection, the historical trends of human capital are discussed, which tells us how human capital has developed over time within Asia and Africa or in different countries of diverse regions.

3.2.1 Asia

Within Asia, one can observe the varying factors that lead to the rapid development of human capital. Asia has always been an important region with respect to human capital development. Countries within Asia started to grow when they started to focus on their human capital development. Apart from that, the countries that were previously named as developing within Asia are now becoming developed or emerging from many dimensions. The dimensions that indicate the improvement in human capital include education, health, GDP per capita, etc. A few studies incorporating country-specific analysis are discussed below.

Sri Lanka has developed its human capital by focusing on youth development, particularly in the areas of education, employment and health. The National Human Development Report (NHDR 2014) of Sri Lanka unveiled the situation of youth in relation to the prevailing strategies. The youth of Sri Lanka were involved in dissipated activities but with the help of equitable access to quality education, this situation was reduced to some extent. Females were more likely to get admissions than males, which led to an increase in Sri Lanka's human capital. However, the females were restricted to some particular jobs and they were not part of the main labor force because of family and security constraints. From the human development perspective, while Sri Lanka made increased investments in health and education over time, it still needs to work on its human capital development.

Moving on to the case of Pakistan, there has been an increase in its Human Capital index from 1.16 in 1960 to 1.99 in 2013, but this is not a very significant increase. The reason behind this poor performance is the relatively stagnant quality of health and education facilities compared to other countries in the same income group. In their study, Jamal and Khan (2007) highlighted the variations in the human development status of the districts of Pakistan between 1998 and 2005

using the Human Development Index (HDI) to estimate the trends in the health and education status of the districts. The results revealed a 3 percent annual growth during 1998-2005. The utmost growth rate was witnessed in NWFP district due to advancements in the education sector.

3.2.2. Africa

The general perspective on human capital in Africa is that there is a lack of basic health and education facilities that leads to lower human capital. Africa's human capital lags behind other regions in many ways. Anyanwu (1998) conducted a study for Nigeria and observed that while at a certain point in time Nigeria had advancements in human capital, after the implementation of the Structural Adjustment Program (SAP) by the World Bank and the International Monetary Fund (IMF), the economy faced serious repercussions. The study, however, used the health and education status of Nigerian men as the proxy of human capital in relation to their incomes. It was found that with the development of their human capital (i.e. their education attainment and health status), the income of Nigerian men increased. Still, the human capital of Nigeria, like much of the rest of Africa, lags behind because of the SAP.

According to a report on the Trends in Human Capital of Africa (2014), by enabling the skills, education and health services for people, the human capital of Africa may increase. Becker (2002) observed that within a society, the promoters of swift economic growth are the people of that society or country. It is important for a government to build on a resilient family to develop a range of economic policies that will accomplish two objectives. First and foremost is the goal to empower the elementary capacities that lie amongst the people of every nation. Secondly, those talents should be used in a productive way. It was observed that the problems with the human capital of Africa are not cultural; rather the problem is a lack of investment in human capital and

poor government policies. If these were eliminated, it is expected that the human capital would improve.

3.3. Trends of Fertility Rate

Fertility rate determines the number of children born per woman within her reproductive years. In order to know how countries worked on controlling their fertility rates and what were the trends of total fertility, the following sub-section discusses the cases of Asia and Africa.

3.3.1. Asia

The United Nations Economic and Social Commission for Asia and Pacific (ESCAP, 2013) discussed the fertility and population trends of that region. They observed that demographic transition (i.e. moving from high to low fertility) took place at a larger scale in this region. According to a 2012 estimate, it was witnessed that the fertility was reduced to 2.1 births per woman, which is the replacement level of fertility. However, different countries were at different stages of the demographic transition. A few moved to aged-societies two decades ago while a few like Korea, Singapore, Vietnam and China were moving slowly towards aged-societies with large working-age population. The challenge faced by these countries would be to move into demographic division with a health, hearty and educated working-age population. However, there still exist some countries where the fertility rate is high and the mortality rate is low. The countries still experiencing high total fertility rate include Samoa, Solomon Islands, and Afghanistan. Furthermore, in this region there exist a few countries which experienced below replacement level fertility; these countries have low populations due to strict family planning policies. Thus, there was a need to start the in-migration policy in these few countries, including China, Macao,

Singapore and Hong Kong. It was also observed that female education in India tends to play a significant role in the reduction of TFR, as discussed by Murthi (2002).

In another study, Westley and Retherford (2002) discussed the fertility trends while illustrating the differences and similarities of Asia's population. Over the past 50 years, fertility has decreased in almost every major country of the region. This downward trend of fertility in Asia remained consistent but the rate of decrease in fertility varied greatly, which is why the fertility levels in Asia are generally assorted. In India, the fertility rate had fallen from 5.2 to 3.2 within the period of 1971-1998. However, in the southern part of India it was the lowest. Fertility in India was near replacement at that time and it was projected by East Asia and the West that it would reach below replacement by 2020. All of this is the result of the improvement in child survival, the increase in mothers' education and mothers being part of the labor force. China adopted their one child policy in 1979 and that worked very efficiently in the urban areas where there is more administrative control. As a result, fertility was reduced from 6.1 to 1.9 between the time period of 1965-1993 and then further to 1.8 by 1998. After this much reduction, a few years later the government of China realized the issue of population ageing and low youth availability, so they abandoned this rule.

3.3.2. Africa

Lesthaeghe (1989) discussed the fluctuations in fertility during the 1960s, 1970s and 1980s. It was observed that during these eras, the fertility rate remained high in Sub-Saharan Africa. Despite the decline of fertility in the third world, the Sub-Saharan region stood alone in having a high fertility rate. However, during the 1990s, fertility tended to fall even in this region.

While discussing some of the African countries and their fertility trends, Gaisie (2005) focused on the trends of fertility in Ghana. Ghana was classified as an intermediate or moderate fertility country, where classifying it as an intermediate fertility country means that the pace of fertility decline in that country was slow. Furthermore, it was observed that the fertility rate was stable and high during the 1960s and 1970s, respectively. However, it fell to 5.83 in 1996 from 6.03 in 1988 and decreased further to 4.6 in the 20th century.

A study by Bongaarts (2005) reported the national TFRs of 38 countries of Africa. He concluded that two countries have experienced stalling fertility, where stalling is demarcated as a default of national Total Fertility Rates to decrease. The study found that 12 countries have witnessed decline in their fertility rates and five countries were marked as the ones still at the early stages of fertility transition. His focus was on those countries which have experienced stall at the stage where their fertility rates tend to fall a little.

A study led by Shapiro and Gebreselassie (2008) identified that around 24 countries of Sub-Saharan Africa, which have almost 75% of the region's population, had observed the beginning of transition in fertility. The fertility decline was slow, which led to stalling fertility; as a result of this, few of the countries are still at the early stage of fertility (pre-transitional stage). The fundamental factor highlighted that led to fertility decline was education. The need to improve the education of people living in Sub-Saharan Africa was emphasized.

It is concluded that different countries in Asia and Africa have different factors through which they experienced the fertility decline. However, while looking at the figures of the fertility rates in different countries, it may be said that Asia has experienced the demographic transition earlier than Africa. This study provided evidence on the decline in fertility of India, China, and some African countries. Murthi (2002) concluded that in the past two to three decades, there have

been significant changes in fertility rates in Asia and Africa. With the availability of data and historical trends, it is easier to have a closer inspection of fertility trends.

4. DATA AND METHODOLOGY

4.1. Introduction

Fertility defines the population size for each country, which influences the size of workforce in the country concerned. The TFR measures the average number of living newborns per woman in her fertile life (Cojocariu 2015). The impact of human capital on TFR in Asia and Africa as a whole and separately will be analyzed empirically in this part of the study. This part is further divided into two sections. Section 4.1 gives the Model specifications and justifications of all the independent variables in relation with the dependent variable through prior literature. Section 4.2 contains the data sources, variables specification and econometric methodology.

4.2. Model Specification

Becker (1960) presented a theory highlighting the link between fertility, human capital and growth. It provided enhanced understanding of fertility (quantity) as the interaction between quantity and quality of children. Within the framework of Becker's theory, many studies are conducted in which TFR is taken as a dependent variable, such as the study of El-Ghannam (2005). Therefore, to determine the linkage between TFR and human capital empirically, a model from the study of Becker (1960) is adapted in which TFR is taken as the dependent variable.

The model for fertility rate and human capital is specified as follows:

$$TFR_{it} = \alpha_0 + \alpha_1 IMR_{it} + \alpha_2 HC_{it} + \alpha_3 GDPPC_{it} + \alpha_4 AFR_{it} + \alpha_5 POP_{it} + \alpha_6 HC\_REG_{it} + \mu_{it}$$

where,

TFR = Total Fertility Rate

IMR = Infant Mortality Rate per 1,000 live births

HC = Human Capital

HC_DREG = Regional Dummy for Human Capital (1= Asia, 0= Otherwise)

GDPPC = GDP Per Capita

AFR = Adolescent Fertility Rate

POP = Population

i = Cross section of Asian and African countries

t = Time period ranging from 1960-2013

where, α_0 is the intercept coefficient which shows the value of the dependent variable when the value of all the independent variables is zero. α_1, α_2, α_3, α_4, α_5, α_6 are slope coefficients which capture the rate of change in the dependent variable due to change in independent variables. μ_{it} is the error term which incorporates the effect of all those independent variables which are not included in the model.

Instrumental variables are used to estimate the causal relationships. In this empirical analysis, exogenous and endogenous variables with lags are included as instruments.

4.2.1. Justification of Variables

Variables that directly and indirectly affect total fertility include human capital, infant mortality, population, adolescent fertility, female labor force participation and GDP per capita.

Infant Mortality Rate

Infant Mortality is the death of a child less than one year of age. The UN Millennium Development Goals (UN, 2010) highlight the Infant Mortality Rate (IMR) as a measure of progress in improving neonatal health and more broadly as an indicator of basic health care (Anthopolos and Becker 2010). The anticipated sign of this variable is positive. It can be observed that when IMR is high, TFR also increases because people plan to have more children if they are afraid of child death. This idea is supported by Bhutto *et al.* (2012), who observed that according to the theory of demographic transition, mortality decline occurs along with an increase in industrialization and urbanization, a diffusion of medical technology, and rises in literacy and living standards, thus lowering fertility rate (Yamada 1985).

Human Capital

Human capital includes the collective skills, knowledge, or other attributes of individuals that can be used to create economic value for the individuals, their employers, or their community. We have measured human capital through mean years of schooling as given in Penn World Tables. The probable sign of the coefficient of human capital is negative, as the more that is invested in human capital, the desire to have more children will fall gradually. Therefore, there exists a negative relation between the quantity and quality of children per family (Lewis and Becker, 1974). Becker *et al.* (1994) detected that when there exists abundance of human capital, rates of return on human capital investments are high relative to the rates of return on children, whereas the opposite holds true when human capital is scarce. Focusing on the quality and quantity of children, they explained the negative relationship between human capital and TFR and also highlighted the benefits of investing in human capital. Additionally, according to Cojocariu (2015), HDI has a very robust negative influence on fertility.

GDP Per Capita

GDP stands for Gross Domestic Product and it measures national income or national expenditure. GDP per capita gives the average income per person in a country. It has always been observed that people from poor nations have much higher fertility rates than people living in rich nations. A couple living in a country having good economic position is able to support more children than the couple living in a country having poor economic position. For example: Congo, Liberia and Eritrea have very low GDP per capita and some of the highest fertility rates in the world, while countries like Switzerland, Singapore, Austria and Norway have very high GDP per capita and low fertility rates. Therefore, the expected sign for per capita GDP can be both positive and negative. Jemna (2015) showed a bi-directional causation between economic growth and fertility. He explains that due to fertility, economic growth or GDP either increases or decreases depending on the economic condition of a nation.

Adolescent Fertility Rate

Adolescent fertility rate (AFR) is defined as the number of live births a woman has between 15-19 years of age. Having children this early in life exposes unavoidable risks for adolescent women. The chance of death of a woman who waits until her 20s to start child bearing is twice as low as the chance of death of an adolescent women having a child. The expected sign of this variable is positive because when women have children at an early age, TFR tends to rise accordingly. A high adolescent fertility rate decreases female labor force participation and female literacy declines sharply. In a study conducted by Westoff *et al.* (1983) it was concluded that for young parents and society, adolescent fertility is a problem. The number of teen-age births can considerably decrease the TFR of a country.

Population

Whenever there is an increase in the fertility rate of a country or region, the population of that country or region increases simultaneously. According to Bhutto *et al.* (2012), population growth has also a significant impact on reducing fertility. As fertility has decreased, so has population growth in many regions. Population growth rates have declined due to demographic transitions. These transitions created awareness by providing the environment of good education, improved health facilities, and increased social standards. It is also emphasized that the focus should be on the quality of children rather than on their quantity (Borooah 2003). Most scholars found a significant positive relationship between human population and the fertility rate. In cross-national studies, Heer (1966) found such relationship between population and fertility after controlling for the level of urbanization, economic development and other background variables.

4.3. Data Sources and Variables Specification

This study is conducted for Asia and Africa separately and as a whole to find the impact of human capital on the fertility rate in these regions. We utilize secondary data for the time period of 1960-2014 from World Development Indicators (WDI, 2014), except the data for Human Capital, which is available from Penn World Table 8.1.

The data does not contain any major transformations. However, almost all of the variables are used in the log form, except AFR. The data for the variable GDP per capita is in constant 2005 US dollars. We have incorporated a regional dummy for human capital (HC_DREG) in the model, where 1 is assigned to all the Asian countries and 0 is assigned to all African countries. The reason behind the inclusion of dummy in the model is that it tells the difference of TFR in the two regions due to human capital.

4.3.1 Descriptive Statistics

Table 1 gives the descriptive statistics of the variables used in the analysis. In Asian countries the average GDP per capita is more than 5 time that of African countries. Africa also has higher average fertility rate and adolescence fertility rate compared to Asia. However, there is more variations in average fertility rate in Asia. Average Mortality rate is also about two times higher in Africa compared to Asian countries. Africa also has lower average human capital.

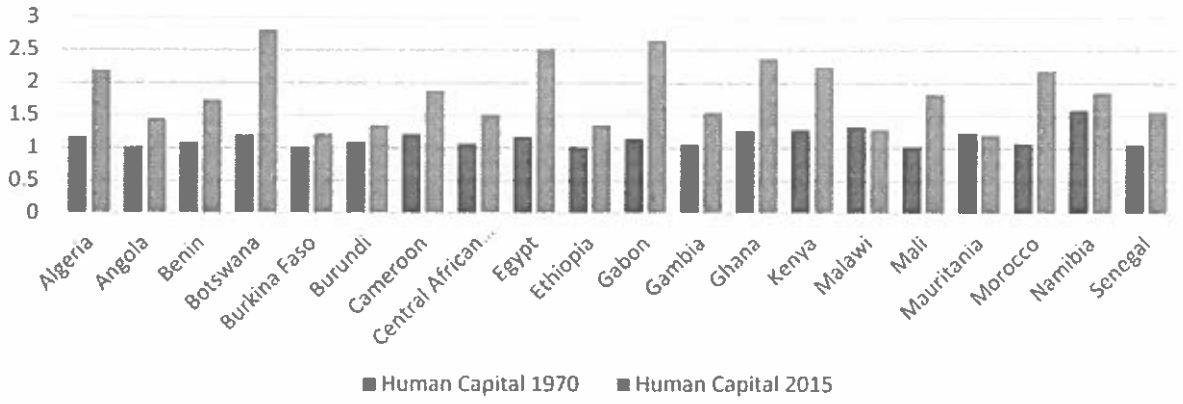
Table 1
Descriptive Statistics

Asia				
Variable	Mean	Std. Dev.	Min	Max
Adolescence Fertility Rate	61.8	45.7	0.5	213.1
Fertility Rate	4.2	1.9	1.1	8.4
GDP Per Capita	9,416.4	15,437.7	132.0	113,682.0
Mortality Rate	76.7	68.6	2.7	363.7
Population	68,700,000.0	208,000,000.0	47,384.0	1,370,000,000.0
Human Capital	2.0	0.6	1.0	3.7
Africa				
Adolescence Fertility Rate	126.3	52.0	6.0	235.3
Fertility Rate	6.0	1.3	2.0	8.5
GDP Per Capita	1,742.7	2,520.2	115.8	20,333.9
Mortality Rate	154.8	80.2	13.4	442.4
Population	12,200,000.0	19,300,000.0	41,700.0	181,000,000.0
Human Capital	1.4	0.4	1.0	2.8

Source: Authors Calculations

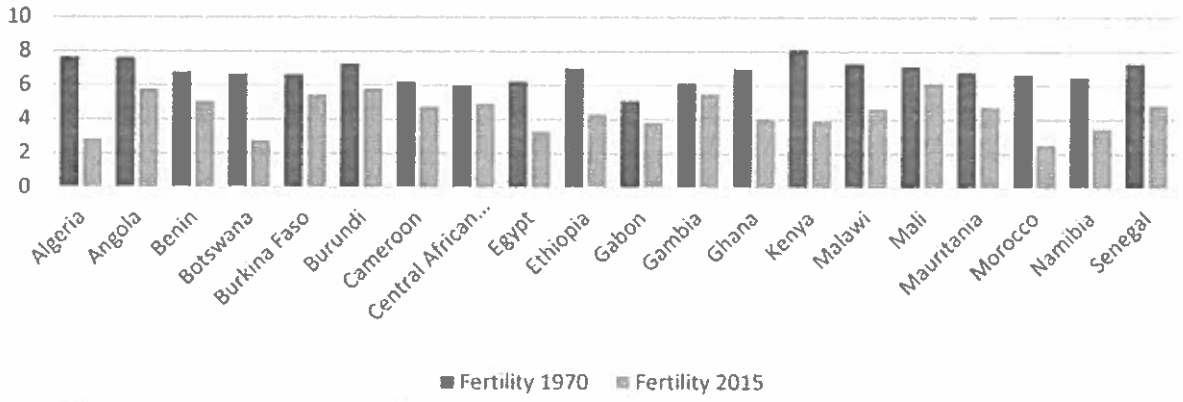
All countries in Africa and Asia experienced increase in human capital during the 1970-2015 period. In Africa, the magnitude of increase in human capital was highest in Botswana and Egypt; some other countries also experienced substantial increase in human capital. In the same period the decrease in fertility rate is also evident in Africa, there is also more decline in fertility in those countries which had higher increase in human capital i.e. Botswana and Egypt.

Figure 1
Human Capital in Africa



Source: World Bank Development Indicatros 2015

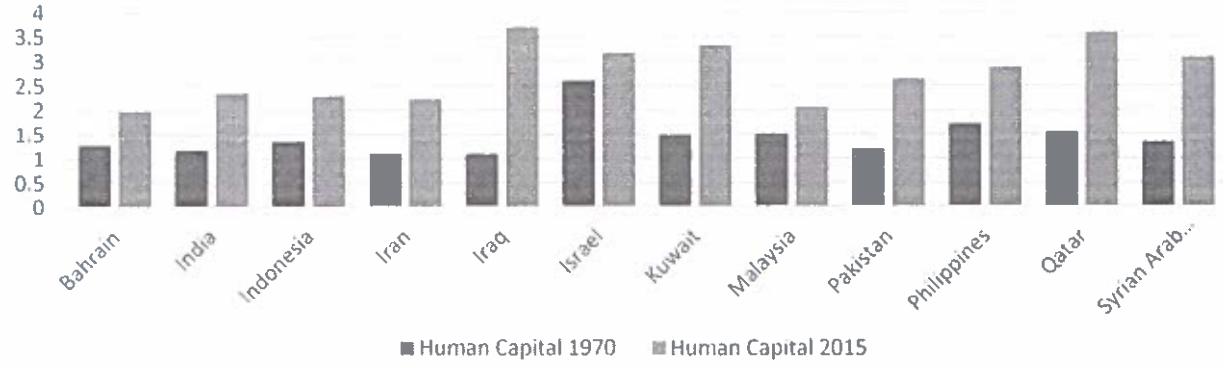
Figure 2
Fertility Rate in Africa



Source: World Bank Development Indicatros 2015

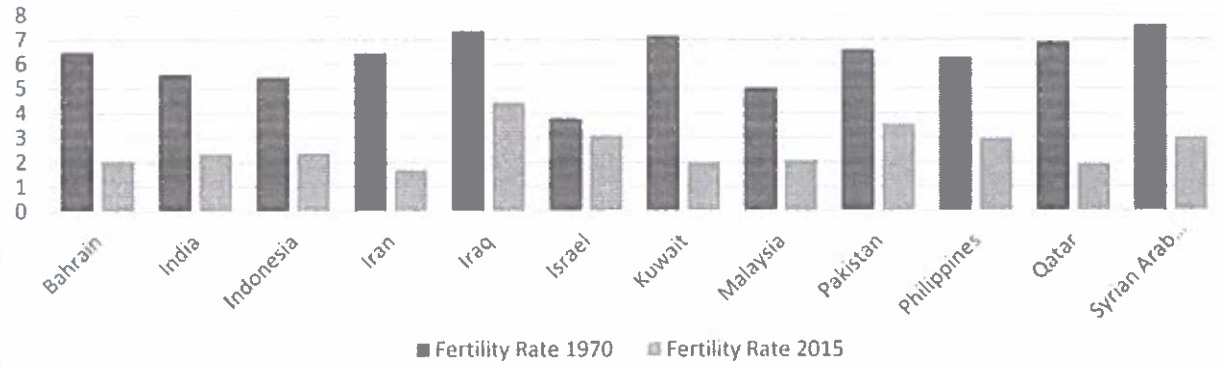
As in case of Africa, all Asian countries experienced an increase in human capital, and a decrease in fertility, which shows the possible relationship between human capital and fertility rate.

Figure 3
Human Capital in Asia



Source: World Bank Development Indicators 2015

Figure 4
Fertility Rate in Asia



Source: World Bank Development Indicators 2015

4.4. Econometric Methodology

The study is centered on the objective to analyze the impact of human capital on the fertility rate along with other variables. For achieving this objective, panel data for 61 countries are used; 32 countries are in Asia and 29 are in Africa. Due to the presence of theoretical endogeneity in panel data model given above, the conventional panel data estimation technique such as fixed and random effects cannot be applied. Instrumental Variable (IV) approach provides the consistent estimates of regression parameters in such situation.

4.4.1. Tests of under- and weak identification

An LM test is an under identification test which depicts whether the equation is identified, i.e., the excluded instruments are correlated with the endogenous regressors. This test is used for checking the matrix rank. Under the null hypothesis, the equation is under-identified, the matrix of reduced form coefficients on the L1=excluded instruments has rank=K1-1, where K1=number of endogenous variables. Under the null, the statistic is distributed as chi-squared with degrees of freedom = (L1-K1+1). A rejection of the null hypothesis indicates that the model is identified.

"Weak identification" arises when the excluded instruments are correlated with the endogenous regressors. Estimators can perform poorly when instruments are weak, and different estimators are more robust to weak instruments. The test for weak identification is an F version of the Cragg-Donald Wald statistic when the errors are assumed to be i.i.d.

4.4.2. Test of Over Identifying Restrictions

The Sargan-Hansen test is a test of over identifying restrictions. The joint null hypothesis is that the instruments are valid instruments. By valid instruments, it states that the instruments excluded from the estimated equation are correctly excluded and have no correlation with the error term. Under the null, the test statistic is distributed as chi-squared in the number of (L-K) over identifying restrictions where the number of instruments is L and K is the number of regressors. A rejection casts doubt on the validity of the instruments. In the presence of heteroskedasticity and autocorrelation, the J statistic is consistent and Hansen's J statistic is reported.

The test statistic for endogeneity is distributed as chi-squared with degrees of freedom equal to the tested number of regressors, indicating that the specified endogenous variables can actually be taken as exogenous, under the null hypothesis (Baum *et al.*, 2007).

5. RESULTS AND DISCUSSION

The results obtained from the GMM estimation are reported in Tables V-1 and V-2. The regression results presented in the tables are interpreted and supported through prior literature. Table IV-1 shows the impact of human capital on TFR. Overall the results of all the variables are statistically significant except population. The value of the coefficient of IMR is 0.048, which indicates that a 1% increase in IMR brings a 0.048% increase in TFR and its probability value is 0.012, which shows that it is significant at the 1% level. Most of the researchers suggest that the impact of mortality on fertility is positive. There are also other factors that are responsible for fertility reductions during the demographic transitions. Bhutto *et al.* (2012) observed that a fall in mortality reduces fertility as suggested by the theory of demographic transitions; i.e. with the improvement in urbanization, health, education and industrialization, fertility and infant mortality decrease.

The findings revealed that there exists a negative relation between human capital and TFR. The value of the coefficient of human capital is -0.448, which indicates that a 1% increase in human capital brings a 0.448% decrease in TFR. Some of the studies conducted by Becker (1960) support the negative relation between human capital and TFR. Lewis and Becker (1974) also showed that there is a negative relation between quantity and quality of children per family. Human Development Index (HDI) refers to the attainments in the central dimensions of human development, i.e. healthy life, good standard of living and being educated, and all the dimensions of HDI have a strong negative impact on fertility (Cojocariu 2015).

The coefficient value of GDPPC is -0.1092, which indicates that a 1% increase in GDPPC brings 0.1092% decrease in TFR and this impact is statistically significant at 1%. Our results are in line with Billingsley (2010) who discovered that the GDP fluctuations and fertility rates are

positively linked. The author also highlighted that deferral of child bearing and marriage age indicated a positive correlation with GDP. Alternatively, from the negative channel of GDP per capita and TFR, it shows that when people are free to enjoy the basic needs and luxuries, they do not want to have more children and they will invest in the human capital of their present born children. A study by Basu & Van (1998) also revealed that if the income of a family drops from non-child labor sources only then will they send their children to the labor market. Otherwise, particularly in low-income countries, more children bring more income via child labor, hence low income increases fertility.

The value of the coefficient of AFR is 0.003, which indicates that a 1% increase in AFR brings a 0.003% increase in TFR. This impact is statistically significant at the 1% level of significance. Gouws (1990) observed that high fertility can be due to youthful reproduction. A study by Mostert and Van Tonder (1986) referred to the report on Fertility and Family of the UN, wherein it is stated that only where marriage age was delayed until the early twenties or later is there any significant reduction of fertility. Adolescent fertility, because of its influence on TFR, has proved to be an effective and dependable computing instrument.

The population (POP) coefficient of -0.023 indicates that a 1% increase in population brings a 0.023% decrease in TFR. However the coefficient of population is insignificant. In contrast to our findings, Bhutto *et al.* (2012) report that population growth has a significant impact on reducing fertility. The negative relationship between population and fertility had also been observed by Leet (1977).

The value of the coefficient of the regional dummy (HC_Dreg) is -0.307, which indicates a TFR lower by 0.307% in Asia as compared to Africa. It is also significant at the 1% level.

Bongaarts (2009) observed that almost simultaneously in the late 1960s, a quick drop in fertility started in Latin America and Asia. On the contrary, only limited reproductive change occurred in Africa. As a result of these opposing past trends, in 2000-2005, the level of fertility varied widely among regions. It was found out to be 2.5 births per women in Asia and Latin America and 5 births per women in Africa.

Under the GMM framework, the under identification test is an LM test of whether the equation is identified, or instruments excluded are "relevant", meaning correlated with the endogenous regressors. Under the null hypothesis, the equation is under identified. The statistic is distributed as chi-squared with degrees of freedom = (L1-K1+1) where L1= Number of excluded instruments and K1=number of endogenous regressors. A rejection of the null indicates that the matrix is full column rank, i.e., the model is identified. When we look at the computed results, it is shown that Kleibergen-Paap rk LM statistic is 427.774 and p-value is 0.000 which indicates that the model is identified.

Table V-1 also reports the closely-related Cragg-Donald (1993) Wald test statistic. The Cragg-Donald Wald statistic is distributed as chi-squared with (L1-K1+1) degrees of freedom. The values of Cragg-Donald Wald F statistic and Kleibergen-Paap rk Wald F statistic are compared with the values of Stock-Yogo weak ID test statistic. The values of Stock-Yogo weak ID test statistic must be less than those of Cragg-Donald Wald F statistic and Kleibergen-Paap rk Wald F statistic. Here, the value of Kleibergen-Paap Wald F statistic is 520.9 and the value of Cragg-Donald Wald F statistic is 477.6, which are much greater than the Stock-Yogo weak ID test statistic values.

The test of over-identifying restrictions may be established via the usually working J-statistic of Hansen (1982). While saying that the instruments excluded from the equation are

correctly excluded, they are valid and have no correlation with the error term that explains the joint null hypothesis of the test. Under the null, the test statistic is distributed as chi-squared in the number of (L-K) over-identifying restrictions, where L is the number of instruments and the number of regressors is K. A rejection of the null hypothesis implies that the instruments do not satisfy the orthogonality conditions required for their employment. This may be either because they are not truly exogenous, or because they are being incorrectly excluded from the regression. The instrumental variable must satisfy two properties: it must be correlated with the included endogenous variable(s), and orthogonal to the error process.

The first step is to identify whether the instruments are valid or not. According to this condition, the number of instruments should be greater than the number of regressors. By regressing the equation, the value of the J-statistic is 3.606 and the probability value is 0.1648, which shows that the instruments are correlated with the included endogenous variable(s), and orthogonal to the error process. Hence, the null hypothesis is accepted, which means the instruments are valid. The test for the endogeneity of regressors revealed that the variable treated as endogenous is valid.

For robustness, we have estimated two separate equations for Asia and Africa.

Table V-2 shows the impact of human capital on fertility in Asia and Table V-3 shows the impact of human capital on fertility within Africa. Overall, the results of all the variables in both regions are statistically significant. Within Asia, all of the variables are significant at 1% level of significance except population. However, all the variables incorporated in Africa are statistically significant at the 1% level.

All of the variables excluding human capital have not shown any major fluctuations. All the coefficients in the case of Asia show a better picture compared to Africa. They differ only

0.01% from each other for variables including infant mortality rate, GDP per capita and adolescent fertility rate. However, the coefficient of population differs 0.02% between the two regions.

The empirics revealed that there exists a negative relation between human capital and TFR in both regions. The value of the coefficient of human capital in Asia is -0.81, which indicates that a 1% increase brings a 0.81% decrease in TFR in Asia. In contrast, the value of the coefficient of human capital in Africa is -0.75, which indicates that a 1% increase brings a 0.75% decrease in TFR in Africa. These impacts are significant at the 1% level in both regions. These results indicate that human capital has a stronger and higher negative impact on fertility in Africa compared to Asia, thus leading to a lower fertility rate. As compared to other continents or regions, these two regions have a high fertility rate and human capital investment is low.

Table V-1: Impact of HC on TFR in Asia and Africa
Empirical Findings (1960-2013)

Dependent Variable: TFR	**Panel A: Estimates**	
Regressors	**Coefficients**	**t-statistic**
IMR	0.4834***	2.50
HC	-0.448***	-7.45
GDPPC	-0.109***	-9.94
AFR	0.003***	-21.21
POP	-0.023	-1.08
HC_DREG	-0.307***	-13.48
	Panel B: Diagnostic Test	
Under Identification Test:		
Kleibergen-Paap rk LM statistic	427.774	0.000
Weak Identification Test:		
Cragg Donald Wald F statistic	520.899	13.91
Kleibergen-Paap rk Wald F statistic	477.569	9.08
Over Identification Test:		
Hansen J-Statistic	3.606	0.1648
Endogeneity Test:	30.789	0.0000

Note: ***, **, * indicate level of significance at 1%, 5% and 10%, respectively.

Table V-2: Impact of HC on TFR: ASIA

Empirical Findings (1960-2013)

Panel A: Estimates		
Regressors	**Coefficients**	**t-Statistic**
IMR	0.12***	2.70
HC	-0.81***	-6.51
GDPPC	-0.09***	-4.33
AFR	0.002***	12.37
POP	-0.08**	2.44
Panel B: Diagnostic Test		
Under Identification Test:		
Kleibergen-Paap rk LM statistic	172.499	0.000
Weak Identification Test:		
Cragg Donald Wald F statistic	110.269	13.91
Kleibergen-Paap rk Wald F statistic	59.284	9.08
Over Identification Test:		
Hansen J-Statistic	0.364	0.8336

Note: ***, **, * indicate level of significance at 1%, 5% and 10%, respectively.

Table V-3: Impact of HC on TFR: AFRICA

Empirical Findings (1960-2013)

Dependent Variable: TFR	**Panel A: Estimates**	
Regressors	**Coefficients**	**t-Statistic**
IMR	0.11***	5.97
HC	-0.75***	-9.03
GDPPC	-0.08***	-6.30
AFR	0.002***	12.66
POP	0.10***	3.60
	Panel B: Diagnostic Test	
Under Identification Test:		
Kleibergen-Paap rk LM statistic	296.365	0.000
Weak Identification Test:		
Cragg Donald Wald F statistic	3.3e+04	19.93
Kleibergen-Paap rk Wald F statistic	3.2e+04	11.59
Over Identification Test:		
Hansen J-Statistic	0.110	0.7397

Note: ***, **, * indicate level of significance at 1%, 5% and 10%, respectively.

6. CONCLUSION AND POLICY RECOMMENDATIONS

TFR determines the demographic position of a country. It is affected by many factors and in turn it does affect many as well. On one hand, it affects its foremost indicators such as infant mortality rate, adolescent fertility rate, population and GDP, while on the other hand it is affected by human capital and urbanization, including the development in health, education and knowledge. Human capital also tends to act as an important factor affecting economic development. Without having a focus on the development of people of a nation, it is impossible to have a lower fertility rate together with economic growth.

This study analyzed the impact of human capital on TFR along with other variables. Besides human capital, we analyzed infant mortality rate, population, adolescent fertility rate and GDP per capita, all of which affect fertility rate in a number of ways. To understand the impact of human capital on fertility, this study developed an empirical model using the Generalized Method of Moments as used in Hansen (1982). This specific study is a case study of Asia and Africa collectively and separately for the period of 1960-2013. The empirical findings of the study show that the impact of human capital on fertility rate is negative and significant on the whole. However, compared to Africa, the impact of human capital is more negative in Asia. The reason may be the increased advancement in health, education and skills of people living Asia. Also, it can be said that with these advancements, the movement of fertility from a higher level to a lower level took place swiftly.

It is evident from the study that human capital and TFR are negatively related, so in order to upsurge the impact of these variables on TFR, the policy recommendations are given below:

Under development planning, the population issues and demographic changes must be included as important factors in the design and implementation of development programs. For example, programs such as employees' old age benefit programs, employment opportunities for the youth and the programs for women's empowerment must be targeted for different segments of the population.

Within Africa, policies for birth control should be made in order to promote the decline in TFR and the advancement of human capital. The policy makers must also give emphasis to education and health programs in order to improve the human capital within Asia and Africa. The countries that have gone through the demographic transition (i.e. moving from high to low fertility) may get some attention with respect to promoting private enterprise, completion of education in accordance with the requirements of an economy's labor market and rural development.

There is still a need to improve access to family planning in numerous African countries. This can be made possible by increasing the education of women and empowering them. Asia as a region is progressively more confronted by low fertility, which leads to ageing societies and somehow a dwindling population. Countries must prepare them for the establishment of health schemes and make policies that are family oriented and encourage fertility.

7. REFERENCES

Acharya, L. B. (1998). Determinants of fertility in the 1970s and 1990s in Nepal. *Contribution to Nepalese Studies*, *25*(special issues), 95-108.

Anthopolos, R., & Becker, C. M. (2010). Global infant mortality: Correcting for undercounting. *World Development*, *38*(4), 467-481.

Anyanwu, John C., (1998). Stock Market Development and Economic Growth in Nigeria. *Vision*, *2*(1), 33-38.

Azarnert, L. V. (2006). Child mortality, fertility, and human capital accumulation. *Journal of Population Economics*, *19*(2), 285-297.

Azarnert, L. V. (2008). Foreign aid, fertility and human capital accumulation. *Economica*, *75*(300), 766-781.

Basu, K., & Van, P. H. (1998). The economics of child labor. *American Economic Review*, *88*(3), 412-427.

Baum, Christopher, Schaffer, Mark and Stillman, Steven, (2007), Enhanced routines for instrumental variables/generalized method of moments estimation and testing, *Stata Journal* 7(4), p. 465-506.

Becker, G. S., (1960). An Economic Analysis of Fertility. In Univesities-N.Bureau, *Demographic and Economic Change in Developed Countries* (pp. 209-240). Columbia University Press.

Becker, G. S. (2002). Human capital. *Revista de Ciencias Empresariales y Economia*, (1), 12-23.

Becker, G. S., & Lewis, H. G. (1974). Interaction between quantity and quality of children. In *Economics of the family: Marriage, children, and human capital* (pp. 81-90). The University of Chicago Press.

Becker, G. S., Murphy, K. M., & Tamura, R. (1994). Human capital, fertility, and economic growth. In *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* (pp. 323-350). The University of Chicago Press.

Becker, G. S., & Tomes, N. (1994). Human capital and the rise and fall of families. In *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* (pp. 257-298). The University of Chicago Press.

Bhutto, N.A, Dayo, R.H, Butt, F, Lohach, R.A, Birjani, N. (2012). *Demographic transitions: analyzing* effects *of mortality on fertility in low middle income countries.*

Billingsey, S., (2010). The Post-Communist Fertility Puzzle, Population Research and Policy Review, vol. 29, no. 2, pp. 193-231.

Bongaarts, J. (2005). "The causes of stalling fertility transitions." Paper presented at the IUSSP International Population Conference, Tours, France, July 2005.

Bongaarts, J. (2009). Human population growth and the demographic transition. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1532), 2985-2990.

Borooah, V. K. (2003). Births, infants and children: an econometric portrait of women and children in India. *Development and Change*, *34*(1), 67-103

Cragg, John G. and Stephen G. Donald (1993), "Testing identifiability and specification in instrumental variable models," Econometric Theory 9 (2): 222-240.

Cojocariu, A. M. A. (2015). Estimating the Negative Influences on Fertility. A Case Study-Romania. *Procedia Economics and Finance*, *20*, 28-34.

Canning, D., Günther, I., Linnemayr, S., & Bloom, D. (2013). Fertility choice, mortality expectations, and interdependent preferences—an empirical analysis. *European Economic Review*, *63*, 273-289.

Cygan-Rehm, Kamila & Maeder, Miriam, (2013), The effect of education on fertility: Evidence from a compulsory schooling reform, *Labour Economics*, *25*(C), 35-48.

Dauda, R. S., & Aziakpono, J. M. (2013). A panel *data analysis of fertility and mortality effects on economic growth and development in West Africa.*

El-Ghannam, A. R. (2005). An examination of factors affecting fertility rate differentials as compared among women in less and more developed countries. *Journal of Human Ecology*, *18*(3), 181-192.

Gaisie, S. K. (2005). Fertility trend in Ghana. *African Population Studies*, *20*(2), 1-24.

Global Human Capital Trends (2014), Top findings for Africa, *Africa Trends of Human Capital.*

Gouws, N. B. (1990). The indicators used to monitor the progress of the Population Development Programme in South Africa. *Southern African Journal of Demography, 3(*1), 33-36.

Grönqvist, H., & Hall, C. (2013). Education policy and early fertility: lessons from an expansion of upper secondary schooling. *Economics of Education Review*, *37*, 13-33.

Hafner, K. A., & Foulkes, Mayer, D. (2013). Fertility, economic growth, and human development causal determinants of the developed lifestyle. *Journal of Macroeconomics*, *38*, 107-120.

Heer, D. M. (1966). Economic development and fertility. *Demography, 3,* 423-444.

Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. Econometrica 50, 1029–1054.

Human Development Index (2014), United Nation Development Programme, http://hdr.undp.org/-en/content/human-development-index-hdi

Jamal, H., & Khan, A. J. (2007). *Trends in regional human development indices*. Social Policy and Development Centre.

Jemna, D. V. (2015). Causality relationship between economic development and fertility in Romania on regional level. *Procedia Economics and Finance, 20,* 334-341.

Laroche, M., Mérette, M., & Ruggeri, G. C. (1999). On the concept and dimensions of human capital in a knowledge-based economy context. *Canadian Public Policy/Analyse de Politiques, 25*(10), 87-100.

Lavy, V., & Zablotsky, A. (2015). Women's schooling and fertility under low female labor force participation: Evidence from mobility restrictions in Israel. *Journal of Public Economics, 124,* 105-121.

Leet, D. R. (1977). Interrelations of population density, urbanization, literacy, and fertility. *Explorations in Economic History, 14*(4), 388-401.

Lesthaeghe, R. (1989). *Social organization economic crises and the future of fertility control in Africa.*

Maitra, P., & Pal, S. (2008). Birth spacing, fertility selection and child survival: Analysis using a correlated hazard model. *Journal of Health Economics, 27*(3), 690-705.

Mishra, V., & Smyth, R. (2010). Female labor force participation and total fertility rates in the OECD: New evidence from panel cointegration and Granger causality testing. *Journal of Economics and Business, 62*(1), 48-64.

Murthi, M. (2002). Fertility change in Asia and Africa. *World Development, 30*(10), 1769-1778.

Mostert, W. P. & Van Tonder, J. L. (1986). Die voorgestelde Suid-Afrikaanse bevolkingsprogram can die Presidentsraand: Insette ter bereiking van fertilietsdoelwitte. Pretoria: Raad vir Geesteswetenskaplike Navorsing (Verslag-142).

Population Trends in Asia and the Pacific (2013), United Nations Economic and Social Commission for Asia and the Pacific.

Siddique, R. (1996). The Impact of Socio-economic Factors on Fertility Behaviour: A Cross-country Analysis. *The Pakistan Development Review*, *35*(2), 107-128.

Shapiro, D., & Gebreselassie, T. (2008). Falling and stalling fertility in Sub-Saharan Africa. In *International Union for the Scientific Study of Population International Seminar on Human Fertility in Africa, Cape Coast, Ghana* (pp. 16-18).

Tamura, R. (1996). From decay to growth: a demographic transition to economic growth. *Journal of Economic Dynamics and Control*, *20*(6), 1237-1261.

Tripathy, P. K., & Sarangi, P. K. (2004). Proximate determinants of fertility in India. *Journal of Family Welfare*, *50*(2), 22-29.

UN. (2010). *Millennium Development Goals Report.* New York: United Nations.

UNDP Sri lanka (2014). *National Human Development Report Youth and Development: Towards a More Inclusive Future*. Colombo, Sri lanka: Softwave Printing and packaging (Pvt) Ltd.

UN ESCAPE (2013). *Economic and Social Survey of Asia and The Pacific*. United Nations publication: Bangkok.

Westley, S. B., & Retherford, R. (2002). The future of population in Asia. *East-West Center, Honolulu.*

Westoff, C. F., Calot, G., & Foster, A. D. (1983). Teenage fertility in developed nations: 1971-1980. *International Family Planning Perspectives*, *15*(3), 45-50.

The World Bank (2014), World Development Indicators, http://data.worldbank.org-/indicator/SP.DYN.TFRT.IN

Yamada, T. (1985). Causal Relationships between Infant Mortality and Fertility in Developed and Less Developed Countries. Southern Economic Journal, 52 (2), 364-370.

Yasuoka, M., & Miyake, A. (2010). Change in the transition of the fertility rate. *Economics Letters*, *106*(2), 78-80.

World Economic Forum (2013). Human Capital Report. Geneva Switzerland: WEF.

WDI (2014), The World Development Indicators, The World Bank.