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Impact of Health on Productivity Growth in India

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ABSTRACT

Health is a very essential component of human development because healthy workers are more productive. Using the conventional growth accounting method the study first estimates the aggregate TFP growth for the Indian economy. It examines the impact of health on TFP growth for the Indian economy. It has been observed that TFP growth in India has been fluctuating in nature. Granger Causality tests show that there is a one way relationship between health as captured by life expectancy at birth and TFP growth for Indian economy. The regression analysis reveals that improvement of health condition as measured by life expectancy at birth in India affects TFP growth positively and significantly. Therefore, the study suggests that government should invest more to deliver better health care facilities which would further help in enhancing the productivity of the economy.

Keywords: *Human Development, Growth Accounting Method, Total Factor Productivity, Granger Causality Test.*

1. INTRODUCTION

Health is a very essential component of human development. Unlike other goods and services the traditional market mechanism fails to attain equilibrium for health care facilities. This is mainly because; improvement and/or deterioration of health condition of any individual generate both positive and negative external effects on the society as well as on the economy. Therefore, delivering health care facilities always calls for a special attention on the part of the policy makers. However, the motive of study is not to assess the health care delivery mechanism rather the study attempts to examine impact of health condition on aggregate productivity i.e. Total Factor Productivity[1](TFP) growth for the Indian economy.

Health is considered to be an important form of human capital. Better health enhances worker productivity by increasing both physical and mental ability. Therefore, health is expected to have positive impact on the productivity of both skilled and unskilled workers (Bloom et al, 2003). Tompa (2002) talked about three channels through which health affects TFP. Firstly, individuals with a longer life expectancy may choose to invest more in education as they receive greater returns from their investment. Secondly, they may also be motivated to save more for retirement, which would lead to greater accumulation of physical capital. Finally, improvement in the survival and health of young children may provide incentives for reduced fertility and may result in increased labour-force participation.

Health influences TFP directly via its effect on labour productivity and technology adoption. Healthy workers are more productivity because they have the ability to work for a longer period. On the other hand, poor health reduces the availability of workers (Kumar and Kober, 2012). Better health induces the

[1] Total Factor Productivity refers to that part of output which neither explained by labour nor by capital used in the production process.

people to save and invest more leading to high capital accumulation which improves productivity further. Foreign investors are also attracted to those regions where workers are not generally exposed to a high disease burden and so on. Not only that when the people are healthy then the government has to incur less health related expenditure and more investment can be made for upgrading infrastructure which will enhance overall productivity of the economy (Isaksson, 2007). Therefore, healthy workers are one of the most important economic assets for a nation. When people cannot work due to serious health problems like disability then they cannot help in raising the economic standard of living of the nation as they do not generate economic output or unable to pay taxes on earnings (Davis *et al.,* 2005). Bloom *et al (*1999) held that low burdens in terms of health and dependency explained a major portion of East Asia's success.

2. BRIEF REVIEW OF LITERATURE

There are extensive studies (Fogel, 1994; Barro, 1996; Arora, 2001; Bloom *et al.*, 2001; Mayer, 2001; Bhargava *et al.,* 2001; Jamison *et al.,* 2003; Bloom *et al.,* 2004; Fogel, 2004; Gupta and Mitra, 2004; Malik, 2005; Bloom and Canning, 2005; Weil, 2006; Bloom and Canning, 2008) which have investigated the relationship between health and economic growth. It is argued that, due attention has not been paid in the past to the impact of Poor health, particularly in less developed countries, on growth and productivity (Cole and Neumayer, 2005). Only a few studies (Lvovsky, 2001; Bloom *et al.,* 2003; Davis *et al.,* 2005; Alemu *et a.l,* 2005; Cole and Neumayer, 2006; Kumar and Kober, 2012) have directly examined the impact of health on productivity.

Lvovsky (2001) in one of his study on the burden of disease in developing countries has used disability-adjusted life years lost per million people, as a health indicator. He observed that the number of years lost in developing countries is about twice that of developed countries. (Bloom *et al.,* 2003) have estimated the effect of health on worker productivity directly using cross-country macroeconomic data. They have found health affects productivity positively and significantly. (Alemu *et al.,* 2005) has constructed a panel of data on general macroeconomic indicators and HIV prevalence rates for over 100 countries and estimate the impact of HIV on TFP growth rates for each country. They find that HIV can have a large negative impact on factor productivity growth in Southern African countries Cole and Neumayer (2006) investigate the impact of poor health on TFP for 52 developed and developing countries. They have used three different health indicators, proportion of undernourished within a country, the incidence of malaria and other waterborne diseases, and life expectancy. Findings reveal that poor health as captured by three different indicators health affects TFP negatively. (Kumar and Kober, 2012) in their study have empirically examined the impact of health, education, and urbanization on the total factor productivity of a large number of countries. They observed that that both the level of urbanization and health capital proxied by life expectancy, Infant mortality rate and the risk of malaria significantly affect TFP. Similarly, there are limited empirical evidences (Chadda et al, 2007) about the linkage of health and productivity for Indian economy. Therefore, the main objectives of the study; firstly, is to estimate the aggregate TFP for the Indian economy using the conventional growth accounting method and secondly, to examine the

impact of health on TFP growth for Indian economy. It is hypothesized that health affects TFP growth positively.

The rest of the study is structured as follows. Section 2 gives the brief review of literature. Section 3 describes data and variables. Section 4 discusses the methodological issues. Section 5 and 6 throws light on the trends and patterns of TFP growth and health scenario in Indian economy respectively. Section 7 discusses the results of the study and section 8 concludes the study.

3. DATA AND VARIABLES

The major problem of calculating total factor productivity at the aggregate level in India is the data constrains that is one require data on output and inputs on a time series basis. The data on output and capital stock is available but the data on total employment on a time series basis is not available because the major source of employment data in India are available mainly on a decadal and quinquennial basis i.e. the Census and NSSO respectively. Therefore, one needs to generate the time series data on total employment based on interpolation and extrapolation. In the present study Gross Domestic Product (GDP) and Net Fixed Capital Stock (NFCS) at 1999-2000 prices has been used as a measure of output and input respectively. At the same time following Virmani (2004) population of ages 15 to 64 has been used as the proxy for potential workers. The secondary data for the study has been used from the World Development Indicators, World Bank, National Accounts Statistics (NAS) various issues, Central Statistical Organization (CSO) and Handbook of Statistics on Indian Economy, Reserve Bank of India (RBI) respectively.

4. METHODOLOGY

4.1 Growth Accounting and TFP Estimation

There are large numbers of method through which TFP can be estimated. However, the literature is inconclusive about the best method to estimate. The present study has adopted growth accounting method for estimating TFP growth. It basically allows the breakdown output growth into components that can be attributed to the observable factors of the growth of the capital stock and of the labor force, and to a residual factor. Solow referred this residual as total factor productivity growth.

Most of the studies [Coronation (2002); Virmani (2004); Lee (2004); Akilno (2005); Khan (2006); Nachega and Fontaine (2006); Gupta (2008); Loko and Diouf (2009) and Das et al (2010)] on aggregate TFP have used standard growth accounting method. Following them, in this study conventional growth accounting in particular Translog-based growth accounting method has been used to estimate aggregate TFP for Indian economy.

$$Q_t^* = TFPG_t^* + V_K K_t^* + V_L L_t^* \quad (2.1)$$

$$TFPG_t^* = \left(lnQ_t - lnQ_{t-1}\right) - V_L^*\left(lnL_t - lnL_{t-1}\right) - V_K^*\left(lnK_t - lnK_{t-1}\right) \quad (2.2)$$

Where, $V_L = \frac{1}{2}(V_{Lt} + V_{Lt-1})$ and $V_K = \frac{1}{2}(V_{Kt} + V_{Kt-1})$;

'ln' is natural logarithm operator; Q is Output, L is labour input and K is capital input V_L and V_K are average factor shares. For estimating TFP factor shares mainly labour share has been adjusted as the sum of compensation of employees and 50 percent of mixed income of the self-employed to GDP with the assumption out of the total mixed income 50 percent is labour income and 50 percent is capital income. Similarly, assuming constant returns to scale 1 minus labour share gives capital share.

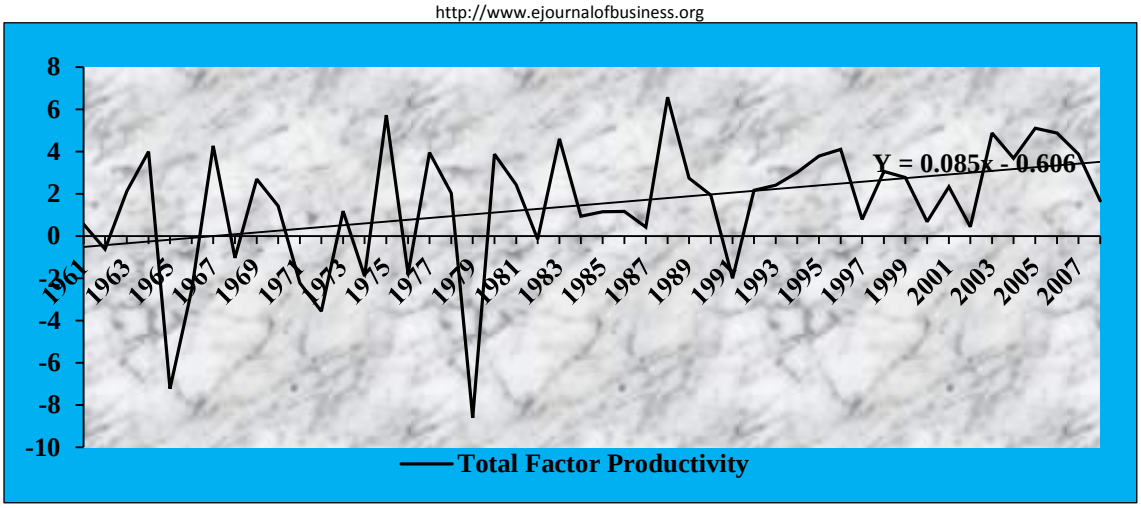
In order to examine the impact of health on TFP growth simple regression analysis has been used. Health condition can be captured by different indicators like proportion of undernourished within a country, incidence of malaria and waterborne diseases, life expectancy at birth, health expenditure as a percentage of GDP, Infant mortality rate and so on. Depending upon the purpose and data availability different scholars has used different indicators. In the present study, life expectancy at birth has been taken as a proxy for health condition for Indian economy.

5. TFP GROWTH IN INDIA

TFP is defined as increase in output growth which is not caused due to the factor accumulation. Thus, TFP may include all those factors which contribute to the generation of output other than labour and capital. This can happen because of several reasons such as, change in the quality of inputs, output, introduction of new techniques, inputs and outputs, better organization and so on.

We have observed that TFP growth in India has been fluctuating during the study period (see figure 5.1). On an average TFP has grown by 1.49 during the study period 1961-2008. Periodical averages show that, during 1961 to 1970 the average TFP growth in India was although positive but it was very low close to zero. Similarly, the economy experienced on an average negative TFP growth during the period 1971 to 1980 implying that there had been technological regress in the economy instead of technical progress. Probable reasons for the low and negative TFP growth during the 1960s and 1970s could be assigned to mainly Indo-China, Indo-Pakistan war along external shocks like severe droughts and oil crisis and so on. Again, considerable inefficiency crept in the industrial sectors due to 'Permit or License Raj'[2] causing TFP to fall. However, during 1980s when internal economic reforms were started in the economy along with the gradual withdrawal of several restrictive policies, the efficiency of the economy had gone up and there was sharp jump in the TFP growth from negative 0.14 percent to positive 2.18 percent. When the economy went for broad based external economic reforms from 1991, the average TFP growth still remains positive but declined slightly by 11 percentage points from 2.18 percent during 1980s to 2.07 percent in the 1990s. Then again, in between 2001 to 2008 there has been considerable increase in TFP growth by 1.18 percentage points from 2.18 percent to 3.36 percent.

[2] **License or Permit Raj** refers to the elaborate licenses, regulations and accompanying red tape that were required to set up and run businesses in India. Licenses were required not only for businesses for expanding productive capacity but also one had to have bureaucratic approval for laying off workers and for shutting down. When a business was losing money the Government would prevent them from shutting down and to keep the business going would provide assistance and subsidies. This gave rise to rampant corruption and inefficiency in the economy.

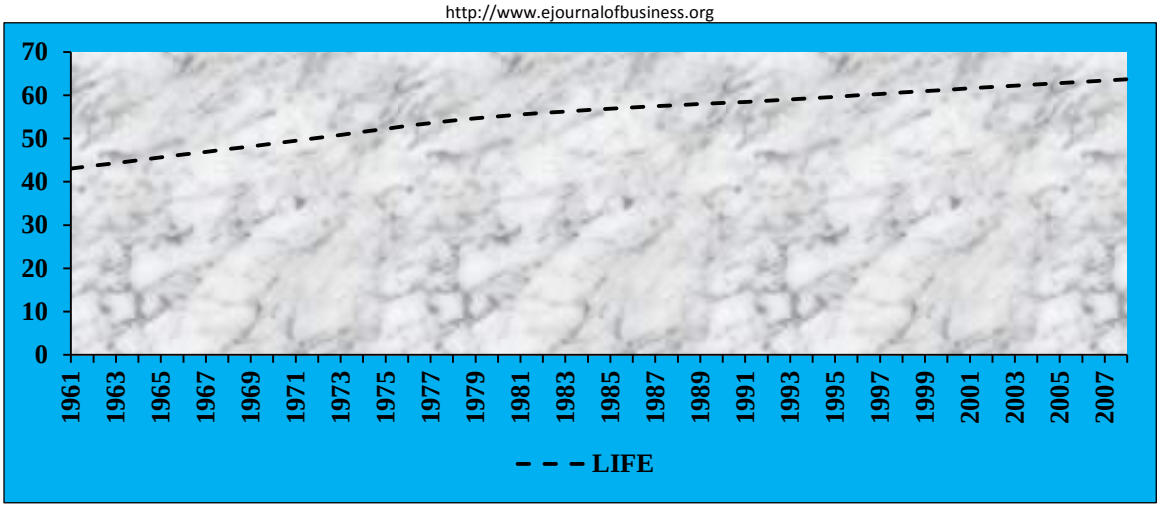


Source: Author's calculation

Figure 5.1: TFP Growth, 1961-2008

6. LIFE EXPECTANCY AT BIRTH IN INDIA, 1961-08

Life expectancy at birth is one of the most widely and commonly used indicator in health analysis. At the same time it is one of the important components which are used in constructing Human Development Index (HDI) also. India was ranked 134 according to Human Development Report (HDR), 2009 and in respect of life expectancy at birth it rank was 128. Poor HDI ranking of India is mainly due to its poor performance in the core areas like life expectancy at birth which was estimated at 63. 4 years. India's annual health care spending is one of the lowest in the world. India's life expectancy at birth is continuously rising since 1960s (see figure 6.1). During the last five decades or so, the life expectancy at birth in India has been around 55 years. Although India has made rapid progress on its economic front but health has remained neglected throughout as it is seen that seen that is spends very for health care. The life expectancy at birth of India has been very low in comparison to the other developing countries of Asia like China, Pakistan and Sri Lanka even. During the 1960s life expectancy at birth of India was merely 45.64 years which is much lower in comparison to Sri Lanka and China had i.e. 59.98 years and 54.55 years respectively. Again, in the recent past also China, Sri Lanka and Pakistan have rapid substantial improvement in their health status. Life expectancy at birth, both in China and Sri Lanka has increased to 72.43 years and 73.30 years respectively, while life expectancy in India is still lower than even Pakistan (see Table 6.1).



Source: World Development Indicators

Figure 6.1: Life Expectancy at Birth in India, 1961-08

Table 6.1: Decadal Average of Life Expectancy at Birth: India and Other Asian Countries

Period	1961-1969	1970-1979	1980-1989	1990-1999	2000-2008
Pakistan	51.93	55.99	59.07	62.07	65.40
Sri Lanka	59.98	65.11	68.85	69.73	73.30
China	54.55	64.13	66.83	69.48	72.43
India	45.64	51.84	56.65	59.53	62.64

Source: Author's calculation from World Bank data.

7. RESULTS AND DISCUSSION

7.1 Unit Root and Granger Causality Tests

The Augmented Dickey-Fuller (ADF) test has been applied to test the nature of stationarity of both dependent and independent variables. The result shows that both the variables are in the level form that is integrated of order zero with different level of significance (Appendix table I). Granger causality tests reveal that there is one way relationship between health (proxied by life expectancy at birth) and aggregate productivity i.e. TFP growth for the Indian economy (Appendix table II).

In this study simple OLS technique has been applied to examine the impact of health on TFP growth for Indian economy taking TFP growth as a dependent variable life expectancy at birth as the explanatory variable. The econometric analysis shows (Appendix table III) that health as captured by the life expectancy at birth is highly significant at 1 percent level of significance and it affects TFP growth positively. Findings of the present study are in conformity with existing studies ((Bloom *et al.*, 2003; Alemu *et al.*, 2005; Cole and Neumayer, 2006;

Kumar and Kober, 2012) which have examined the relationship between health and productivity and observed that health affects TFP positively and significantly. Therefore, improving health condition plays a vital role in boosting TFP growth for Indian economy.

8. CONCLUSION

Using the conventional growth accounting method the study first attempts to estimate the aggregate TFP for the Indian economy and then examines the impact of health on TFP growth. It has been observed that on an average TFP has grown by 1.49 percent during study period but is erratic in nature. During 1960s average TFP growth in India was although positive but it was very low close to zero. Similarly, the economy experienced technological regress in the economy instead of technical progress during 1970s due to the average negative TFP growth. However, the economy's overall productivity has increased considerably after the initiation of internal economic reform measures during 1980s. The economy has been experiencing continuous rise in TFP growth since the introduction of external economic reforms. The econometric analysis reveals that improvement of health condition as measured by life expectancy at birth in India affects TFP growth positively and significantly. Therefore, the study suggests that government should invest more to deliver better health care facilities which would further help in enhancing the productivity of the economy. The present study uses only one health indicator for supporting its argument; so, in-depth future inquiry in this area using both positive and negative health indicators, is expected to give better idea about health and productivity relationship for Indian economy in future.

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APPENDIX

Table I: Results of Unit Root Tests

Variables	No constant	Constant	Constant & Trend	Test Statistic	Critical Values		
					1%	5%	10%
TFP	√			-5.725	-2.625	-1-950	-1.609
Life		√		-12.102	-2.412	-1.679	-1.301

Table II: Results of Granger Causality Tests

Null Hypothesis	Observation	F-Statistic	Probability
HEALTH does not Granger Cause TFP	46	5.99517	0.00520
TFP does not Granger Cause HEALTH	46	0.37373	0.69048

Table III: Results of Regression Analysis

Variable	TFP				
	Coefficients	t-value	P-value	R^2	0.14
Intercept	-0.0908	-2.36	0.022	F(1,46)	7.65
Life	0.0019	2.77	0.008	DW(2,48)	2.41