



Modeling the impact of education on the economic growth: Evidence from aggregated and disaggregated time series data of Pakistan

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ABSTRACT

Motivated by the recent studies on the endogenous growth theories, which suggest that the economic growth driven by human capital accumulated by education has potential to be substantial and more sustainable, this article evaluates the level and growth effects of education on the economic growth of Pakistan over the period of 1960 to 2010. Non-linear two stage least square instrumental variable (NLTSL-IV) estimators have been used for estimating the error correction model. Our estimated production function clearly indicates that there is a positive effect of different levels of education on the economic growth of Pakistan. Therefore, we find support for the hypothesis that the investments in education sector may raise the economic growth of the country.

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1. Introduction

Recent studies on endogenous growth theory argue that the economic growth driven by human capital accumulated by education has potential to be substantial and more sustainable due to the increase in productivity and technological innovation (Aghion and Howitt, 1998; Aghion et al., 2009; Lucas, 1988; Romer, 1990). These studies predict that the human capital is a growth improving policy variable and it may create a number of externalities along with the increase in the private returns. While, the expanded neoclassical growth model of Mankiw et al. (1992) considers the human capital an additional input in Solow (1956) model that has a significant impact on the level of economic growth.

However, the empirical research on the subject provides ambiguous results due to several reasons. One of the most important reasons is that the researchers are using the crude proxies, such as the average level of education, to measure the level of education (Aghion et al., 2009). The implication of using average level of education is that an extra year of tertiary education is just the same as the extra year of primary education. It is not justified to assume that the enrolment in primary education is as important as the enrollments in tertiary education for efficient utilization of labor and capital. Therefore, different studies consider the different levels of education for different channels of the economic growth. For example, Scherer and Hue (1992) and Sapir et al. (2004) note that the investment in the higher education is more important to increase the innovative activities, which are the major source of economic growth in the endogenous framework. On the other hand, Aghion et al. (2009) document that

the economic growth in Asian countries is linked with the investment in primary and secondary levels of education. Similar conclusion is drawn by Krueger and Lindahl (2001) that investment in education matters for those countries which have the lowest level of education. This controversy among the researchers argues that the link between education and economic growth is not so simple that we can test it with the average level of education. Therefore, it is more suitable to investigate the impact of different levels of education on the economic growth. This article attempts to incorporate the effects of different levels of education to investigate the level and growth effect of human capital on the economic growth.

To accomplish this task, three different levels of education – primary, secondary and tertiary – along with the average level of income in the context of a single country case are used. Using the time series data for single country, instead of larger sample of countries, is another novel feature of the present article. It is a fact that the education policies may be heterogeneous for the different countries at different stages of the development. Specifically, countries differ dramatically in the way they finance their educational systems (Osang and Sarkar, 2008). Hence, generalizing the results for all countries may lead to wrong policies and therefore the historical time series analysis is more useful for the analysis of growth dynamics (Temple, 1999). Unfortunately, a very few studies are available for the developing countries which econometrically analyze the impact of human capital on the economic growth.

For the empirical purpose, we take the case of a Pakistan. Indeed, Pakistan is an ideal candidate in this context given that it maintains a noticeable GDP growth rate of 5% over the last fifty years, along with bringing down the poverty rate to 17%, although with several peaks and troughs. On the other hand, paradoxically, the half of the population of Pakistan is still illiterate despite of a respectable economic growth rate over a fairly long period of time. Indeed, the

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educational sector has undergone the significant reforms in the recent years and the literacy rate rises from 10% to 53% over the period of 1950 to 2010. It is also equally important to mention that the expenditure on education as a percentage of GDP is the lowest as compared to other emerging economies in the region. While Behrman (1995) estimates that the returns to expanding years of education in Pakistan are 20%. Similarly, Shabbir (1994) estimates the social rate of return of 13% for reinvestment in primary school. This implies that the assets may be doubled within six years. Birdsall et al. (1993) also notes that the income of Pakistan in 1985 would have been 25% higher if Pakistan had primary enrolment rate of 67%. Husain (2005) documents that the income of Pakistan may be double than the actual if we extend these projections to 2005. The results of these studies indicate that Pakistan misses economic returns by not properly increasing the investment in the education sector.

However, look at Fig. 1. It is evident that expenditure on education has never been higher than 2.5% of GNP over the last four decades. Ironically, the expenditure on education as a percentage of GNP is decreasing for the last four or five years.¹ Therefore, this article intends to motivate the policy makers for mobilizing the available resources in the education sector of Pakistan. To the best of our knowledge, there is none for Pakistan which uses a historical series of disaggregated data of education to investigate both level and growth effect of human capital on the economic growth. The present article is an attempt to fill this gap.

The rest of the article is distributed into five main sections. Section 2 provides a brief literature review on the subject. The model and econometric strategy are discussed in Section 3. The construction of variables and data sources is presented in Section 4. The empirical results have been reported in Section 5, and finally in Section 6 conclusions have been drawn.

2. Literature review

The literature on economic growth provides a plethora of evidences on the importance of human capital accumulated by education. The discussion starts right from Adam Smith and then followed by Marshall, Schultz, Bowman and others. However, this dimension of research is growing at the exponential rate in the recent times and researchers offer a variety of models for relating education and economic growth.² Specifically, the significance of education in growth literature is explicitly recognized by expanded neoclassical models and endogenous growth theories. The expanded neoclassical growth model of Mankiw et al. (1992) considers the human capital accumulated by education as an additional input which has a significant positive relationship with the economic growth.

On the other hand, the endogenous growth theories consider it a process that improves the growth of the economies by increasing the efficiency of the labor force. These theories have a stance that the human capital accumulated by education is subject to the increasing return to scale and, therefore, it may reduce the effect of diminishing returns of physical capital change in the economies (Lucas, 1988; Romer, 1986). Specifically, Romer (1990) and Aghion and Howitt (1998), argue that education provides a process that may change the production technology and may shift the production curve outward. While Barro and Sala-i-Martin (1995), Sala-i-Martin (1997) and Hall and Jones (1999) document that the educated labor is better able to cope with changing technologies. Firms like the educated workers as compared to less educated are also more able to

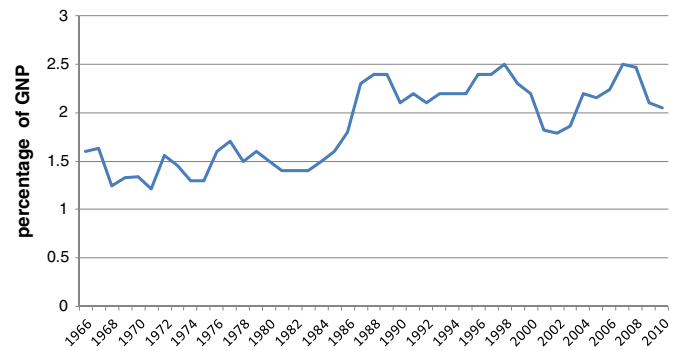


Fig. 1. Expenditure on education as percentage of GNP.

adapt innovations and to learn new functions (Aghion et al., 2009). Therefore the countries with new technology should have a faster growth rates. Furthermore, Kim and Kim (2000) and Schiff and Wang (2004) argue that education is a source of mobilizing the resource from the static sector of the economy to technologically dynamic sector of the economy.

Not only the average level of education but the composition of education is also important factor in the development process. Webber (2002) observes positive effects of education on economic growth by estimating the impact of three different levels of education: primary, secondary and tertiary. However, Chi (2008) points out that though the human capital has an indirect role in the economic growth even then the college education has more important role than the primary level of education. Zhang and Zhuang (2011), in a province based study, note that the different levels of education effect differently on the different stages of economic growth. Specifically, they document that tertiary education is more beneficial for the developed provinces of China, while primary or secondary education is more beneficial for the underdeveloped provinces.

However, there is a still a controversy among the researchers, despite the strong evidences of the positive relationship between education and economic growth. For example, Azariadis and Drazen (1990) and Rebelo (1991) point out that a critical minimum level of education is required in order to get some measurable impacts from education on the economic growth. Benhabib and Spiegel (1994) found weak correlation between human capital and economic growth. Specifically, they claim that the human capital which is accumulated by education may have a positive indirect effect through the technological progress instead of any direct effect on the economic growth.

Education plays a significant role in explaining the economic growth of Pakistan as well. For example, Iqbal and Zahid (1998) put the primary level enrolments in growth regression of macroeconomic determinant and conclude that it has significantly a positive impact on the growth of Pakistan. Whereas Abbas and Foreman-Peck (2008) document that secondary education enrolments are much important to capture the technological impact on the economic growth. On the other hand, Azhar (1991) and Fafchamps and Quisumbing (1999) find an indirect link between education and economic growth. Both studies point out that the educated labor adopts the new crop variety and, therefore, become a reason for the higher production in the agriculture sector, which is an important part in the economy of Pakistan. Specifically, Fafchamps and Quisumbing (1999) document a 9% rise in the income with one additional unit of schooling. More recently, Shahbaz et al. (2011) also document the impact of human development and economic growth in a panel data framework. This study clearly finds the link between education index and economic growth of the Asian countries and Pakistan was included in their sample. Similarly, Shahbaz et al. (2009) conducts a province level study using the panel cointegration rank test. The study concludes that the human development resources have a significant impact on the economic growth of Pakistan and not vice versa. On the

¹ The GDP of Pakistan drastically slipped, over the last few years, due to political uncertainty, situation of law and order, war on terror shortage of energy, uncontrolled inflation and devastating flood of 2010 and 2011. The lower expenditure on education may be an outcome of negative indicators of the economy.

² See Lucas (1988); Romer (1990); Rebelo (1991); Grossman and Helpman (1991); and Osang and Sarkar (2008) for further details.

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