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How did national life expectation related to school years in developing countries—An approach using panel data mining

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ABSTRACT

Background: The purpose of the study was to probe into the changes in life expectancy associated with schooling years found by the Organization for Economic Co-operation and Development (OECD).

Methods: The study was based on the OECD database from the period 2000 to 2006. The data of thirty countries were constructed to allow comparisons over time and across these countries. Panel data analysis was used to estimate the relationship of national education, as defined as school years, with life expectancy. The control factors considered were numbers of practicing physicians, practicing nurses, hospital beds, and GDP.

Results: We used fixed effects of both country and time through linear regression, the coefficient of school years in relation to life expectancy was statistically significant but negative. This finding is not in accord with the hypothesis that investing in human capital through education stimulates better health outcomes.

Conclusion: Within developing countries, educational attainment is no longer keeping the same pace with life expectancy as before. Therefore, we suggest that an effective education policy should cover diverse topics, for example, balancing economic growth and mental hygiene, to improve national life expectancy.

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1. Introduction

Long-term economic growth increases the duration of schooling times all over the world, and in such societies, people are living longer than before [1]. A popular hypothesis is that better-educated people are more likely to earn higher incomes, and thus have more opportunity to make healthier choices in life. Their occupations are less likely to entail risks to safety and they are less likely to live in areas where they are exposed to danger. They are also regarded as likely to have more control over their lives. Thus, in all developed countries, a positive correlation between life expectancy and education has been observed [2–5].

We propose that this relationship may be changing; once a developed society is characterized by changing lifestyles, the beneficial relationship between years of schooling years and life expectancy disappears. In this paper we examine the new relationship of schooling years on life expectancy among OECD countries from 2000 to 2006. Despite the bulk of research concluding that the gap in life expectancy related to education is rising, our findings suggest that phenomenon may be reversing. Our main objectives are to provide new evidence in response to the argument that widespread efforts to push successful health interventions in well-educated countries to prolong human life may be not efficient anymore.

2. Materials and methods

It is well known that education is an important determinant of outcomes in many areas of life. Since life expectancy as a final outcome has become a hot issue, estimates of life expectancy according to educational attainment have been a focus of research for some time. Most such research aims at assessing differences between select groups and establishing relationships that explain social inequality [6]. The study sample consists of 30 countries over a period of eight years starting from 2000, up to the newest data collected. The samples were drawn from the Organization for Economic Co-operation and Development (OECD) which has been one of the world's largest organizations. Its database has been one of the most reliable sources of comparable statistics for economic and social data. We used its data and assessed the latest findings.

Health care behavior in each country or region reflects different cultures, traditions, and ways of operating. Government policies and administrative strategies likewise influence health outcomes. These and other unobserved attributes may affect healthcare utilization decisions and final outcomes. If a study excludes these traits, it will result in omitted variable bias. The goal of this study is to determine whether a change in national education causes a change in life expectancy, and the data set of this study contains observations on multiple phenomena observed over multiple time periods. Whereas time series and cross-sectional data are both one-dimensional, the two-dimensional panel data analysis is suitable for this empirical study. The before-and-after comparison in effect holds constant the unobserved factors can help us focusing on changes in the dependent variable. Therefore, panel data analysis, a method for controlling for some types of omitted variables without actually observing them, is applied here. Panel data, which consist of information gathered from the same countries units at several different points in time, are commonly used in the social sciences to test theories of social change or their causal relationship [7].

At least a dozen studies have investigated different factors that have interactive relationships with life expectancy, such as physicians, nurses, and hospital beds [4,8]. GDP per capita is another variable here as economic growth has a powerful impact on the healthcare industry. For our study, these were constructed into regressors to test their influence.

A specific regression model used to estimate relationship here is:

$$\text{Outcome}_{ht} = \alpha + \beta_1 \text{HeaCha}_{ht} + \beta_2 Z_h + u_{ht} \quad (1)$$

where Outcome_{ht} is the life expectancy that measures of a country called "h" at year "t". HeaCha_{ht} is a vector of national health characteristics described in the above section. So,

$$\beta_1 \,\text{HeaCha}_{ht} = \beta_1(\lambda_1 \,\text{School years} + \lambda_2 \,\text{Physicians} + \lambda_3 \,\text{Nurses} + \lambda_4 \,\text{Beds} + \lambda_5 \,\text{GDPper capita}),$$

Then Z_h was defined as a vector of a country called "h" but did not change over time. Therefore,

$$\text{Outcome}_{ht} = \alpha + \beta_1 \text{HeaCha}_{ht} + \beta_2 Z_h + u_{ht} \quad (1a)$$

$$\text{Outcome}_{ht+1} = \alpha + \beta_1 \text{HeaCha}_{ht+1} + \beta_2 Z_h + u_{ht+1} \quad (1b)$$

Subtracting Eq. (1a) from Eq. (1b) eliminates the effect of the unobserved variables Z_h that are constant over time.

Now, let $\alpha_h = \alpha + \beta_2 \, Z_h$.

Eq. (1) will be rewritten as:

$$\text{Outcome}_{ht} = \beta_1 \text{HeaCha}_{ht} + \alpha_h + u_{ht} \quad (2)$$

where $\alpha_1 \ldots \alpha_h$ are known as entity fixed effects.

The slope coefficient, β_1, is the same for all countries, but the intercept of the regression line varies from one country to the next.

At the similar method, the time fixed effects regression model is:

$$\text{Outcome}_{ht} = \beta_1 \text{HeaCha}_{ht} + \gamma_t + u_{ht} \quad (3)$$

where γ_t is known as time fixed effect.

The combined entity and time fixed effects regression model is:

$$\text{Outcome}_{ht} = \beta_1 \text{HeaCha}_{ht} + \alpha_h + \gamma_t + u_{ht} \quad (4)$$

Then, repeatedly subtracting this index year from next year in Eq. (4) would eliminate the effect of the unobserved variables that are constant over time and country. This study chooses measurements with robust parameter estimates based on specification analysis.