

# A Summary of Externalities Research on Compulsory Education

Baozhen Yao<sup>1,\*</sup>

<sup>1</sup>Strategic Talent Research Center, Beijing Normal University, Beijing, China

\*Corresponding author. Email: [janey@mail.bnu.edu.cn](mailto:janey@mail.bnu.edu.cn)

## ABSTRACT

The paper presents a literature review on externalities of compulsory education. The externalities are listed as national education level, economic growth, income, crime and health. Due to the potential influence of political, economic, social, cultural and other factors, it is difficult to generalize a more universal conclusion and form convincing hypotheses and theoretical verification in the study of single sample. More in-depth and multi-dimensional research is necessary.

**Keywords:** compulsory education, literature review, externalities

## I. INTRODUCTION

Compulsory education, known as compulsory schooling, is originated in the 15th century. At the beginning, compulsory education was only related to religion, military and royal families. With the development of the economy and society, more and more countries have recognized the importance of compulsory education. Germany (1559), Scotland (1616), the United States (1620), and Prussia (1763) legislated for education, which guided the development of compulsory education system. Now, the compulsory education has become an important part of the public service system in most of the countries.

The positive externality of compulsory education has been widely recognized by scholars for many years. Early scholars mostly used normative research methods to discuss values. Plato pointed out the idea that an ideal individual needs an ideal education. Aristotle divided education into physical education, moral education and intellectual education. Children aged 0-7 should focus on physical training, 7-14 years old should focus on moral education, and 14-21 years old should focus on rational training. Dewey pointed out that it's the people, parents and teachers who have purpose, not education itself. The educational process means developing individual endowments, so the goal of education is only as a guidance. The philosophers widely discussed the value of education, which promoted the development of particular educational theories.

With the development of scientific research, the requirements for the scientificity and preciseness of the theory and hypothesis demonstration process are becoming higher and higher. Therefore, the quantitative research, based on empirical research, has become the

mainstream. Empirical research methods verify the positive externalities of compulsory education. According to the views generally accepted by scholars, the positive externalities of compulsory education are as follows:

- Leading to a significant increase in national education.
- As an important factor to promote economic growth, there is even a strong causal relationship.
- Have a positive impact on narrowing the income inequality gap and increasing income.
- Reduce crime.

## II. IMPACT OF COMPULSORY EDUCATION ON NATIONAL EDUCATION

To identify that compulsory education promotes the improvement of national education level, scholars have adopted a variety of empirical methods to build models for verification. Both positive and negative conclusions are shown. Muyanga, Olwande, Mueni and Wambugu used Propensity Score Matching to calculate the effect of free primary education (FPE) implementation in Kenya.[1] The results show that the enrollment rate of primary and secondary schools has increased significantly. Lang and Kropp used the fixed effect model to prove that the effect of law does not change the education any more. However, empirical analysis showed that compulsory education legislation can have an impact.[2] Acemoglu & Angrist's study showed that men born with child labor laws (requiring nine years of compulsory education) attended 0.26 years in school than those born in other states.[3] Lleras Muney found that education levels were affected by the legislative changes.[4] Clark and Royer found that both men and

women will increase the educative years about 0.5 years after the revolution.[5]

### **III. IMPACT OF COMPULSORY EDUCATION ON ECONOMY GROWTH**

When discussing the causality of compulsory education on economic growth, scholars have formed two different views because of abundant samples, methods, periods and a series of unknown factors.

The empirical analysis shows that compulsory education is positively related to economic growth. This point is generally accepted by scholars. Barro believes that the initial human capital stock (estimated by enrollment rate) has a positive effect on economic growth through promoting technological progress, diffusion and learning, but negatively correlated with the initial per capita GDP level.[6] By using the Overlapping Generation Model, Zvi Eckstein and Itzhak Zilcha verified that a certain minimum level of compulsory education funded by the wage proportional tax increases total output.[7] He Zongyue and Song Xuguang took public education investment as the key variable and the systematic GMM regression showed that the investment in compulsory education has a significant positive effect on inclusive growth of economy. What's more, the public investment in compulsory education also can significantly improve educational opportunities for women.[8]

The relationship between education and economic growth has been widely studied and recognized by scholars. As the most universal, mandatory and basic part of education, whether compulsory education also plays an important role of promoting economic growth? Indian scholars Sharmathha Self and Richard Grabowski used the Granger Causality Test to analyze the impact of primary, secondary and higher education on economic growth. Results showed that primary education is not only closely related to economic growth, but also has a strong causal impact on growth. The causal impact originated from the increase of the primary enrollment rate and the change of the average years of primary school education.[9] Several years later, Kobzev Kot áskov á updated the data in 2018 and made Granger Causality Test again, the conclusions of Sharmathha Self and Richard Grabowski were verified again even India's economic and social development has changed.[10] Domestic scholars, such as Caiyun Zhou and Tiantian Zhu, used the Johansen Cointegration Test and Granger Causality Test respectively based on Chinese data after the 1990s (where Zhu Tiantian used the improved Granger Causality Test). Caiyun Zhou's research showed that there is a long-term co-integration relationship between China's compulsory education development and economic growth. Granger causality test shows that when the lag period is 2, which means a two-way

causal relationship between the compulsory education and economic growth.[11] While Zhu Tiantian added junior high school education to the basic education. The result showed that the quality of basic education development has a long-term balanced co-integration relationship with economic growth, and the Granger Causality Test showed that there is strong two-way causal relationship between its quantity and economic growth when lag period is 2.[12] However, no all scholars agree with the above conclusions. Xiaohua Yang and Daqiang Wang used Jilin Province of China as the sample and found that basic education just had a weak reverse pulling effect on economic growth.[13]

### **IV. IMPACT OF COMPULSORY EDUCATION ON INCOME**

Chiswick believes that the minimum school education law increases the degree of bias, but reduces the inequality of income distribution.[14] Through the natural experiment, Acemoglu and Angrist directly proved that compulsory education can increase the possible dropout income by educational and compulsory enrollment. The personal return rate of compulsory education is 8% or higher, and the additional social return is negligible.[15] Using Canada as a sample, Philip Oreopoulos used the Difference-in-Difference method to measure the opportunity cost of early dropouts by evaluating the effects of changes in Canadian compulsory education laws. He found that strict restrictions on school-leaving age during 1920-1990 increased average grades and income. If you are forced to increase your school time by one year, your annual income can increase by about 12%. The income of those who stay in school is 1-3 times the highest annual salary of the school dropout, or 3-6 times the average income of the school dropout.[16] In another empirical study in the same year, Oreopoulos also showed that the benefits of compulsory education are very large (between 10% and 14%) regardless of whether these laws affect the majority or a small number.[17] Harmonand Walker found that the changes in British compulsory education in 1947 had a particularly significant impact not only on increasing the participation rate of post-compulsory education, but also on the return to male education.[18] The Overlapping Generation Model of Zvi Eckstein and Itzhak Zilcha verified that compulsory education reduces the level of inequality, especially for the poorer parts of the population, while the intra-generational distribution of human capital is more equal in all periods. Melvin Stephens and Jr.Dou -Yan Yang used the two-stage least square to verify the importance of the common trend hypothesis in the evaluation of the benefits of compulsory education, but he did not find the benefits of additional school education, and failed to obtain the evidence to show the relationship between education and wages.[19]

## **V. IMPACT OF COMPULSORY EDUCATION ON CRIME**

Classical economists have proved that the increase of education level will lead to the reduction of crime and disorder, and the cost-benefit calculation can prove that the introduction of compulsory education is reasonable. Lochner and Moretti found through different identification strategies and criminal activities that compulsory education effectively reduced the crime rate.[20]

## **VI. IMPACT OF COMPULSORY EDUCATION ON HEALTH**

A series of empirical studies have shown that compulsory education can improve health level. Lleras-Muney's study took the compulsory education reform in the early 20th century in the United States as an example and used instrumental variables, he concluded that an additional year of school education reduced the 10-year mortality rate by 6%. Fischer, Karlsson and Nilsson showed that the death rate reduced by an extra year of compulsory education is far greater than that found by Lleras-Muney, and compulsory education reduces the risk of death by an average of about 7% [21] (Fischer et al., 2013). Studies by Crespo, López-Noval, and Mira showed that an extra year of education has a significant protective effect on two aspects of adult mental health, the probability of depression decreased by 6.5 percentage.[22] While, Clark and Royer's study of the United Kingdom found that the extension of compulsory education in the United Kingdom did not significantly affect the risk of death, self-reported health, and tobacco and alcohol behavior.[23] Meghir used Difference-in-Difference and breakpoint regression to discuss the effect of compulsory education on mortality. Their estimation results showed that the extension of compulsory education had no effect on the health of the samples used.[24] This is consistent with the research conclusions of Clarke, Royer (2013) and Behrman (2011), but it is inconsistent with the research results of Lleras muney (2002); Martin Fischer, Martin Karlsson and Therese Nilsson (2013); Clark, Royer (2008). Christina Gathmann used samples from different countries and found that compulsory education reform reduced male mortality in both short and long term, but no effect on women.[25] However, contrary to the views of the above scholars, Lager and Torssander used Sweden as a sample. Through natural experiment and separation of causes of death, they found that only the experimental group receiving compulsory education or short-term vocational training had lower mortality, that is to say, cancer and accident mortality were usually related to more and better education.[26] Mazumder used a variety of methods to study the long-term impact of compulsory education on health. He found that the impact of compulsory

education on mortality did not emphasize the country specific trend. Therefore, there is no basis to discuss the causal explanation. At the same time, he believes that the impact of compulsory education has a very important relationship with national background and research period.[27]

## **VII. CONCLUSION**

Reviewing the previous discussions on the externality of compulsory education, it is found that there are usually the following problems:

- Most studies use a single country as a sample. Due to the potential influence of political, economic, social, cultural and other factors, it is difficult to generalize a more universal conclusion and form convincing hypotheses and theoretical verification by the study of single country sample. Therefore, it is particularly necessary to use multiple samples, especially differential samples, to study the correlation and causality. Barro and Nazrul Islam's research in this area can provide us with some enlightenment.
- Lack of mechanism, path and other aspects of the discussion. What kind of transmission mechanism does compulsory education influence the economic growth, how does the transmission mechanisms work, and whether there are factors influencing this transmission mechanisms and what are these factors? These are problems which are worthy of discussion. Future research should do a deeper excavation on the basis of the current situation, which is conducive to the realization of theoretical development and compulsory education in reality.
- Lack of research characterized by horizontal comparison and dynamic historical tracking. Generally, the research in this field is based on a single country and a single period of history as samples. In fact, in different economic bases and different historical periods, the contribution of compulsory education to economic growth is quite different on significance and mechanism transmission. Therefore, further classified research is necessary, such as whether there are differences of contribution between developed countries and developing countries, is there any difference between the contributions to the industrial revolution in the 19th century and the scientific and technological revolution in the 20th century. Such a comparative study is of great significance for a deeper understanding of the contribution of compulsory education.

- Lack of comparative study between different capital contributions. Human capital or compulsory education as key variable to verify the relationship is not enough to explain the current dynamic problem of economic transformation and development. The contribution of human capital, social capital and material capital to economic growth urgently needs to be discussed in value and empirical level. For example, in poor regions, which factor is stronger between material capital and human capital. There is great practical significance for how to build the driving force of economic growth under different development stages, especially in the current China's comprehensive poverty alleviation oriented poverty alleviation.
- Lack of more accurate measurement. In the process of empirical research, scholars mostly study on the basis of the years of compulsory education, enrollment rate, public investment and other variables. However, the differences in education quality, education curriculum and education institution have not been included in the model as the measurement factors of compulsory education. This variable processing method is simple and crude, and it is difficult to prove the contribution of compulsory education accurately. That also means the lack of definition of variable connotation and more accurate measurement. At the same time, many empirical research models do not include the time trend of economic and social development into the model, so there are large errors in the measurement of correlation and causality.
- Lack of normative research on value. In this field, empirical research methods are generally used to verify research hypotheses, which can verify the existing theories or propose new hypotheses for verification, but it is difficult to achieve a breakthrough in the theory. As Kingon said, tracing back to the source of thought will lead to an infinite return. No matter how innovative the argumentation of research hypotheses is, it is impossible to achieve unprecedented results. The tracing back of theory is infinite. This is also the reason why the theory of human capital has been based on Schultz's human capital theory for many years, and has failed to achieve a new breakthrough in theory. Therefore, we urgently need to return to the speculative research and explore the externalities of compulsory education and human capital from the value level, which is the more profound power to promote the development of theory.

## References

- [1] Muyanga M C , Olwande J , Mueni E , et al. Free Primary Education in Kenya: An Impact Evaluation Using Propensity Score Methods[J]. *Social ence Electronic Publishing*, 2010:125-155.
- [2] Kropp L D . Human Capital Versus Sorting: The Effects of Compulsory Attendance Laws[J]. *Quarterly Journal of Economics*, 1986, 101(3):609-624.
- [3] Daron Acemoglu, Joshua Angrist. How Large Are Human-Capital Externalities? Evidence from Compulsory Schooling Laws[J]. *NBER/Macroeconomics Annual*, 2000.
- [4] Llerasmuney A . Were Compulsory Attendance and Child Labor Laws Effective? An Analysis from 1915 to 1939[C]. *Journal of Law & Economics*. 2001.
- [5] Damon Clark, Heather Royer, Kelly Bedard, et al. The Effect of Education on Adult Mortality and Health: Evidence from Britain[J]. *American Economic Review*, 2013, 103(6):2087-2120.
- [6] Robert, J. Barro. Economic Growth in a Cross Section of Countries[J]. *Quarterly Journal of Economics*, 1991.
- [7] Eckstein, Z, Zilcha. The effects of compulsory schooling on growth, income distribution and welfare[J]. *JOURNAL OF PUBLIC ECONOMICS*, 1994.
- [8] Xuguang Song, Zongyue He. The Influence of Fiscal Compulsory Education Expenditure on Intergenerational Income Mobility [J]. *Public Finance Research*, 2018, 000(002):64-76.
- [9] Sharmistha Self, Richard Grabowski. Does education at all levels cause growth? India, a case study[J]. *Economics of Education Review*, 2004.
- [10] Sylvie Kobzev Kotásková, Petr Procházka, Luboš Smutka, et al. The Impact of Education on Economic Growth: The Case of India[J]. *Acta Universitatis Agriculturae Et Silviculturae Mendelianae Brunensis*, 2018, 66(1):253-262.
- [11] Caiyun Zhou. Relationship of Compulsory Education Development and Economic Growth[J]. *The Guide of Science & Education*, 2011(01):25-26.
- [12] Tiantian Zhu. The Driving Force of Economic Growth in China: Evidence From the Perspective of Educational Development Structure[J]. *The Theory and Practice of Finance and Economics*, 2015, 36(06):102-107.
- [13] Xiaohua Yang, Daqiang Wang. An Empirical Analysis of the Effect of Education on Economic Growth[J]. *Northwest Population Journal*, 2005(04):53-55.
- [14] Chiswick, Barry R. Minimum Schooling Legislation and the Cross-Sectional Distribution of Income[J]. *Economic Journal*, 1969, 79(315):495-507.
- [15] Daron Acemoglu, Joshua Angrist. How Large Are Human-Capital Externalities? Evidence from Compulsory Schooling Laws[J]. *NBER/Macroeconomics Annual*, 2000.
- [16] Oreopoulos, Philip. Estimating Average and Local Average Treatment Effects of Education when Compulsory Schooling Laws Really Matter.[J]. *American Economic Review*, 2006.
- [17] Oreopoulos P . The compelling effects of compulsory schooling: evidence from Canada[J]. *Canadian Journal of Economics/revue Canadienne D'économie*, 2010, 39(1):22-52.
- [18] Walker I , Harmon C . Estimates of the economic return to schooling for the United Kingdom[J]. *Open Access publications*, 1995.
- [19] Jr M S , Yang D Y . Compulsory Education and the Benefits of Schooling[J]. *American Economic Review*, 2013, volume 104.
- [20] Lochner, Lance, Moretti. The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports.[J]. *American Economic Review*, 2004.

- [21] Martin Fischer, Martin Karlsson, Therese Nilsson. Effects of Compulsory Schooling on Mortality: Evidence from Sweden[J]. *Int J Environ Res Public Health*, 2013, 10(8): 3596–3618.
- [22] Crespo L, López-Noval, Borja, Mira P. Compulsory schooling, education, depression and memory: New evidence from SHARELIFE[J]. *Economics of Education Review*, 2014, 43:36-46.
- [23] Damon Clark, Heather Royer. The effect of education on adult mortality and health. Evidence from the United Kingdom[J]. *The American Economic Review*, 2013, 103(6):2087-2120.
- [24] Meghir C, Palme M, Simeonova E. Education and Mortality: Evidence from a Social Experiment[J]. *American economic journal*, 2018, 10(2):234-256.
- [25] Gathmann C, Jürges, Hendrik, Reinhold S. Compulsory schooling reforms, education and mortality in twentieth century Europe[J]. *Social Science & Medicine*, 2015, 127:74-82.
- [26] Lager A C J, Torssander J. Causal effect of education on mortality in a quasi-experiment on 1.2 million Swedes[J]. *Proceedings of the National Academy of Sciences*, 2012.
- [27] Mazumder B. Does education improve health? A reexamination of the evidence from compulsory schooling laws[J]. *Economic Perspectives*, 2008, 33(Q II):2-16.