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Effects of education externalities on schooling



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ABSTRACT

In some developed countries, such as Japan and Sweden, the number of years of education does not predict wage differences as opposed to in some countries such as the United States and Germany. To explain such seemingly contradictory observations, this study develops a simple model utilizing the 'keeping up with Joneses' effect regarding schooling decisions. The main result of this study is that the model can have multiple equilibria, which can explain the difference between the two groups of countries. Moreover, efficiency analysis reveals that changes in the strength of education reference and psychological cost parameters can alter the welfare ranking of multiple equilibria.

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1. Introduction

Education is widely considered to play a very important role in human society because it has contributed to both the growth of specific countries and overall global growth through technical innovations. For developed countries, primary education is provided to almost all children, and schooling rates of higher education have risen. Standard economic theory considers that the potential to earn a higher wage is a main factor for obtaining a higher education. It states that widening wage differences between educational levels will induce an increase in schooling length. However, some actual data contradict this theory. Fig. 1 shows the relative wages of upper secondary school graduates to those of lower secondary school graduates. The higher wage paid to the former implies the presence of an economic incentive to attend upper secondary school. Standard economic theory states that the relative wages of graduates compared with non-graduates induces a rise in graduation rates. Fig. 2 depicts student participation rate data from the Eurostat database. The data reveal trends in educational choice in different countries beyond compulsory education levels. The post-compulsory schooling rate was used to enable us to consider grade retention and differences between education systems.

From the figures and the data, we conventionally divide these countries into two groups.¹ The first group is composed of Germany and the United States from the dashed-line group, and the United Kingdom from the grey-line group. In these countries, standard economic theory predicts the movement seen in the data; a high wage difference leads to a high schooling rate. For example, in Germany, the relative wage is 1.72 and the schooling rate 87.6 percent in 2010. These values indicate that high wage difference induces a high schooling rate. In the United States, the relative wage is 1.46 and the schooling rate is 51.8 percent in 2012, respectively. These values indicate that high wage differentials lead to a high schooling rate but that the presence of some educational or structural difficulties reduces the schooling rate. In the United Kingdom, the relative wage is 1.07 and schooling rate is 56.8 percent in 2010, respectively. The low ratio indicates that the low schooling rate is due to low wage differentials.

In contrast, the second group, which is composed of Japan and Sweden from the solid-line group, does not obey the standard economic theory. In this group, the relative wage is very low but most people nevertheless decide to attend upper secondary school. For instance, in Japan, the relative wage was 1.1 in 2010; however, in the same year, the schooling rate was 94.1 percent. In

E-mail address: rge026fk@student.econ.osaka-u.ac.jp¹ This division is a conventional one because of lacking definitive criterion.

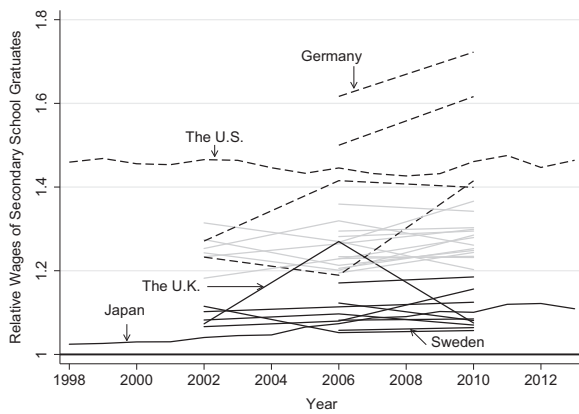


Fig. 1. Relative average wages of secondary school graduates to non-graduates. The data on U.S. relative wages are median data from weekly and hourly earnings data from the Current Population Survey (CPS). The data on Japan's relative wages are mean data from its Basic Survey on Wage Structure. The data on EU countries' relative wages are mean monthly earnings data from Structure of Earnings Survey 2002, 2006 and 2010 from the Eurostat database. The difference between median and mean is due to data availability. The U.S. data are the ratio of the median relative wages of males over 25 years old who are high school graduates compared with those who are not high school graduates. The Japanese data are the ratio of average relative wages of working males who are high school graduates compared with those who are not high school graduates. Dashed lines indicate countries where the relative wage is greater than 1.4 in 2010. Grey lines indicate countries where the relative wage is between 1.2 and 1.4 in 2010. Solid lines indicate countries where the relative wage is less than 1.2 in 2010. We used data on 27 EU countries obtained for more than two periods of the three surveys mentioned above. The included EU countries are listed in [Appendix A](#).

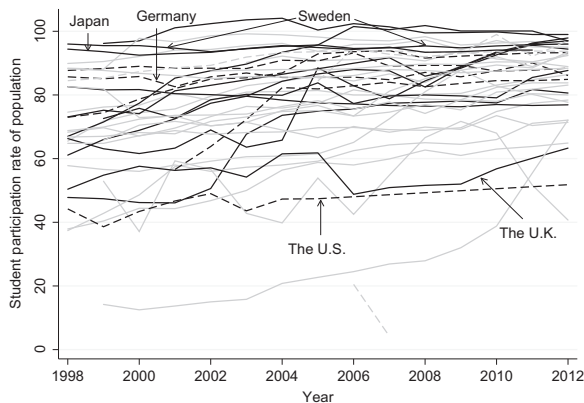


Fig. 2. School participation rate of the same-age population cohort after two years from the end of compulsory education in EU countries, United States and Japan. Students' participation is the percentage of the population who aged two additional years from the end of compulsory age. The data are from Participation/Enrolment in education (ISCED 0–4) (`educ_ipart`) in the Eurostat database. The lines imply the group used in [Fig. 1](#). The dashed grey lines are countries for which wage data is not available. The examined countries are listed in [Appendix A](#).

Sweden, the wage ratio is 1.06 and the schooling rate is 95.4 percent, respectively. Standard economic theory cannot explain the differences between these two groups. These figures suggest that people in these countries choose to obtain a higher education for reasons besides (or in addition to) the expectation of higher wages as a result. Therefore, schooling decisions in these countries can be viewed as being determined by non-monetary factors as well, such as the utilities obtained from education level, an argument that we develop in this paper.

In this study, a simple model of the education externality is developed and investigated. The investigation result shows that two education equilibria exist in this model if the existence condition is satisfied. This presence of multiple equilibria can explain the differences between countries such as United States and Japan

regarding the relationship between wages and schooling decisions. The model also indicates that an economy where education levels are determined solely by individuals cannot achieve a socially optimal level of education. Moreover, analysis from a social planner's perspective reveals that placing certain conditions on parameters can change individuals' social preferences regarding desired education level.

In the economics literature, [Becker \(1993\)](#) developed the widely accepted theory of human capital formation. He investigated the effect of human capital, which is accumulated through education and training, upon the economy by considering the marginal benefits and marginal costs of education. Subsequently, many studies have examined the relationship between human capital investment and returns, the latter of which are primarily measured using wages or several other monetary measures. Therefore, wages are frequently viewed as being determined by education or human capital. [Mincer \(1974\)](#) theorised this relationship as the Mincerian wage equation, which is frequently used to determine factors that affect wages. [Moretti \(2004\)](#) used the Mincerian wage equation to empirically study the relationship between number of schooling years, place of residence and wages. The study showed that increasing the number of highly educated people in a Metropolitan Statistical Area (MSA) induces increased wages within that MSA, which is known as the spillover effect. [Calvó-Armengol et al. \(2009\)](#) showed that after controlling other factors, the school performance of children in the United States is significantly and positively affected by social networks. In a similar research, [Giannini \(2003\)](#) considers a bargaining model of human capital involving the interaction between individual and aggregate human capital levels. However, that paper considers only an externality induced through wages. These results suggest the existence of a positive education externality, a finding this study builds upon. Many other empirical research studies support the existence of externalities. Therefore, this study views the existence of a human capital externality as a given.

Before describing the model, we review the so-called 'keeping up with the Joneses' consumption effect because the education effect is similar. Many researchers have studied 'keeping up with the Joneses' consumption effects. [Abel \(1990\)](#) developed an asset-pricing model that investigated the effect of aggregate consumption per capita on asset pricing and showed that the 'keeping up with the Joneses' effect is a source of equity premiums. [Ljungqvist and Uhlig \(2000\)](#) explored taxation effects on 'keeping up with the Joneses' consumption. Their study found that although several externalities exist, government taxation is a good method for controlling the economy. Their paper's implications are utilised in this study's discussion of policies. [Dupor and Liu \(2003\)](#) modified ([Abel, 1990](#)) by measuring the utility of the 'keeping up with the Joneses' effect from the marginal consumption level. Their finding on evaluating welfare is critical and is utilised here in constructing the proposed model. [Liu and Turnovsky \(2005\)](#) considered macroeconomic dynamics with consumption and production externalities as the 'keeping up with the Joneses' effect in consumption and production functions and capital stock externalities in production. In our study, the production function that determines wages is considered a human capital externality. This externality, described as the average education level of workers in an economy, is designed to increase personal income. [Mino \(2008\)](#) developed an overlapping generations (OLG) model with a consumption externality and demonstrated that this consumption externality fundamentally affects the characterization of both the equilibrium and steady state. Because parents primarily affect children's education, the OLG economy model is applicable when considering education. However, because the OLG economy model might be too complicated, this study does not consider generations. These previous studies carefully developed consumption

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