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Abstract

This paper measures human capital development in the Japanese workforce after WWII. An increase in workers' years of schooling is believed to have aided Japan's economic growth after WWII. The development of human capital has acquired increasing importance for Japan's future economic growth given its aging population.

To quantify these historical and forward-looking contributions of human capital, we construct a dataset that incorporates the distribution of workers' years of schooling by employing data covering workers and students. We transform years of schooling into a measure of human capital by using a nonlinear Mincer-type wage function. We find that workers' average years of schooling increased dramatically during the 1950s and 1960s. While this increase in human capital could explain much of Japan's economic growth during these decades, education policies have limited prospects for contributing to Japan's future economic growth.

1 Introduction

This paper addresses two questions: How significantly has education contributed to Japan's past economic growth, and how much it can contribute to future economic growth as Japan's population ages? To answer these questions, this paper measures the long-term development of human capital among Japanese workers by examining their years of education. First, we construct a dataset that incorporates the distribution of workers' years of schooling, combining data for workers and students. Second, we transform years of schooling into a measure of human capital by employing a nonlinear Mincer-type wage function as per Bils and Klenow (2000).[1] Finally, we perform a growth accounting analysis by incorporating workers' data from official Japanese sources into our model for human capital.

We observe that the average years of schooling for Japanese workers increased dramatically during the 1950s and 1960s. The growth rate is higher than that cited by Godo and Hayami (1999), who measure years of schooling among the working-age population. Then, we find that increase in human capital could explain much of Japan's economic growth during the 1950s and 1960s. However, education policies have a limited possibility to contribute to Japan's future economic growth.

In addition, we measure average years of schooling among workers in the nonagricultural sector. Esteban-Pretel and Sawada (2009) point out that high technological growth in the nonagricultural sector induced Japan's economic growth in the 1950s and 1960s and also prompted a structural shift of workers from the agricultural to the nonagricultural sector. We find that average years of schooling for nonagricultural workers increased more rapidly than among other Japanese workers. Our result confirms that a high degree of education precedes movement of workers to nonagricultural employment.

The remainder of this paper is divided into three sections. Section 2 describes the evolution of Japan's educational system. Although our analysis examines post-WWII period, this section reviews educational system before WWII because many workers after WWII were educated under the prewar system. Section 3 explains methodology and results. Section 4 provides conclusions.

2 Evolution of Japan's Educational System

This section describes Japan's educational system before and around WWII.[2] emphasizing requirements for admission to Japan's multiple categories of educational institutions and the years of study required for graduation from each institution.

Before WWII, Japan had a streaming system of national education. Although a main institution of primary education are primary schools, institutions of secondary education were numerous and diverse in their purpose and requirements. In addition, the educational system was changed frequently to satisfy the demands of economic development. Therefore, there is no simple comparison between Japan's educational system before and after WWII. Japan's educational system before WWII was segmented as follows. A main institution for primary education was primary schools. Institutions for and secondary consisted of middle schools, girls' high schools, vocational schools, and normal schools.

[1] Mincer (1974) specification implies that the log of the individuals wage is linearly related to that individual's years of schooling. However, Bils and Klenow (2000) suggest that the log of the individuals wage is nonlinearly related to that individual's years of schooling. We call this nonlinear Mincer-type wage function.

[2] We refer to The Ministry of Education, Science and Culture (1980).

Postsecondary education consisted of higher schools, universities, specialized schools, and higher normal schools.footnote Figure 1 of Godo and Hayami (1999) illustrates the educational system in Japan.

2.1 Elementary Education

Before WWII, primary schools were a main institution of primary education. The Education System Order (*Gakusei*) in 1872 established ordinary elementary schools and divided them into a lower course for pupils in the age group of 6–9 years and an upper course for pupils in the age group of 10–13 years.

The 1881 Guidelines for the Course of Study for Elementary Schools (*Shogakko Kyosoku Ko-ryo*) divided elementary education into a three-year primary course, a three-year intermediate course, and a two-year higher course.

The 1886 Elementary School Order (*Syogakko Rei*) and Subjects and Their Standards for Elementary Schools divided elementary schools into a four-year ordinary division (*Jinjo Shogakko*) and a four-year higher division (*Koto Shogakko*). The 1890 Elementary School Order divided elementary schools into ordinary elementary schools, consisting of either a three- or four-year course of compulsory education, and higher elementary schools, consisting of a further two-, three-, or four-year course.[3] The 1900 Elementary School Order replaced the previously recognized three-year course with a four-year course for all ordinary elementary schools.

The 1907 revision to the 1900 Elementary School Order extended the years of ordinary elementary schools from four to six and the years of higher elementary schools became two or three.

2.2 Secondary Education

Japan's pre-WWII secondary education consisted of middle schools, girls' high schools, vocational (middle) schools, and normal schools.

Middle School (*Chugakko*)

In the Education System Order era from 1872 to 1881, middle schools were divided into lower and upper divisions. The lower division was a three-year course for students 14–16years of age. The three-year upper division accepted students 17–19 years of age.

The General Guidelines for the Course of Study for Middle Schools (*Chugakko Kyosoku Taiko*), issued in 1881, divided middle schools into a four-year primary course and a two-year higher course. The requirement for admission to the primary course was graduation from an elementary school intermediate course.

The 1886 Elementary School Order (*Chugakko Rei*) divided middle schools into five-year ordinary middle schools (*Jinjo Chugakko*) and two-year higher middle schools (*Koto Chugakko*). The requirement for admission to ordinary middle schools was graduation from an elementary school that provided preparation for a middle school or from another school of an equivalent level. Following the 1894 Higher School Order (*Kotogakko Rei*), high school (*Kotogakko*) replaced higher middle school. *Jinjo Chugakko* was renamed Chugakko in 1899.

Girls' High School (*Koto Jogakko*)

[3]Years of schooling were determined by local governments.

Japan's first girls' high school was established in 1882. The requirement for admission was graduation from an intermediate elementary school. Girls' high school was divided into a three-year lower course and two-year upper course. The Girls' High School Regulations (*Koto Jogakko Kitei*) in January 1895 established graduation from the four-year course of an ordinary elementary school as the admission requirement. Six years were required for graduation.

The requirements for education set by The Girls' High School Order in February 1899 were graduation from the second year of a higher elementary school and being 12 at least years old. Four years were required for graduation, but three or five years were permitted under some circumstances. The 1907 revision of the order increased the term to four or five years.

The 1910 revision of the Girls' High School Order recognized schools that offered the practical course (*Jikka*) in household management and permitted practical course girls' high schools (*Jikka Koto Jogakko*) that offered only a practical course. The duration of the practical course was (1) in the case of entry as a graduate from an ordinary elementary school, four years, (2) in the case of entry after completion of the first year of higher elementary school, three years, and (3) in the case of entry after completion of the two-year course of higher elementary school, two years.

Vocational School (*Jitsugyogakko*)

The 1880 Education Order (*Kyoiku Rei*) classified vocational educational institutions into agricultural schools, commercial schools, and technical schools. General Regulations for Agricultural Schools (*Nogakko Tsusoku*) and General Regulations for Commercial Schools (*Shogyogakko Tsusoku*) were issued in 1883 and 1884, respectively. These schools were divided into first and second categories. The requirements for admission to the former were graduation from the intermediate course of elementary schools and being at least 15 years of age; requirements for the latter were graduation from the primary course of middle schools and being at least 16 years of age. Two and three years, respectively, were required for graduation from the first and second categories. The 1894 Apprentice School Regulations specified that students seeking admission to apprentice schools (*Toteigakko*) were required to graduate from an ordinary elementary school and be at least 12 years old. The duration of the course ranged from six months to four years.

The 1893 Vocational Supplementary School Regulations pertained to vocational supplementary schools (*Jitsugyo Hosyu Gakko*) that offered industrial education to workers. Graduation from an ordinary elementary school was required for admission. Three years or fewer were required for graduation.

The Vocational School Order (*Jitsugyo Gakko Rei*) in 1899 established technical schools, commercial schools, merchant marine schools, vocational supplementary schools, and agricultural schools. Sericulture schools, forestry schools, veterinary schools, and fisheries schools were included in agricultural schools. Agricultural schools, commercial schools, and merchant marine schools were divided into category A (*Kosyu*) and category B (*Otsusyu*). Students seeking admission to category A schools, technical schools, and fisheries schools were required to graduate from the four-year course of a higher elementary school and be at least 14 years old. Admission to category B schools (of merchant marine schools) required graduating from the four-year course of an ordinary elementary school and being at least 12 years old (10 years old). Two or three years were required for graduation.

The 1920 Vocational Supplementary School Regulations divided courses into a two-year lower division and a two- or three-year upper division. The 1921 Regulations Con-

cerning Vocational Schools with Two or More Vocational Courses dropped the distinction between category A and B schools.

The Youth Training Center Order (*Seinen Kunrenjo Rei*) and The Youth Training Center Regulations (*Seinen Kunrenjo Kitei*) were promulgated in 1926. Youth training centers provided military education for 16–20 year-old males. Many male workers attended both vocational supplementary schools and youth training schools, and some courses were redundant. Therefore, the Youth School Order (*Seinengakko Rei*) and The Youth School Order Regulation (*Seinengakko Kitei*) in 1935 combined both schools into the category of youth schools. Graduation from an elementary school was required for admission. For graduation, seven years were required for male and five years for female students.

Normal School (*Shihangakko*)

In 1872, the Ministry of Education established normal schools to train elementary school teachers. The 1881 General Guidelines for the Course of Study for Normal Schools (*Shihangakko Kyosoku Taiko*) standardized normal schools into three courses. Admission requirements were graduation from an intermediate elementary school and being at least 17 years old. Normal schools offered lower, middle, and higher courses, for which one, two, and four years, respectively, were required for graduation.

The Normal School Order in 1886 divided normal schools into higher and ordinary normal schools. Ordinary normal schools trained principals and teachers for local public elementary schools. Higher normal schools trained principals and teachers for ordinary normal schools. The 1886 Subjects and Their Standards for Ordinary Normal Schools (*Jinjo Shihangakko no Gakka oyobi Sono Teido*) set requirements for admission to an ordinary school as graduation from a higher elementary school and being in the age group of 17–20 years. Four years were required for graduation. Ordinary normal schools were renamed "normal schools" in 1897.

The 1907 Normal School Regulations (*Shihangakko Kitei*) established a preparatory course and a regular course and divided the latter into two tracks. Admission requirements to the preparatory course were graduation from the second year of a higher elementary school. Admission to the first track required completion of the preparatory course or three years of a higher elementary school. Graduation from a middle school or a girls' high school was required for admission to the second track. One year was required for graduation from the preparatory course, male students in the second track, and for graduates of five-year girls' high school. Two years were required for graduates of four-year girls' high schools. Four years were required for graduation from the first track for all students.

2.3 Higher Education

Japan's pre-WWII higher education was divided into higher schools, universities, collages, and higher normal schools.

Higher School (*Kotogakko*)

The 1894 Higher School Order reconstituted higher middle schools as higher schools (*Kotogakko*). High School Regulations were issued in 1894. Admission to a lower school required graduation from an ordinary middle school. Three or four years were required for graduation.

The 1918 Higher School Order divided higher schools into higher and ordinary courses. Requirements for admission to the ordinary course were graduation from an elementary

school; for the higher course, the requirement was completion of the ordinary course or the fourth year of a middle school. Four years were required for graduation from the ordinary course and three years from the higher course.

University/Specialized School (*Daigaku/Senmongakko*)

Established in 1877, the University of Tokyo combined *Tokyo Kaisei Gakko* and Tokyo Medical School (*Tokyo Igakko*). Four years were required for graduation from many courses. At the same time, a preparatory school for the University of Tokyo was established, and the General Rules for the Preparatory School (*Yobimon Tsusoku*) was issued in 1878. Four years were required for graduation from the preparatory school.

The Imperial University Order was promulgated in 1886, and the University of Tokyo was renamed Imperial University. Graduation from a higher middle school was required for admission. Four years were required for graduation from the medical department, and three years for all others. The preparatory school for Imperial University was renamed "first higher middle school" in 1886.

The Specialized School Order (*Senmongakko Rei*) in 1903 unified the system of existing colleges (*Senmon Gakko*). Requirements for admission were graduation from a middle school or from a four-year or longer course at a girls' high school. Three years or more were required for graduation. The 1903 revision of the Vocational School Order (*Jitsugyo Gakko Rei*) declared that "in the case of vocational schools, those schools offering higher education will be considered vocational specialized schools (*Jitsugyo Senmon Gakko*), and these vocational specialized schools will be treated according to the Specialized School Order."

The University Order of 1918 permitted establishment of universities other than Imperial University. Admission requirements were graduation from the preparatory school of each Imperial University or from the higher course of a higher school. Three years were required for graduation.

Higher Normal School (*Koto Shihangakko*)

The 1886 Normal School Order established higher normal schools for training principals and teachers of ordinary normal schools. The 1886 Subjects and Their Standards for Higher Normal Schools (*Koto Shihangakko no Gakka oyobi Sono Teido*) provided separate courses for male and female students. Admission requirements for male and female courses were graduation from an ordinary normal school and graduation from the second year of an ordinary normal school, respectively. Four years were required for graduation for both genders. In 1890, female courses became independent, and girls' higher normal schools were established.

2.4 Education around WWII

World War II changed Japan's educational system. In 1939, The Youth School Order made attending youth schools compulsory for boys. Following the National School Order (*Kokumin Gakko Rei*) in 1941, elementary schools were renamed "national schools."

School terms in secondary and higher education were shortened. In 1943, the Middle Level School Order (*Chugakko Rei*) shortened from five to four the number of years required for graduation from a middle school. Although graduation from girls' high schools required four years, girls' high schools could offer a two-year course. The requirement for admission to the four-year course was graduation from an ordinary national school; admission to the two- or three-year course required completion of the second year of a higher national school. In 1941, the Minister of Education [Remark 15] reduced by three

months the term of the regular course at universities, specialized school courses, and vocational specialized school courses. In 1942, the Minister of Education [Remark 15] reduced by six months the durations of regular and preparatory courses at universities, the higher course at higher schools, specialized school courses, and vocational specialized school courses. In 1943, the higher course of higher schools and the preparatory course of universities were further shortened to two years.

By the last half of WWII, Japan's educational system had ceased to function. In 1943, Japan's cabinet in October discontinued military draft deferments for all except students in science and technology and teacher training programs (*Gakuto Syutsujin*). In addition, the cabinet mobilized middle and higher level school students for four months of military duty in 1943 and for the entire year in 1944. In 1945, Japanese education was suspended nationwide for one year, with the exception of the primary course among the national schools. WWII ended in August 1945, but Japan's educational system did not start to immediately function (see National Institute for Educational Policy Research 1974).

2.5 Education after WWII

Compared with the prewar period, Japan's postwar educational system is remarkably simple. Under the School Education Law of 1947, all regular schools, which provided general education, were organized into a 6-3-3-4 system: (1) six years of primary school (*Shogakko*), (2) three years of lower secondary school (*Chugakko*), (3) three years of upper secondary school (*Kotogakko*), and (4) a four-year university system (*Daigaku*). The requirement for admission to each school is basically graduation from its preceding lower school. Attending primary and lower secondary schools was made compulsory.

In 1949, junior colleges (*Tanki Daigaku*) were allowed to function, and the requirement for admission was graduation from an upper secondary school; two years were required for graduation. In 1962, a five-year technical college course was established to promote scientific and technical education. Graduation from a lower secondary school was required for admission.

3 Analysis

3.1 Workers' Years of Schooling

To construct data concerning the distribution of workers' years of schooling following Denison and Chung (1976), we consult the Population Census (*Kokusei Chosa*) for 1950, 1960, 1970, 1990, and 2000.[4] In addition, we extract data from the Employment Status Survey (*Syugyo Kozo Kihon Chosa*) for 11 years from 1968 to 2007. These official data classify workers by gender, five-year age cohort, sector, and education. We call these "workers' data."

These data present two serious problems. First, the Employment Status Survey specifies only 3–5 categories for education, and this rough classification might bias the data toward workers educated under complex prewar educational systems. Second, many years are not collected from these data. Denison and Chung (1976) interpolated the data.

To improve the data concerning workers' years of schooling, we rely on the Annual Survey of the Ministry of Education, Science and Culture and the School Basic Survey.

[4]The Population Census survey is held every five years. The Census surveyed education levels of the population every 10 years until 1980.

Data therein contain the annual number of graduates by gender. We can construct our data from the population classified by gender, age, and education. We call this "educational data."[5]

Then we combine workers' and education data for the years that workers' data are available. We assume that employment rates are the same for all persons in the same five-year age and education cohorts. We calculate the distribution of workers' years of schooling in the surveyed years.

Finally, for the years in which the official data are not available, we interpolate the employment rate of each person classified by age, gender, and education. However, if we directly make use of this employment rate, the calculated total number of employment is inconsistent with the official data of employment, i.e. the yearly Labor Force Survey. Therefore, using the Labor Force Survey that surveys workers by gender, sector, and five-year age cohort, we modify the employment rates under the assumption that the number of workers, classified by gender and age, fluctuates by the same magnitude around each interpolated trend.

Figure 1 illustrates the average per capita years of schooling in the age group 15–64 years to compare the findings with those of Godo and Hayami (1999). The years of per capita schooling for this working-age population are slightly less than that in Godo and Hayami (1999). This difference is due to differences in how years of schooling are defined, how social education is treated, and how distortions in Japanese education around WWII are considered (see Appendix). In this research, years of schooling for workers are longer than those of Godo and Hayami (1999), particularly in the 1960s and 1970s. In these years, the employment rate declined among working-age female and elderly persons. The average years of schooling of these groups are less than those of young males.

3.2 Human Capital

Following Bils and Klenow (2000), our human capital measurement is based on a nonlinear Mincer-type wage function:

$$\ln X_{it} = \frac{\alpha}{1-\psi} s_{it}^{1-\psi}, \tag{1}$$

where X_{it} is human capital, s_{it} is years of schooling, and i is the index of years of schooling. We employ the nonlinear function because the internal rates of return on education are different amoung education levels. The values of parameter α, ψ in a baseline case are 0.32 and 0.58, respectively which is the point estimate of Bils and Klenow (2000). These values denote sharply diminishing returns, and departs from the custom of assuming constant return in the labor literature. Therefore, following Bils and Klenow (2000), we consider a lower value, $\psi = 0.28$, which is the point estimate minus two standard errors. Finally, we aggregate the human capital of Japan's macro economy:

$$X_t = \sum_i X_{it}. \tag{2}$$

3.3 Growth Accounting

We employ the data of Hayashi and Prescott (2002) and Kobayashi and Inaba (2006) for output, capital, and labor. We simply assume a Cobb-Douglas production function:

$$Y = AK^{\alpha}(XhE)^{1-\alpha}, \tag{3}$$

[5]This educational data are similar to those in Godo and Hayami (1999), but with several differences. See the Appendix for details.

where Y, A, K, h, E, and α are output, total factor productivity (TFP), capital, hours per worker, number of employed workers, and capital cost share. The value of α is .33.

Table 1 shows the result of a growth accounting. In the 1956–1973 period, human capital X_t accounts for a large part of output growth. However, the contribution of the human capital declines after 1973. These facts reflect that the enrollment rates in middle schools and high schools increased drastically in 1956–1973 (Figure 2), and rates of return on middle school and high school education are higher than that for collage education.

3.4 Implication for Future Japanese Education Policy

This subsection investigates the effect of an active education policy on Japan's economic growth. The scenario is that all new workers after 2007 graduate college, i.e., new workers have 16 years of schooling. Figure 3 displays the average years of schooling under this (counterfactual) scenario. At the same time, we calculate expected average years of schooling without an aggressive educational policy (prediction scenario). We assume that enrollment rates and employment rates of each education cohort are the same as those in 2007. Although years of schooling under the counterfactual scenario exceed those in the prediction scenario, the effect on economic growth is not important. Based on the nonlinear Mincer-type wage function in Equation (1) and the production function in Equation (3), the difference in contribution to economic growth is only 0.05 percent.

3.5 Structural Change and Human Capital

Because the Population Census and the Employment Status Survey classify workers by sectors, we can calculate workers' years of schooling by sectors. We divide Japan's macroeconomy into agricultural and nonagricultural sectors to investigate the role of human capital during Japan's structural change during the 1950s and 1960s.

Figure 4 illustrates that average years of schooling for nonagricultural workers increased more rapidly than among Japanese workers overall. This result indicates that higher levels of education precede workers' movement toward nonagricultural employment. Table 2 shows the result of our growth accounting obtained for the nonagricultural sector. Here, we assume the same production function and parameter value form as that for Japan's macroeconomy. We find that human capital contributes to economic growth of Japan's nonagricultural sector.

A reasonable conjecture is that the flexibility imposed on Japan's educational system contributed to this movement. After WWII, vocational high schools took over the role of vocational schools, and this trend corresponds to the documented increase in years of schooling. At the same time, many universities established faculties of technology and commerce. Japan's educational system adapted to economic growth and structural change.

4 Conclusive Remarks

This paper has investigated the contribution of Japan's educational system to Japan's past economic growth and its possible contribution to future economic growth. We constructed a dataset of the distribution of workers' years of schooling, measured Japan's human capital, and performed a growth accounting. We found that workers' average years of schooling increased dramatically during the 1950s and 1960s. Although this increase in human capital could explain much of Japan's economic growth during the

1950s and 1960s, the expansion of higher education in Japan does not promise to greatly contribute to future economic growth.

To investigate the role of human capital during Japan's structural changes of the 1950s and 1960s, we measured average years of schooling for nonagricultural workers and found that it increased more rapidly than among workers in other sectors. This result indicates that highly educated workers migrate to nonagricultural employment.

A Dataset of Schooling Years

This appendix explains the details of our data for years of schooling. In particular, it explains the difference between our data and that of Godo and Hayami (1999).

Graduation v.s. Enrollment

Godo and Hayami (1999) use student enrollment data. We, however, use graduation data because we employ "workers' data" derived from the Population Census and the Employment Status Survey that survey workers' terminal educational attainment. We assume a "model" pattern for the starting and ending ages for each course and for each year. The 1950 Population Census surveys years of schooling only in workers' data. We compare the education data and the 1950 Population Census, and then we adjust the years of schooling in the 1950 Population Census.

Social Education

When measuring years of schooling, we do not consider social education provided by vocational supplementary schools and the youth training centers during the war years. We excluded this measure to achieve consistency with workers' data that do not survey social education after WWII and also because the youth training centers primarily provided military education. The 1950 Population Census surveys years of schooling only in collations of workers' data. We compare the educational data and the 1950 Population Census and then we adjust the years of schooling in the 1950 Population Census.

Education around WWII

We do consider the changes in Japan's educational system described in Section 2.4. We consider the shortening the duration of secondary and higher education during 1941–1943 as well as the cessation of secondary and higher education during 1943–1945 and primary education in 1945.

Mortarity Rate

We evaluate the difference in mortality rates by gender and education. Workers' data also survey the education and gender of the working-age population. We interpolate the mortality rate for years in which official survey data are not available.

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Table 1: Growth Accounting

		Y_t	A_t	K_t^{α}	$X_t^{1-\alpha}$	$E_t^{1-\alpha}$	$h_t^{1-\alpha}$
$\psi = 0.58$	1956–1973	9.3%	3.3%	3.1%	2.0%	0.9%	0.0%
	1973–1990	3.8%	0.7%	1.9%	0.8%	0.7%	-0.2%
	1990–2003	1.3%	0.4%	0.9%	0.5%	0.1%	-0.6%
$\psi = 0.28$	1956–1973	9.3%	3.8%	3.1%	1.5%	0.9%	0.0%
	1973–1990	3.8%	0.4%	1.9%	1.1%	0.7%	-0.2%
	1990–2003	1.3%	0.1%	0.9%	0.8%	0.1%	-0.6%

Note: $Y = A\ K^{\alpha}(XhE)^{1-\alpha}, \alpha = 1/3$

Table 2: Growth Accounting of Nonagricultural Sector

		Y_t	A_t	K_t^{α}	$X_t^{1-\alpha}$	$E_t^{1-\alpha}$	$h_t^{1-\alpha}$
$\psi = 0.58$	1956–1973	9.8%	2.5%	3.2%	2.4%	2.0%	-0.3%
	1973–1990	3.9%	0.6%	2.0%	0.6%	0.9%	-0.2%
$\psi = 0.28$	1956–1973	9.8%	3.1%	3.2%	1.8%	2.0%	-0.3%
	1973–1990	3.9%	0.3%	2.0%	0.9%	0.9%	-0.2%

Note: $Y = A\ K^{\alpha}(XhE)^{1-\alpha}, \alpha = 1/3$

Figure 1: Average Years of Schooling

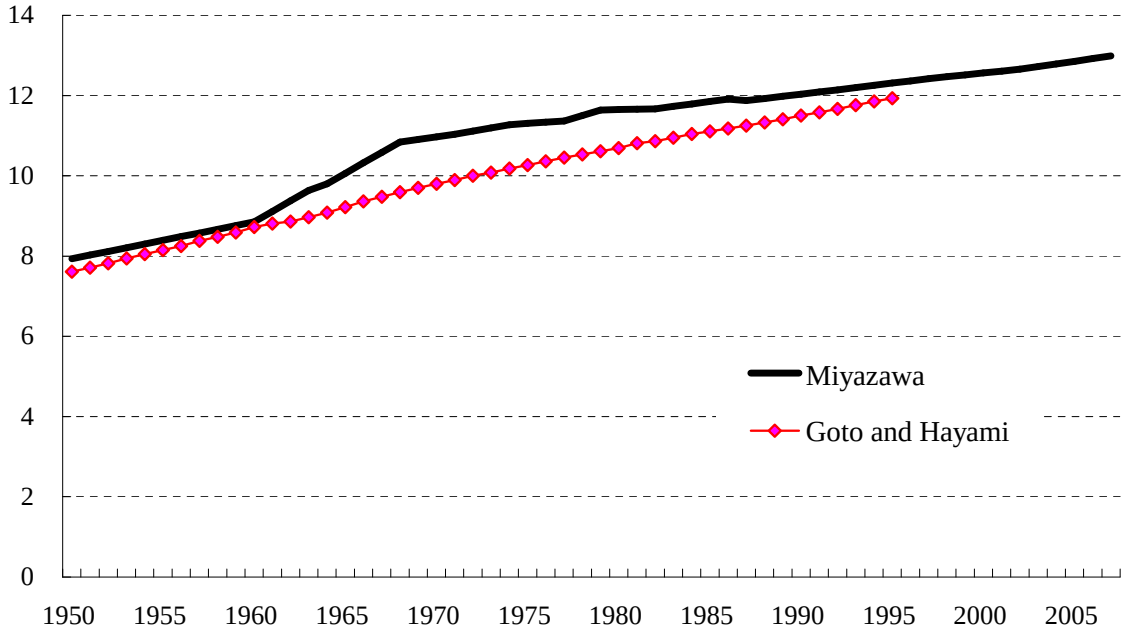

Figure 2: Enrollment Rate

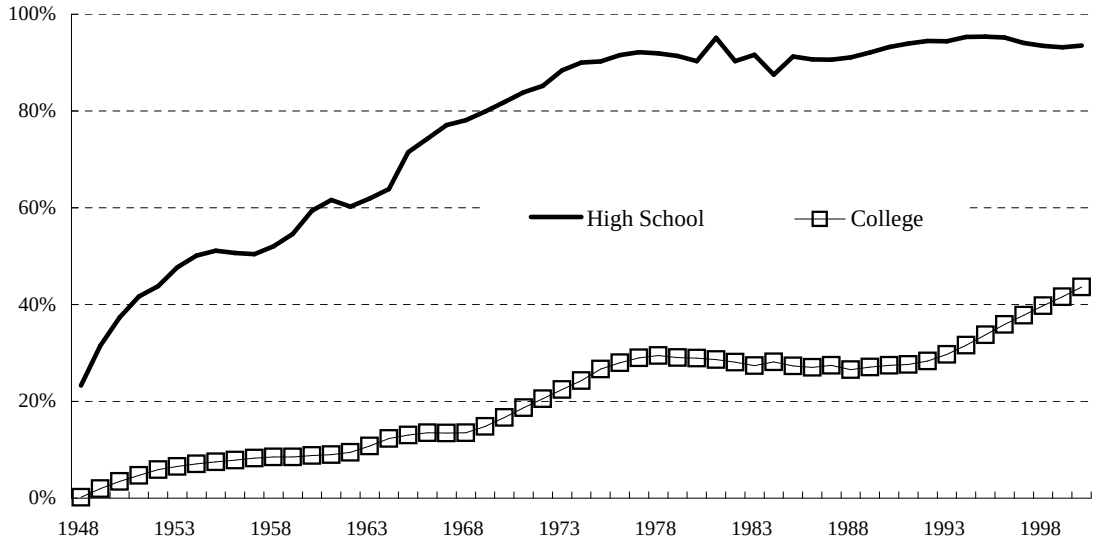

Figure 3: Policy Implication

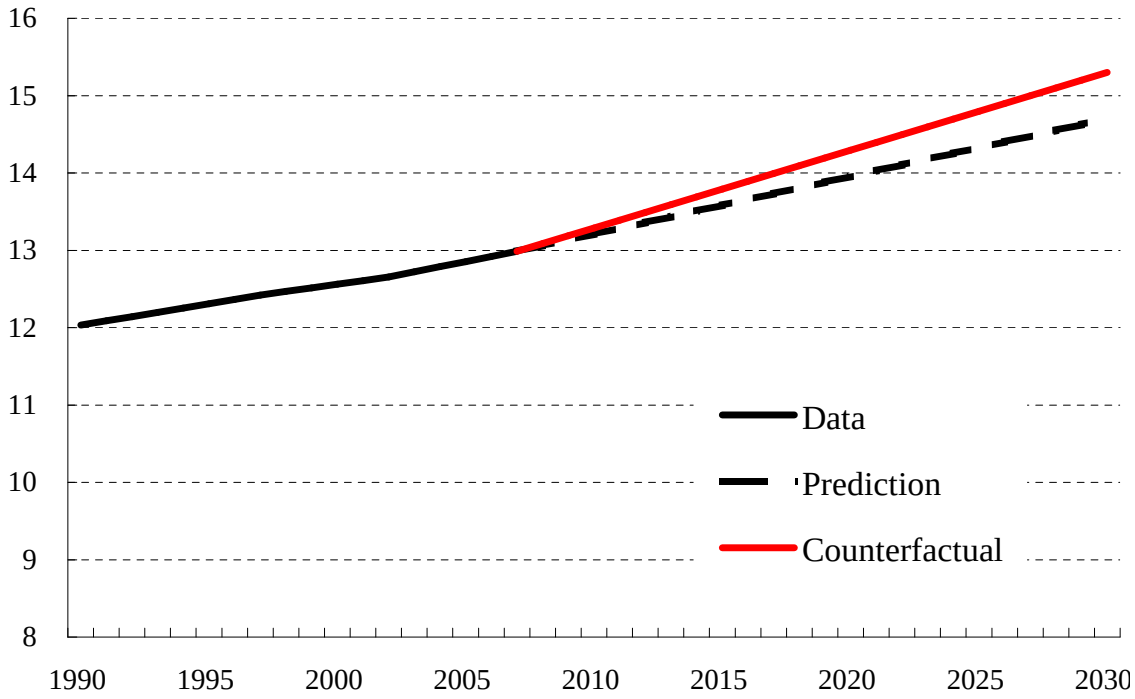

Figure 4: Average Years of Schooling in non-Agricultural Sector