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Is Korea Number One in Human Capital Accumulation?

Education Bubble Formation and its Labor Market Evidence

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Is Korea Number One in Human Capital Accumulation?: Education Bubble Formation and its Labor Market Evidence

August, 2014

(First draft, *June 5, 2014*)

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Is Korea Number One in Human Capital Accumulation?:

Education Bubble Formation and its Labor Market Evidence

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Abstract

This paper proposes a new conceptual framework of “education bubble” in analyzing the human capital investment and formation. We apply this concept to the Korean experience. Sixty years ago Korea was destitute not only of income but also of all sorts of education, but now it is one of the leading countries in educational attainment as well as in other conventional measures of human capital investment indices such as the PISA tests and the number of researchers. We argue, however, that such phenomenal expansion of these quantitative measures involved the problems of enormous burden of private tutoring and the mass production of low-quality higher education institutions, which did not contribute to increasing the effective unit of human capital particularly since the 1990s. We find that despite rapid increase in private educational expenditure for college entrance, the college wage premiums for the bottom two decile groups of 4-year college graduates and the bottom half of 2-year college graduates are both *negative*. This striking evidence from the microeconomic data suggests that such phenomenal expansion in aggregate quantity of human capital indices of Korea could be a bubble. We learn from this evidence that the quantitative expansion of education may not be good enough for sustainable development, which would guide the design of human capital policy not only for Korea but also for other developing countries.

1. Introduction

Korea is praised by the international community including United States President Barack Obama for its successful educational development. Goldin and Katz (2008) call the 20th century the era of American human capital and argue that U.S.' economic dominance in the 20th century was possible because the U.S. surpassed Europe in terms of education. Similarly, the second half of the 20th century was an era of Korean human capital. During this period, Korea transformed itself from a poor nation heavily depending on foreign aid to a donor country providing development assistance to others. This was possible in large part by human capital accumulation through the rapid expansion of education (Kim, 2013).

For the last half century, Korea showed the fastest educational expansion in the world and reached the world's top level in terms of average years of schooling, performance on international academic achievement tests, and number of researchers per population. Yet, Korea suffers from quality problems of schools which do not appear in quantitative indicators, e.g., Korean research universities have yet to reached the world's top level; colleges are vertically differentiated based on admission test scores; and horizontal differentiation through specialization and industry-academia cooperation are weak. Furthermore, Korean primary and secondary schools put excessive emphasis on cognitive skills that are measurable through test scores. However, they are not sufficient conditions in developing students' creativity, character skills, and effective on-the-job skills.

This paper focuses on the problem of persistent increases in educational expenditures which do not contribute to human capital accumulation under considerable gap in speed between quantitative expansion and qualitative change. We capture this problem through the new conceptual framework called "education bubble." We consider that Korea went through the education bubble period from 1990 to 2009, when the total private educational expenditure increased by more than four times; the advancement rate of high school graduates to college rapidly increased from 33.3% in 1990 to 83.9% in 2008; the share of vocational high school graduates taking jobs sharply decreased from 80.1% in 1991 to 16.8% in 2009; the expansion of the low-quality 2-year and 4-year colleges under vertical differentiation was intensified; and the private tutoring business became an enormous industry (in 2010 the number of employees in

private tutoring institutions reached 77% of the total number of primary and secondary school teachers).

We find that despite rapid increase in private educational expenditure for college entrance, the college wage premiums for the bottom two decile groups of 4-year college graduates and the bottom half of 2-year college graduates are both *negative*. We consider such substantial presence of non-performing college graduates in the labor market as evidence of the educational bubble in Korea. Despite the rapid expansion of higher education in Korea, the wage inequality among college graduates, as well as the overall inequality, rose sharply for the period when the college graduates who went through the education bubble began to enter the labor market. This stunning observation rings an alarming bell to human capital policy oriented to simple quantitative expansion.

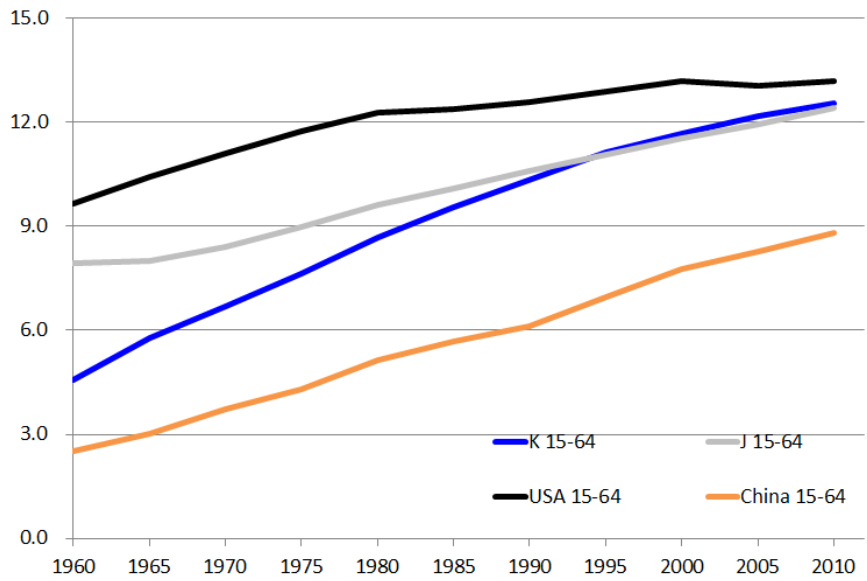
The paper is organized as follows. Section 2 analyzes the features of the quantity expansion of Korean education. Section 3 examines the quality problems of Korean education. In Section 4, we define the education bubble and explore the process of its formation in Korea. In Section 5, we show the existence of the education bubble by analyzing the wage premium dynamics across schooling groups using the microeconomic data from Korea. Section 6 concludes.

2. World's Fastest Educational Expansion

During the last half century, Korea transformed itself from one of the lowest ranked to one of the highest ranked countries in terms of educational attainment. Figure 1 shows that Korea's average years of schooling of the working-age population (age group of 15-64) was 4.6 in 1960, which grew to 8.3 years in 1980, and to 12.6 in 2010 to surpass most developed countries.¹ This increasing rate of Korean average years of schooling was fastest in the world for the 1960-2010 periods. From this rapid expansion, Korea is ranked third in the world in terms of average years of schooling of the working-age population in 2010, next to New Zealand (13.0 years) and the United States (13.2 years).

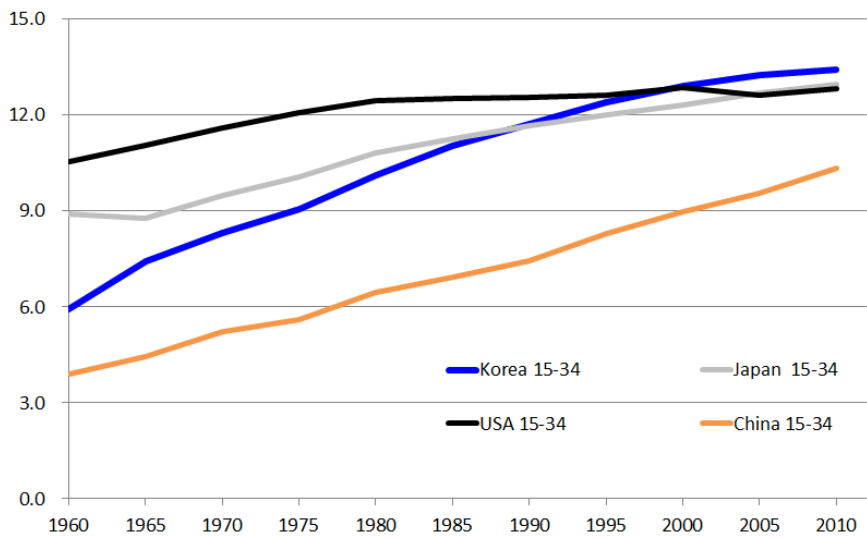
¹ This paper used the data of Barro and Lee (2013) on individual country's average years of schooling by 5-year age group and we added each age's population size to calculate individual country's total average years of schooling.

Figure 1: Average Years of Schooling (age group 15-64) in Korea, Japan, USA and China



Source: Barro and Lee (2013). <http://www.barrolee.com> (retrieved on April 12, 2013)

Figure 2: Average Years of Schooling (age group 15-34) in Korea, Japan, USA and China

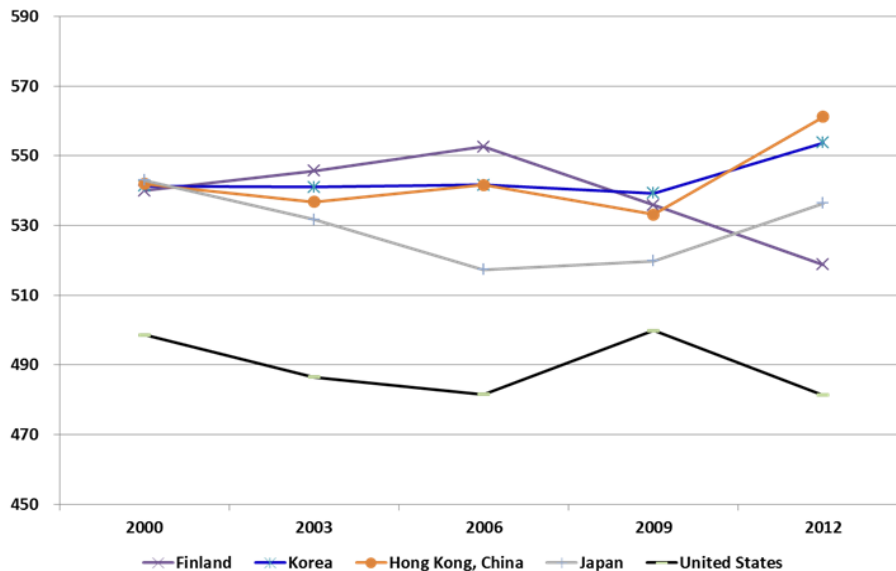


Source: same as Figure 1

Among the young cohorts (age group of 15-34), Korea's years of schooling (13.4 years) ranking even escalates up to the second in the world, ahead of the United States (12.8 years) and only behind New Zealand (13.7 years). Figure 2 shows the even faster growth of the young cohort's years of schooling. The average years of schooling of Korea's working-age population will continue to increase for a while since the years of schooling of the young cohorts exceeds that of the overall working-age population.

Korea not only shows the highest record in quantity expansion of education but also in educational achievement. Since 2000, OECD's Programme for International Student Achievement (PISA) test has evaluated 15-year-old students in OECD countries every three years on their academic achievements. As demonstrated in Figure 3, when the PISA test first began in 2000, the average score of 15-year-old Korean students in reading, math and science was at the top along with students of Finland, Hong Kong and Japan. Since then, Korea has performed at the highest levels in the last four PISA tests. However, Japan has been outperformed by other high-scoring East Asian countries like Korea, Taiwan, Singapore and Macao, and the performance gap is widening. The United States lags far behind Korea.

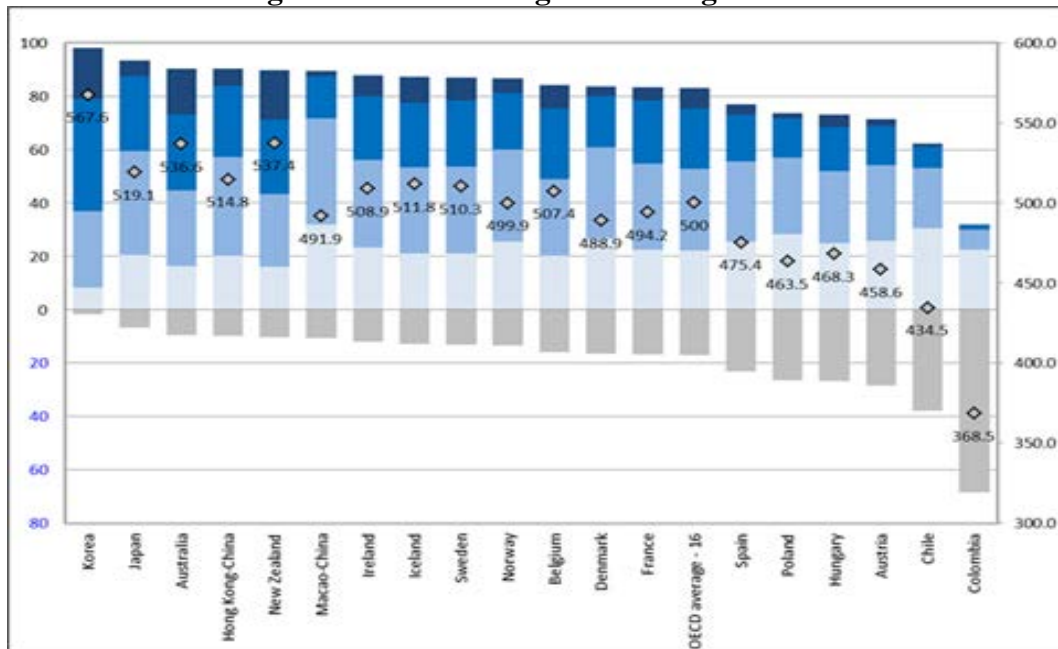
Figure 3: Average Scores of Reading, Math and Science in PISA



Source: OECD (2013)

The PISA test is not a typical multiple choice test on certain subjects, but is designed to evaluate students' problem solving skills and level of understanding problems. Therefore, it is difficult to conclude that Korean students' high achievement is simply due to memorization or rote learning. In this respect, it is important to pay attention to the Digital Reading Assessment (DRA) implemented in 2009 by PISA. On the DRA Korean students performed far better than their counterparts from other countries and proved that Korea's educational achievement is at a world-class level.² As displayed in Figure 4, Korea obtained the highest score and greatly outperformed countries such as New Zealand, Australia, and Japan. Furthermore, in regards to the gap between the highest and lowest scoring students, and the gap between male and female students, Korea shows the smallest gaps among the countries that were surveyed (OECD, 2011). These results show that Korean students are ahead of other countries' students in one of the key "21st Century Skills" that are required in the ICT era (Trilling and Fadel, 2009).

Figure 4: Scores of Digital Reading in PISA

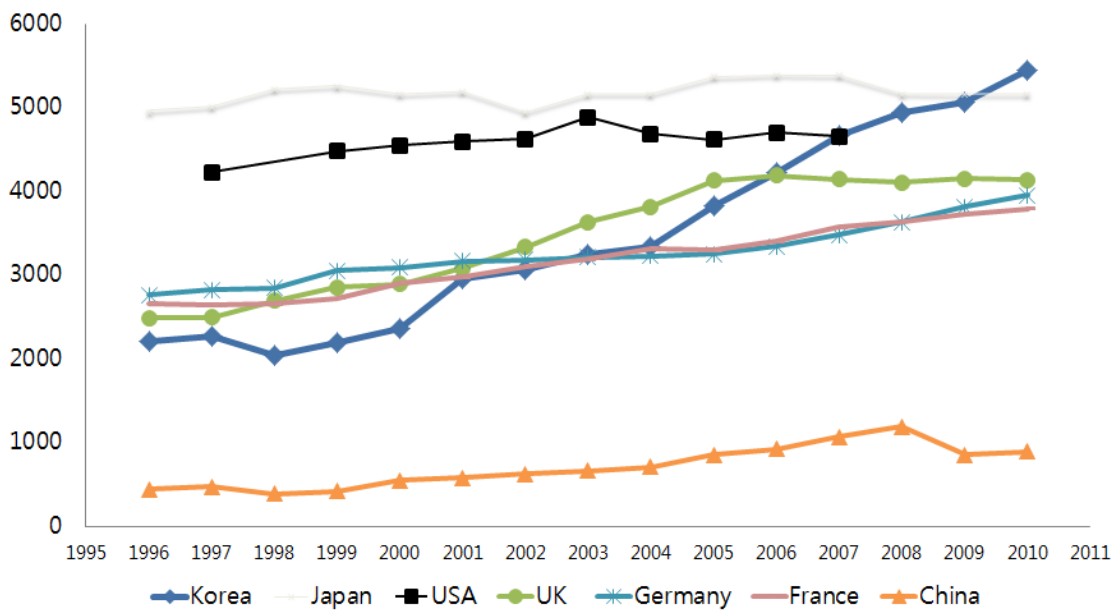


Note: percentage of students at each level (5 or above, 4, 3, 2, and below 2) in bar, and mean scores (◇)
 Source: OECD (2011)

² The DRA is a hypermedia based assessment that collects existing information on various fields (e.g. humanities, social studies, science) in different forms (e.g. image, video, articles) from the Internet and apply it to measure a student's thinking skills and creativity (OECD, 2011).

Moreover, the size of a country's R&D manpower is an important measure of human capital. The roles of R&D and universities are becoming increasingly important. If developing countries lack the innovative capacity to develop and continuously produce competitive products, it may fall into a middle income trap and be limited from achieving sustainable growth (Lee and Kim, 2009). As presented in Figure 5, Korea shows rapid growth in the number of researchers per population, particularly after the 2000s. In the mid-1990s, Korea's number of researchers per inhabitant was smaller than that of Japan, the United States, Germany, France and the United Kingdom, but Korea surpassed all of these countries in 2010. If we compare the size of investment in research and development for each country, Korea ranks fifth in the world, following the United States, China, Japan and Germany. Among these countries, Korea's number of researchers per inhabitant is the highest and also grew at the fastest rate.³

Figure 5: Number of Researchers in Major Countries (per million inhabitants, FTE)



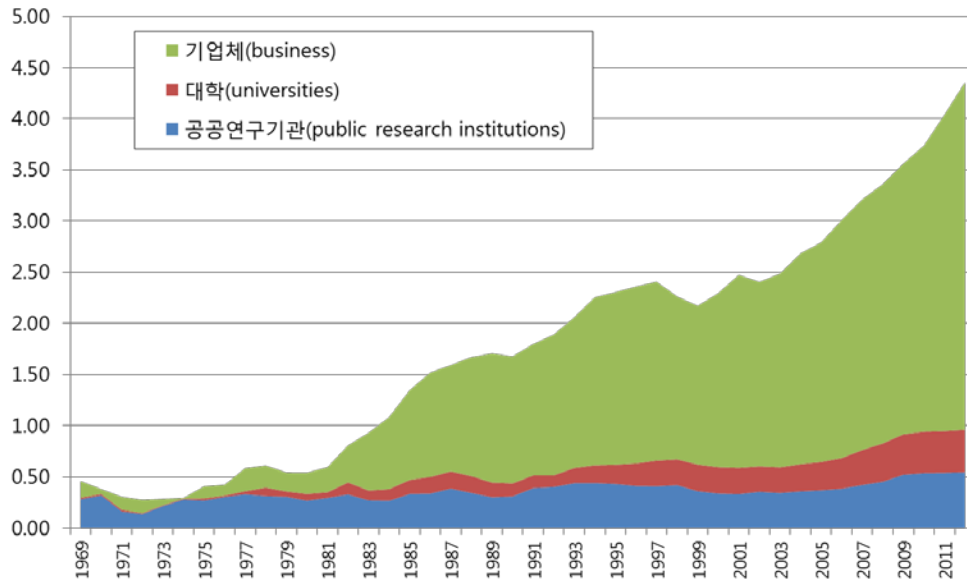
Source: UNESCO Database

³ Korea is fourth in the world behind Finland, Denmark and Singapore in the number of researchers per 100,000 population

Looking at the demand side of such rapid increase in the number of researchers in Korea, Figure 6 shows that R&D investment was mainly conducted by national research institutes until the 1980s. In the following periods, R&D investment by the private sector increased drastically and that of universities steadily increased. As of 2012, Korea's ratio of R&D to GDP increased to 4.36% to surpass Israel (4.20%) and rank first in the world (OECD, 2014).

What is to be noted is that Koreans who received master's and Ph.D. degrees from abroad contributed to the supply of high-quality researchers which Korean colleges could not produce. Beginning in the 1970s, many students who studied abroad returned to Korea as researchers and this signifies that a great portion of graduate school education was outsourced overseas (Kim, 2012). However, in recent years, Korean colleges are producing many competitive master's and doctorate degree holders and the portion of overseas doctorate degree holders decreased. Yet, Korea is still one of the countries that send the most students to the United States, behind China and India. After China's Peking University and Tsinghua University, and the United States' University of California, Berkeley, graduates of Seoul National University compose the greatest number of students admitted to graduate schools in the United States (Clotfelter, 2010).

Figure 6: R&D Expenditure per GDP by Performing Sectors



Source: National Science and Technology Information Service (2014).

According to the survey in 2010 by Science and Technology Policy Institute (STEPI), out of 195,000 doctorate degree holders in Korea, 71.6% received the degree domestically and 28.4% received the degree overseas. The 60-69 age group shows the highest proportion of overseas degree holders with 36.9% and the proportion decreases to 21.8% for the 15-34 age group. Thus, the proportion of overseas doctorate degrees is decreasing gradually (Cho et al., 2011). Korea's human capital expansion was achieved through its openness in human capital accumulation which allowed utilization of both domestic and overseas educational institutions.⁴

For the past half century, Korea has been expanding its education at the world's fastest rate. Three major measures of human capital most often used in international comparisons show that Korea has been approaching the world's highest level. First, average years of schooling have increased rapidly and is the world's second highest. Second, on international educational achievement tests like the PISA, Korean students receive the highest scores in reading, math, and science, as well as on DRA. Third, Korea's number of researchers per population increased drastically and reached the highest ratio among the top five countries with the highest total R&D investment.

How did Korea achieve the worlds' fastest educational expansion in the last half century? This paper examines three major factors. First is rapid economic growth with emphasis on openness and equity. Second is the effective enforcement of education policies by the Korean government. Third is rapid decline in fertility rates, which is closely related to increased human capital investment per student.

First, according to human capital theory and endogenous growth theory, human capital is the engine of economic growth. And the fuel that drives the growth engine is the high rate of return in human capital investment provided by an efficient market (Lucas, 1988; Romer, 1990; Ehrlich, 2007). In this context, Korea's efficient market economy contributed greatly to the country's educational expansion. Lee (2003) points out that openness and equity, two major characteristics of Korea's economic development, contributed to educational expansion. The outward-oriented economy allowed those with higher education to receive higher wages and secure better jobs, and relatively equal income distribution made education affordable for most people. Through such a virtuous cycle between economic growth and human capital

⁴ Today, Korea sends the most students to China.

accumulation, Korea was able to achieve rapid economic growth simultaneously with rapid educational expansion (Lee et al. ed., 2012; Suri, Boozer, and Ranis, 2010).

Second, while rapid economic growth and sharp decline in fertility rates escalated household expenditure on education, the Korean government's efficient enforcement of education policies is also viewed as a contributing factor to Korea's educational expansion (World Bank, 1993). Mingat (1998) points out that many East Asian countries that successfully achieved both economic growth and educational development prioritized government spending on primary education in the earlier stages of economic development, and utilized private schools for secondary and higher education. In fact, 42.4% of Korean middle school students in 1965 attended private schools. Due to an increase in the number of public middle schools, the proportion gradually decreased to 20.7% in 2010. The proportion of private schools is greater for high schools than middle schools. In 1965, 50.7% of high school students attended private schools. The proportion increased to 61.7% in 1990, and rapidly decreased to 45.2% in 2010. Compared to secondary education institutions, higher education institutions have an even higher proportion of private schools. Since 1970, the share of private colleges in higher education gradually increased, and in 2010, 97.2% of 2-year college students and 78.9% of 4-year college students attended private colleges (KEDI, 2013).

When the Korean government promoted the light industry during the earlier stages of economic development, the government focused on primary education. In the late 1970s, when the government strongly pursued industrialization policy to foster the heavy and chemical industry, the government's investment in vocational high schools was almost equivalent to that of the total government investment in higher education (Lee and Hong, 2014). In the 1990s, the Korean government shifted away from policies that suppressed higher education expansion in order to better supply manpower for industrial upgrading and diversification. The government gradually shifted its educational priority from primary to secondary, particularly to vocational high schools (Green et al., 1999; Ashiton et al., 2002), and afterwards focused on a full-blown universal higher education system. This sort of shift in priorities is in line with Lin's arguments (2011, 2012) that as a successful factor of economic development, each country should designate specific industries that coincide with certain development stages along with existing natural resources and its national competitive advantage.

Lastly, another important link that is related to educational expansion is the relationship

between education and fertility rates. Unlike Malthus' prediction that an increase in household income is followed by an increase in fertility rates, Becker, Murphy, and Tamura (1990) focuses on the fact that while household income increased in western countries, fertility rates decreased and contributed to human capital accumulation. According to their argument, for a country with abundant human capital, earnings are greater when investment is focused on an individual child compared to having multiple children, and thus fertility rates will decrease and human capital investment will increase. Korea's average fertility rate was 6.0 persons in 1960, 4.07 persons in 1973, 3.0 persons in 1976, 2.06 persons in 1983, and 1.53 persons in 1987. It decreased even further to 1.24 persons in 2011. Currently, Korea's fertility rate is the lowest among OECD countries (average of 1.70) along with Hungary. Korea's unique case of such drastic decline in fertility rates is closely related to its rapid educational expansion.

3. Quality Problems of Colleges and Schools

Is Korea truly the number one country in terms of human capital accumulation? Measures previously discussed imply that that may be the case. However, those measures are incomplete because problems concerning educational quality are not properly considered. Thus, those quantitative measures alone cannot lead to the conclusion that Korea's human capital accumulation is number one in the world.

Despite the strong and consistent educational demand by parents and students that has made the world's fastest educational expansion possible, Korea's level of educational quality is not as high. The quality problem of Korean colleges and schools include three major factors. First, Korea's research universities are not at the world class level. Second, strong vertical differentiation exists among roughly 200 4-year colleges and 150 2-year colleges in Korea. Most colleges, vertically differentiated based on students' admissions test scores, lack specialization and do not sufficiently focus on students' education or industry-academia cooperation, making horizontal differentiation very weak.⁵ Third, primary and secondary schools in Korea put

⁵ Recent papers by educational economists (Hoxby 2009; Cullen-Levitt-Robertson-Sadoff, 2013) are also giving attention to the vertical and horizontal differentiation in education.

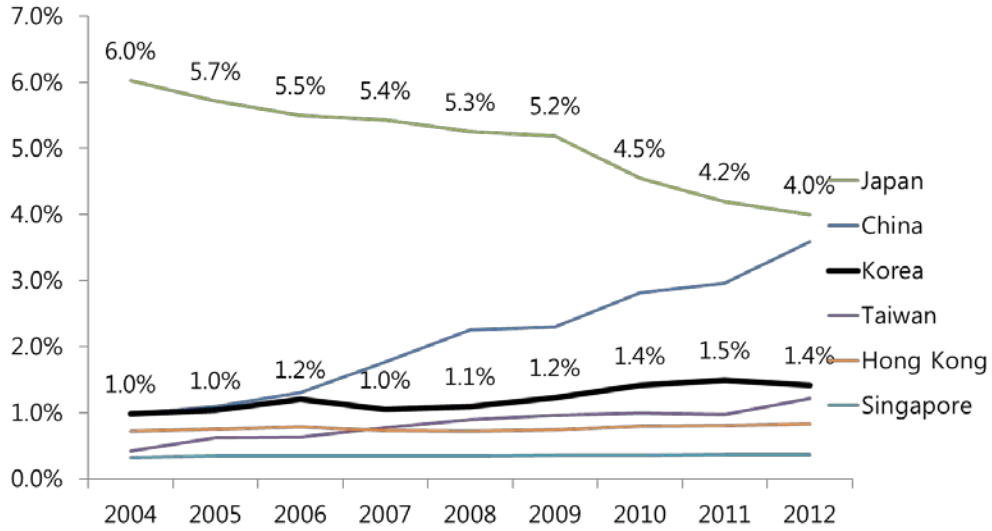
excessive emphasis on cognitive skills that can be measured by test scores, and non-cognitive skills such as creativity, character, and vocational skills are not properly developed.

First of all, Korean research universities are far behind the world's top research universities. There is no standard measure that compares quality of universities across countries. However, Shanghai Jiao Tong University's Academic Ranking of World University (ARWU) announces the top 500 universities in the world based on quantitative measures representing the level of research quality. The number of Korean universities in the top 500 increased from 8 in 2004 to 10 in 2012.⁶ On the other hand, the number of Chinese universities in the top 500 was equal to Korea in 2004, but rapidly increased to 28 universities in 2012. Japan displayed a contrasting change with China as the number decreased from 36 to 21 universities over the same period.

We calculate each individual country's share in the total sum of scores obtained by all of the universities that were included in the ARWU 500 universities. As demonstrated in Figure 7, the share of Korean universities' scores increases from 1.0% in 2004 to 1.4% in 2012. While Chinese universities' share was initially similar to that of Korea in 2004, it increases to nearly 4%. Though Japanese universities' share started out at 6%, it rapidly declines to 4%. This signifies that while Korea has displayed drastic increases for measures such as average years of schooling and researcher per inhabitant, it is China that is displaying a strong upward trend in measures related to universities' international competitiveness.

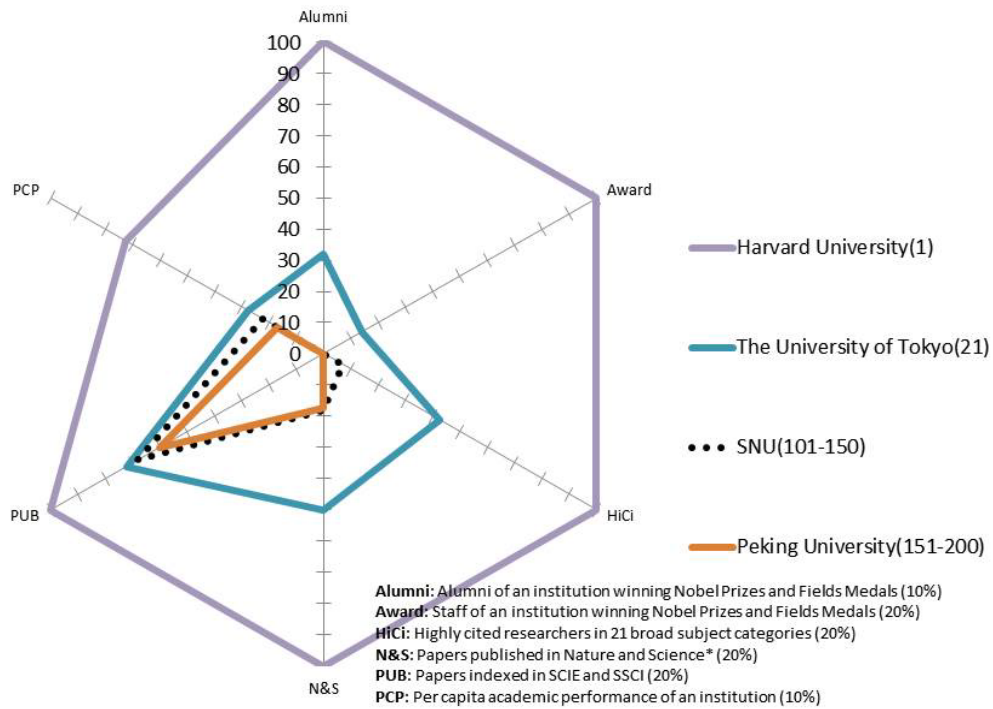
⁶ The 10 universities are: Seoul National University(101-150th), Korea Advanced Institute of Science and Technology (KAIST), Sung Kyun Kwan University, Yonsei University, Hanyang University, Korea University, Postech (201-300th), Kyung Hee University, Kyungpook National University, and Pusan National University(401-500th).

Figure 7: Each Country's Share within the Summation of the Total Evaluation Points of ARWU 500 Universities



Source: Shanghai Ranking Consultancy (2013)

Figure 8: Academic Ranking of World Universities



Source: Shanghai Ranking Consultancy (2013)

Figure 8 shows in detail how Korean universities were assessed in the ARWU evaluation compared to other top universities in the world. In comparison with Harvard University and University of Tokyo, Seoul National University, one of the most renowned research universities in Korea, received lower scores for the number of papers published in Nature or Science and the number of highly cited researchers. Furthermore, the university did not receive any scores for the number of professors or graduates awarded with the Nobel Prize or Fields Medal. Of course, Nobel laureates, Fields Medal winners, and highly cited researchers are not produced overnight. Still, it should be noted that Seoul National University and Peking University have nearly caught up with the University of Tokyo in terms of the number of papers published in SCI- or SSCI-indexed journals and the number of papers published per faculty. Thus, after rapid quantitative expansion in the number of research papers, we can expect that the quality gap with other major research universities will gradually decrease. However, in order to narrow down such a research quality gap, Korea needs to upgrade its research system and continuously push forward with policies that invigorate high risk-high payoff research (Lee, 2014).

To make an international comparison of the quality of research universities, Figure 9 examines the number of published papers and citations for OECD countries and China. United States is dominant in terms of the share of published papers (25.9%) and share of citations (28.7%).⁷ For countries other than the United States, Figure 9 shows that the United Kingdom (7.1%, 8.6%), Germany (6.8%, 8.1%), and France (4.8%, 5.1%) have high shares of published papers and citations. Since the number of published papers is counted based on papers published in international journals (SCI and SSCI DB), English-speaking countries may have an advantage. Yet non-English speaking countries like Germany, France, Japan, Italy, and Spain appear to perform much better than Korea.

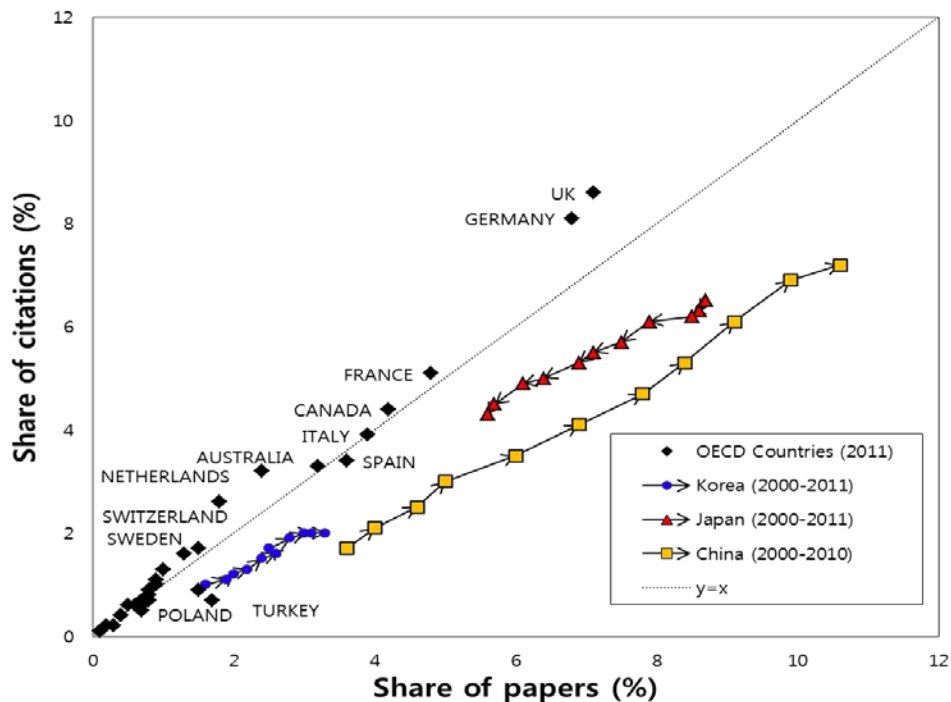
Figure 9 also examines the changes in trend for three East Asian countries – China, Korea, and Japan. Korea's share of published papers increases from 1.6% in 2000 (13,461 papers) to 2.6% in 2005 (27,839 papers) and to 3.3% in 2011 (44,718 papers). The share of citations also increases from 1.0% to 1.6%, and to 2.0% during the same periods. However, Korea's rate of increase is dwarfed by China. China shows rapid increase in both number of published papers

⁷ Out of the total number of published papers and citations of researchers in OECD countries and China in 2011, the share of those of the United States. As it counted all the numbers of co-authors, the total number appears to be higher than actual number of published papers (citations).

and number of citations; the share of published papers increases from 3.6% in 2000 to 11.5% in 2011, and the share of citations increases from 1.7% to 6.9%. On the other hand, Japan's share of published papers decreases from 8.7% in 2000 to 5.6% in 2011, and the share of citations decreases from 6.5% to 4.3%.

While the number of published papers increased around the world, Japan's number remained relatively unchanged and thus its share of published papers and citations drastically decreased. In terms of the number of published papers and citations, Korea lags behind globally leading countries, and the relatively small citation rate compared to the number of published papers is a weakness with much room for improvement. Western countries, including the United States, the United Kingdom, Germany, and France show high shares of citations compared to published papers, but Korean researchers still lack qualitative competitiveness, measured by citations, compared to the quantity of published papers.

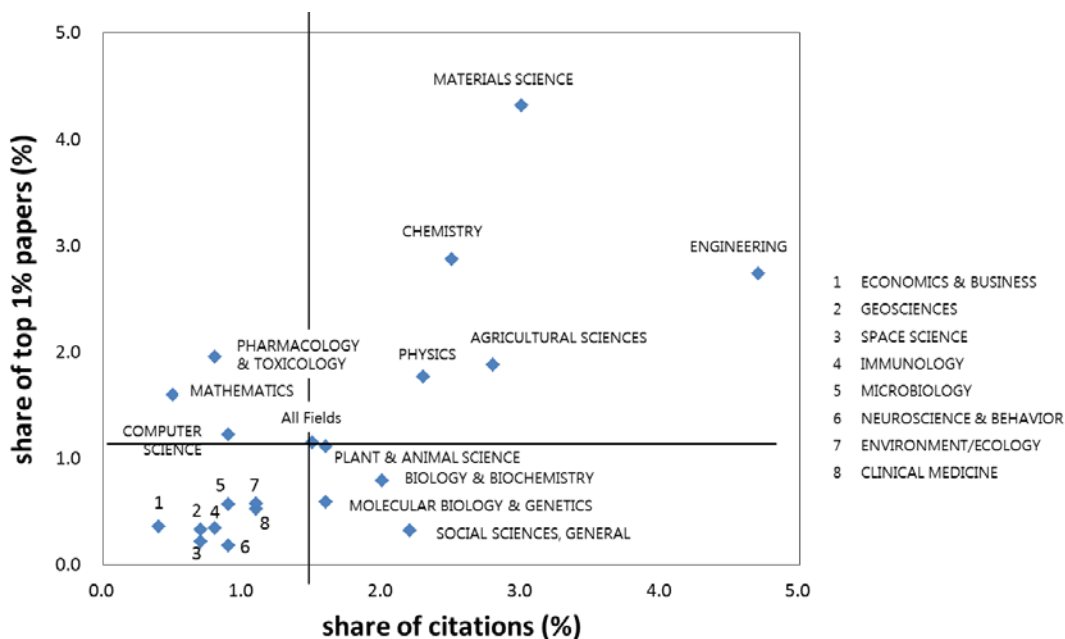
Figure 9: Share of Published Papers and Citations by Country



Source: Web of Science (2013)

According to Figure 10 Korea has a great imbalance among different research fields.⁸ The fields of material engineering, engineering, chemistry, agriculture and physics exhibit higher shares of citations compared to Korea's overall share of citations (1.5%)⁹ and highly-cited papers (1.1%). This shows that research in these fields are relatively more active than other fields. However, in the fields of economics and business, earth science, space science, immunology, microbiology, behavioral neuroscience, clinical medicine, and environmental ecology, the shares of citations and highly-cited papers are quite low, showing lower research competitiveness compared to other fields. In summary, the number of papers and citations of research universities in Korea show an increasing trend, but they are far behind the worlds' top research universities, and the rate of Korea's increase falls far short of China's.

Figure 10: Korea's Share of Citations by Field



Source: Web of Science (2013). Citation, Jan 2003-Apr 2013. Top 1% Paper, 2002-2012

⁸ The horizontal axis shows the share of papers that Korean researchers participated in and published out of the total papers cited from 2003 to early 2013. Of the total papers cited, the share of cited papers in which Korean researchers participated was roughly 1.5%. The vertical axis represents the share of papers that Korean researchers participated in among the papers with citation frequency in the top 1% from 2002 to 2011. The share excludes researchers in foreign research institutions and only reflects researchers in domestic research institutions, and it is roughly 1.2%.

⁹ The differences between Figure 9 and Figure 10 come from the fact that the former includes only OECD countries and China and the latter includes all countries with relevant data.

Second, Korea's higher education institutions display strict vertical and weak horizontal differentiation. When it comes to higher education, students are not only consumers but also inputs (Rothschild and White, 1995; Rothschild, White, and Clotfelter, 1993). Students also learn from their fellow students. Thus, colleges try to select outstanding students to increase the quality of education and at the same time students try to enter the colleges where the most outstanding students are gathered. Therefore, colleges in many countries show vertical differentiation depending on newly entering students' admission scores, but at the same time, colleges should try to meet various demands through horizontal differentiation. As previously mentioned, there are only 10 universities in Korea that are included in the top 500 research universities of the world. Of course, more Korean colleges could gain international competitiveness as large research universities, but other colleges should focus on fostering specific fields through specialization or developing functions like teaching or industry-academia cooperation. In the absence of such horizontal differentiation, colleges will be ranked based solely on the admission scores of entering students, and for lower ranked colleges, students will have to receive low-quality education in a poor educational environment.

Tables 1 and 2 show vertical differentiation among Korea's colleges through the decile ranking of newly entering students' Korean Scholastic Aptitude Test (KSAT) percentile scores.¹⁰ In 2003, the average KSAT percentile score of newly entering students of colleges in the top 10% (91-100%) was 96.1%, 91.3% for colleges in the 81-90% range, and 86.2% for those in the 71-80% range. As students invest a significant amount of time in preparing for the KSAT, the competition to get into the top colleges is fierce. According to Hoxby (2009), newly entering students' SAT and ACT percentile scores for U.S. colleges in the top 5% (96-100%) was at the 90% level, at the 80% level for colleges in the 91-95% range, and at the 70% level for colleges in the 81-90% range. This signifies that Korean colleges are excessively vertically differentiated based on newly entering students' KSAT scores.

Since it is difficult to measure a student's capacity based solely on tests composed of multiple choice questions, colleges in many advanced countries select students based on various

¹⁰ The scores were collected and publicized by Jinhaksa corp. (www.jinhaksa.co.kr). In this paper, we re-tabulated the data from Kim & Lee (2006), and Kim (2007). The rest of the data was collected from College Information Disclosure statistics based on year 2013. Thus, we can utilize the data on more extensive variables in more recent years, compared to Kim and Lee (2006).

additional criteria. Also, colleges in many advanced countries provide educational programs differentiated from other colleges so that graduates can advance to jobs or fields differentiated from graduates of other colleges. But as Table 1 and Table 2 show, colleges of the lower ranks among vertical differentiation tend to be located in local districts, are financially weak, and conditions for education and research and their outcome are relatively worse than colleges of the higher ranks. These results demonstrate that as Korean colleges are vertically differentiated based excessively on newly admitted students' test scores, colleges in the lower ranks provide low quality of education in a weak educational environment, given that students with low test scores require more resources for remedial education programs and job services.

Table 1 shows vertical differentiation among colleges from a general and financial perspective. According to a decile ranking of colleges based on test scores of newly admitted students in 2003, the upper ranks show a higher share of national colleges and colleges in metropolitan areas, while the share of private colleges and local colleges are higher for the lower ranks. To compare colleges' autonomous financial capacity, it is important to look into the level of revenue secured from diverse sources other than tuition and government subsidy to use for education and research. Thus, we calculate 'net expenditure' by subtracting tuition and government subsidy from the colleges' total educational and research expenditure, including spending on personnel, management, and research and education.¹¹ Colleges are non-profit corporations¹², thus in addition to tuition and government subsidy they obtain funds through endowment funds, donations, and industry-academia cooperation, and spend them on education and research.¹³ Therefore, colleges with larger net expenditure are better equipped with autonomous financial capacity for high-quality education and research.

¹¹ Educational account revenue = operating revenue (tuition, management fund, donation, government subsidy, industry-education cooperation management fund, other incomes) + assets and debt revenue + carried over costs from previous year ; Educational account expenditure = operating expenditure (repair, operation and management cost, student & research fund, non-educational costs, cash transfer, reserve fund) + assets and debt expenditure + carried over costs for next year

¹² For-profit college is not legally allowed in Korea.

¹³ The share of tuition and government subsidy in total income showed that the top 10% group was the lowest with 56.4%, and the 11-20% group had the highest with 76.8%, and the 1-10% group was 69.7%, whereas for 2-year colleges it was 70.2%.

Table 1: Vertical Differentiation Among Colleges: General and Financial Indicators (2013)

(KRW 0.1billion)

Group	Mean KSAT Percentile (2003)	No. Univ.	in Seoul region		Private	Total Revenue (a)	Total Tuition (b)	Gov't Subsidy (c)	Expenses for Education, Research, & Operation (d)	Net Expenses (d-b-c)
Top 10%	96.1	15	9	8		4,844	2,506	224	3,691	961
81-90%	91.3	14	8	8		2,180	1,433	156	1,725	136
71-80%	86.2	12	9	10(2)		2,099	1,424	143	1,616	50
61-70%	79.8	14	12	10(1)		1,440	833	100	1,003	70
51-60%	73.1	15	5	10(1)		1,451	811	90	1,058	157
41-50%	65.6	15	6	12(2)		1,079	676	85	861	100
31-40%	58.6	16	4	14(3)		1,112	661	105	791	25
21-30%	51.8	16	4	13		1,131	713	105	876	58
11-20%	45.2	16	2	15		745	489	83	577	5
1-10%	31.7	19	1	16		713	419	78	494	-3
2-yr Colleges	-	141	45	132		371	221	39	252	-8

Note: 55 colleges with no KSAT record are excluded. Incomes and expenses data are based on school accounts of 107 private colleges, in which 9 branch campuses (in parenthesis) are combined with the main campuses
Source: Kim and Lee (2003), Kim (2007), Center for Higher Education Information Disclosure (2014)

Table 2: Vertical Differentiation among Colleges: Education and Research Indicators (2013)

Group	Student per Faculty	Research Fund per Faculty (KRW Million)	Papers per Faculty		Dropout rate (%)	Employment rate (%)	Advancement rate (%)
			International	Domestic			
Top 10%	13.4	162.6	0.71	0.51	1.7	61.9	18.2
81-90%	20.7	77.7	0.35	0.73	2.4	57.0	10.2
71-80%	24.7	79.4	0.39	0.61	2.6	54.8	10.0
61-70%	21.6	46.9	0.35	0.59	3.3	51.8	7.8
51-60%	23.0	68.4	0.33	0.58	3.4	53.9	8.8
41-50%	22.1	51.3	0.32	0.55	3.4	50.4	7.6
31-40%	26.2	24.1	0.17	0.56	4.8	50.4	5.1
21-30%	24.8	27.5	0.17	0.58	5.3	54.7	5.5
11-20%	27.6	18.0	0.12	0.60	6.4	55.2	4.6
1-10%	28.9	23.5	0.08	0.52	6.6	55.2	3.7
2-yr colleges	37.4	3.7	0.01	0.13	7.3	55.3	5.2

Note: Employment rate excludes students who are employed at the time of admission
Source: same as Table 1

The average net expenditure of Korean colleges in the top 10% (91-100%) is 96.1 billion won, which is much higher than colleges in the lower decile groups. Also, the size of expenditure on education and research for colleges in the higher ranks is relatively higher than others. In particular, for colleges whose newly entering students' KSAT scores rank in the bottom 10% (1-10%), expenditure on education and research is actually smaller than tuition and government subsidy, thus their average net expenditure is negative 300 million won. Expenditure for colleges with student test scores in the 11-20% range is quite meager. Such colleges spend less than the amount of revenue from tuition or government subsidy or cannot secure additional funds. It can be said that colleges with negative net expenditure are using portions of tuition and government subsidy for clearing debt or increasing asset. These colleges may be over-investing in facilities or in weak financial conditions under poor management and governance.

Table 2 shows the vertical differentiation among Korean colleges from the perspective of education and research. Above all, colleges in the top 10% (91-100%) are differentiated from other colleges and show higher quality for nearly all measures including student-faculty ratio, research funding per faculty, number of published papers, student dropout rate, employment rate, and graduate school advancement rate. And based on newly admitted students' KSAT scores, from top to bottom, colleges are vertically differentiated in almost every measure for research and education with the exception of domestic research paper published and employment rate.

First, there is strong vertical differentiation with respect to faculties. The student-faculty ratio for colleges in the top 10% (91-100%) is the lowest with 13.4, and for the lower ranked colleges, even colleges in the 81-90% range have more than 20 students per faculty member. On the contrary, the student-faculty ratio for colleges in the lowest 10% (1-10%) is the highest with 28.9. Colleges in the top 10% (91-100%) receive more than twice the amount of research funding as those in the 81-90% range and have twice as many international journal publications. Research funding and international journal publication per faculty generally display a positive correlation with newly admitted students' KSAT scores, but in terms of papers published domestically, there is no clear correlation. In particular, for domestic journals, colleges in the lowest 10% (1-10%) have a higher number of papers published per faculty (0.52) than colleges in the top 10% (91-100%) (0.51). This shows that while the quality of international publications is controlled by global peer review, academic papers published domestically have problems in

quality control. It suggests that there are limitations in evaluating the research capacity of colleges or faculties based on the number of domestic publications.

Next, strong vertical differentiation exists regarding colleges' educational achievement. The most notable trend is that colleges with higher KSAT scores for newly admitted students have lower student drop-out rates. In particular, colleges in the bottom 20% (1-20%) have drop-out rates nearly four times greater than colleges in the top 10% (91-100%). Thus, considering the fact that these colleges' net expenditure is negative or minimal, we need to question whether the quality of education they provide is below the suitable level. The graduate school advancement rates of graduates is higher for higher ranked colleges and significantly so for those in the top 10% (91-100%). The employment rate of graduates for colleges in the top 10% (91-100%) is over 60%, which is higher than other colleges whose employment rates are roughly 50%. However, there is no significant difference in employment rates between mid- and low- ranking colleges.¹⁴

It is very important for 2-year colleges, whose purposes are fostering technical manpower needed by industry, to be horizontally, rather than vertically, differentiated from 4-year colleges. The employment rate of 2-year college graduates is 55.3% which is higher than the average of 4-year colleges in all decile groups except for the top 20% (81-100%). It can be interpreted that 2-year colleges are horizontally differentiated from 4-year colleges as technical education institutions. Also, the fact that research funding per faculty and paper published per faculty are significantly lower for 2-year colleges than 4-year colleges may not be evidence of vertical differentiation. Rather, this might show that faculties of 2-year colleges are more focused on industry-academia cooperation or technical education. However, net expenditure of 2-year colleges is negative and much lower than 4-year colleges in the lower 10% (1-10%); student-faculty ratio of 37.4 is much higher than 4-year colleges in the lower 10% (1-10%) (28.9); student dropout rate of 7.3% is four times greater than 4-year colleges in the top 10% (91-100%). This shows that 2-year colleges fail to be horizontally differentiated from 4-year colleges, and are at the bottom of the vertically differentiated ranking among all higher education institutions.

Thus, Korea's top research universities are far behind world-class universities, and at the same time there is strong vertical differentiation among universities based on newly admitted

¹⁴ Further research on whether downward employment is actually occurring in low ranking colleges and the impact policies such as college financial support and its restrictions have on low ranking colleges is needed.

students' KSAT scores. Also, 4-year colleges in the bottom 20% (1-20%) lack autonomous financial capacity and have very weak environments and outcomes of education and research. Furthermore, most 2-year colleges fail to horizontally differentiate with 4-year colleges and rank at the bottom not only in financial terms, but also in educational and research environment and outcome.

Lastly, there are serious problems regarding the education quality of primary and secondary schools in Korea. Despite the high scores Korean students receive on the PISA test, long hours of studying outside of school, including private tutoring, point to the problems of the quality of schools in Korea (Kim and Lee, 2010). The core of the problem lies in teachers' teaching and assessment methods not shifting away from rote learning and quantitative evaluation through multiple-choice tests. Problems involving rote learning and quantitative evaluation have grown inside the school, and at the same time, the problems caused by long hours of studying through private tutoring have spread outside the school. Thus, schools and students only focus on cognitive skills that can be quantitatively evaluated and this limits students from developing important skills like creativity and character.

Such problems are closely connected to strict vertical differentiation among higher education institutions based on newly admitted students' KSAT scores. This strict vertical differentiation makes students work harder for better test scores with the goal of entering better colleges. However, an excessive focus on objectively measurable cognitive skills for college admission carries many side effects, such as neglect of non-cognitive skills like creativity, character, and job training, and sacrificing important non-academic activities such as sports, voluntary work, and hands-on experience.

Korean students spend the longest time in the world on studying. According to the international comparison of students' daily use of time surveyed in 2008 by Ministry of Health and Welfare, Korean students aged 15-24 spend an average of 7 hours and 50 minutes per day on studying, which is 2 hours longer than the average of other countries (5 hours) (Kim et al., 2009). Another survey in 2003 by PISA shows that this difference in studying time is due to after-school programs including private tutoring, rather than regular school classes. For example, Korean students' average weekly studying time of math is 9.32 hours, the highest in the world. It is 1.4 times greater than the OECD average (6.83 hours) and 1.9 times greater than Finland (5.02 hours), which also receives high scores in math. In particular, students spend about 2.28 hours in

after-school programs such as private tutoring, and this is 2.1 times greater than the OECD average (1.07 hours) and 6.2 times greater than Finland (0.37 hours). Also, students spend 2.31 hours on self-study, such as doing homework, which is twice as that of Finland (1.20 hours). In the case of subjects on reading, students spend 1.45 hours in after-school programs including private tutoring, which is very high compared to other OECD countries (0.92 hours) and Finland (0.36 hours) (Kim et al., 2009; OECD, 2004).

If the quality of schools is measured by students' performance in subjects such as math, science, and reading compared to study time invested, the quality of Korean schools is not very high. Moreover, the longest study time in the world leads to the problem of students lacking time for developing other important skills like creativity and character. Korean students aged 15-24 exercise 13 minutes a day and this is one-third of that of the United States (37 minutes) and half of that of countries like Sweden (26 minutes) and Germany (24 minutes) (Kim et al., 2009). Furthermore, Korean students aged 15-24 participate one minute a day in voluntary work, which is very short compared to Germany (11 minutes), the United States (8 minutes) and Finland (7 minutes). Additionally, average hours of sleeping for Korean students aged 15-24 is 7.30 hours and it is at least one hour shorter than the United States (8.47), United Kingdom (8.36), Finland (8.31), and Germany (8.1 hours) (Kim et al., 2009).

The problems arising from Korean students allocating the longest amount of time to studying outside of school are closely connected to the problem of Korean teachers' teaching style and assessment method. Teachers are still more familiar with rote learning rather than teaching through project work that can foster students' ability to cooperate with one another to solve problems creatively. For student assessment, teachers rely on quantitative assessments based on multiple choice tests rather than qualitative assessments of reports and projects. Also, it is mandatory for every middle and high school to report on the relative academic ranking of individual students. Under these circumstances, Korean students have less chance to develop creativity and character skills.

The problem of Korean schools' teaching and assessment method can be examined indirectly through Figure 11. Korean teachers are paid the highest salary in the world, but have

the lowest self-efficacy.¹⁵ A large number of teachers answered that they are not succeeding in class and that they do not know how to deal with students, and think that students cannot be changed through education (OECD, 2009). The reason for such tendencies can be found in teachers' teaching and assessment methods, which rely heavily on multiple-choice tests. Of course, the problems of teachers' teaching and assessment methods not only pertain to teachers, but are connected to more fundamental issues involving the uniform institutional regulation of the school system under the equalization policy, mandatory reporting of the relative ranking of individual students, and college entrance based on a multiple choice scholastic aptitude test.

Students have to develop not only cognitive skills that can be evaluated through tests inside and outside of school, but also foster creativity and character skills (Heckman, 2006; Heckman and Kautz, 2013). However, due to rote learning and multiple choice testing, Korean students face difficulty in developing creativity and character skills. The qualitative problems of schools can lead Korean students to excel in cognitive skills that are measured in the PISA test, but lag behind others in other important skills. Of course, PISA measures skills such as problem solving and comprehension, which go beyond simple memorization and solving multiple-choice questions. However, it is difficult to evaluate high-dimensional cognitive skills such as creativity and non-cognitive skills such as character through the PISA test.

Although it is difficult to make international comparisons with measures like the PISA test, there are increasing evidences that show Korean students to have issues with their character skills. In a survey in 2006, Korean students were shown to be very weak in skills related to living in harmony with others (Schulz et al, 2010).¹⁶ Also, on the PISA test surveys on students' positive attitude toward areas of learning like reading, math and science, Korean students received the lowest scores. Moreover, on the issue of school bullying, which has recently received public attention, the root cause is believed to be a lack of social and emotional learning in Korean schools. Furthermore, studies show that an increasing number of Korean students have

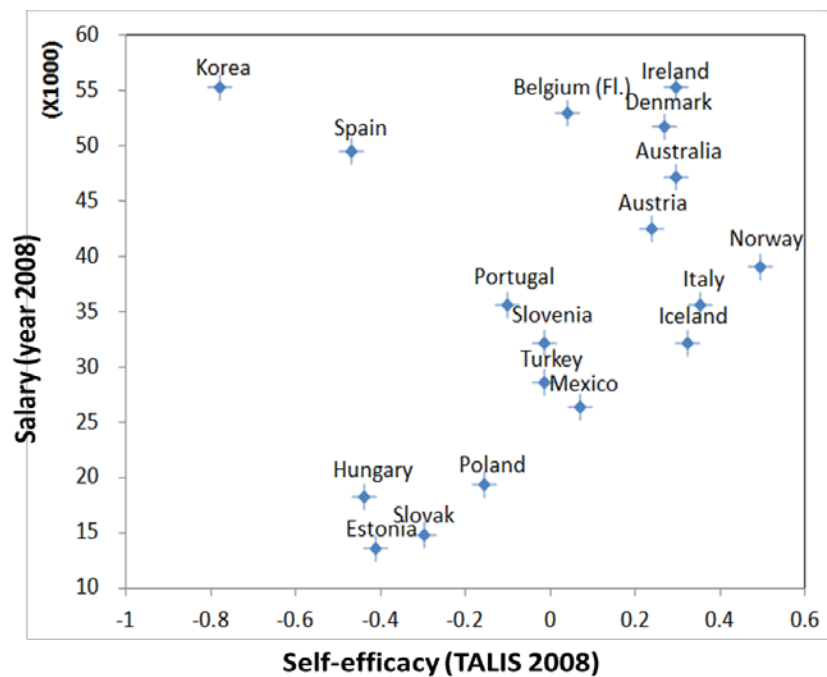
¹⁵ OECD Teaching and Learning International Survey (TALIS) constructs self-efficacy index from the following four items of the teacher questionnaire: 1) I feel that I am making a significant educational difference in the lives of my students; 2) If I try really hard, I can make progress with even the most difficult and unmotivated students; 3) I am successful with the students in my class; and 4) I usually know how to get through to students (OECD, 2009).

¹⁶ The International Civic and Citizenship Education Study (ICCS) surveyed 8th grade students' civic knowledge throughout 38 countries, including Korea (Schulzet et al., 2010)

serious mental health issues related to Internet addiction, obesity, and depression. Studies also show that Korean students' level of physical health is continuously declining (Lee, et al., 2012).

According to the Schulz et al. (2010), although Korean students display a high level of civic knowledge, actual social activity is very low. On a test which measures students' knowledge in civil society, among 38 participating countries Korea ranks third with a score of 565, lower than Finland (576 points) and Denmark (576 points) and higher than Taiwan (559 points) and Sweden (537 points). However, the portion of students who are actually engaged in local community or civil organizations is 26%, which is much below the average (65%) and lower than Finland (36%) and Taiwan (35%). Also, for students' trust in civic institutions, including government, judiciary, police and others, Korea is the lowest among participating countries (Schulz et al., 2010).

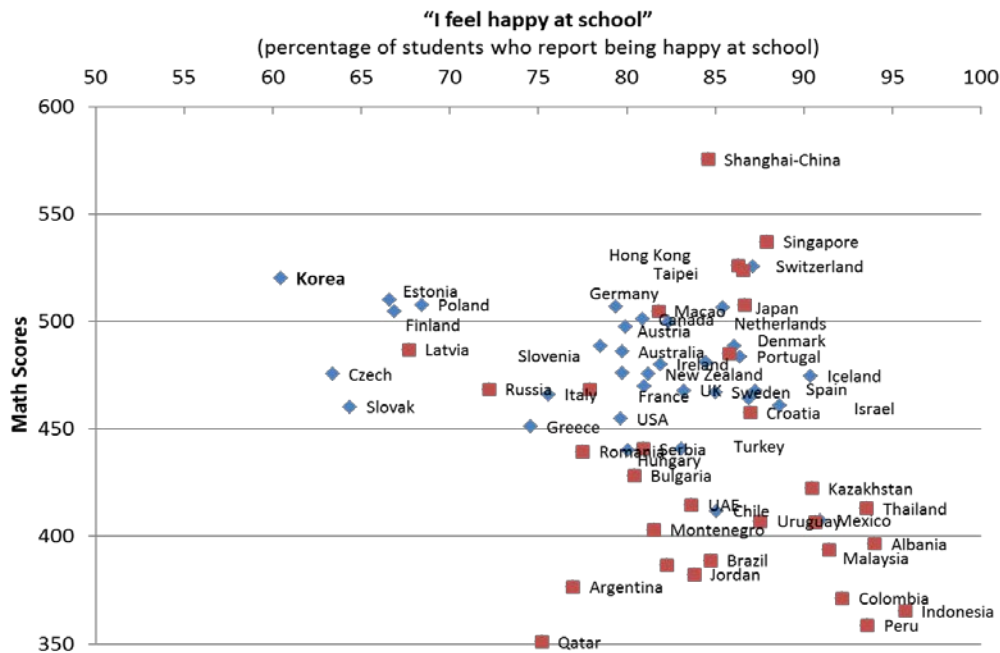
Figure 11: Salaries and Self-efficacy of Teachers



Source: OECD (2009; 2010)

In 2012, PISA for the first time asked students whether they are happy in schools and the portion of positive answers by countries are verified through Figure 12. Despite high scores in math, Korean students have the lowest portion of students that answered they are happy (OECD, 2013). Of course, there is a ‘reference bias’ problem and we cannot conclude that Korean students are relatively unhappy solely on students’ subjective answers.¹⁷ However, we believe that students are unhappy because they put in too much time in private tutoring while teachers’ teaching and assessment methods do not develop students’ creativity and character skills. Unfortunately, there are no empirical studies that assess these issues.

Figure 12: High Scores by Unhappy Students



Source: OECD (2013)

¹⁷ As an exemplary case of reference bias, Heckman-Kautz (2013) paid close attention to the study by Schmitt et. al. (2007) where Koreans work the longest hours, but their conscientiousness was the lowest among the OECD countries.

4. Formation of the Education Bubble

Although Korea achieved the world's fastest educational expansion, Korea was not able to make swift institutional changes to resolve quality problems of colleges and schools. Under considerable gap in speed between quantitative expansion and qualitative change, continuous rise in education expenditure may not lead to increase in human capital. We propose a new conceptual framework of the "education bubble" to shed light on the problem of constant increase in educational expenditure not contributing to increase in human capital.

While the quality of schools and colleges did not improve quickly, parents and students tried to seek market responses with their high demand for education. After the 1960s, many outstanding Korean students received doctorate degrees from abroad and returned to Korea and contributed to the development of academia as well as the economy. Thus the quality problem of higher education was solved through the global education market and this largely contributed to Korea's human capital accumulation. Certainly, Korea cannot outsource its doctorate education to the world's top universities forever, but Korean doctorate students received education from top-notch universities until Korean research universities reached substantial quality levels, and this allowed Korea to rapidly accumulate its human capital.

However, when the quality of education is not satisfactory, parents and students may not always be able to find the right solution from the market and market responses do not always bring desirable outcomes. Continuous increase in private tutoring in Korea is becoming too much of an economic burden on parents while failing to contribute to human capital accumulation. Also, under a strict vertical differentiation among higher education institutions, students who enter low-quality colleges do not earn positive returns in the labor market. We define this trend of continuous increase in educational expenditure not leading to human capital accumulation as the education bubble. Education bubble is a different concept from over-education. The debate on over-education started in the 1970s when the college enrollment rate in the United States increased and concern was raised over possible excessive supply of college graduates compared to labor demand (Freeman, 1976; Leuven, 2011). However, after the 1970s, as knowledge-based economy expanded through the world, economists (Katz and Murpy, 1992; Katz and Autor, 1999) provided empirical evidences supporting that "skill-biased technological change" increased the labor demand for college graduates, which in turn increased the college premium over high

school graduates. Accordingly, policy makers in many countries put aside their concerns on over-education and recognized the importance of having increased college enrollment as the main goal of educational policy. While over-education focuses on the quantity problems of education and labor market mismatches, the education bubble emphasizes the quality problems such as low quality of colleges and schools, strict vertical differentiation, and constant increase in educational expenditure.

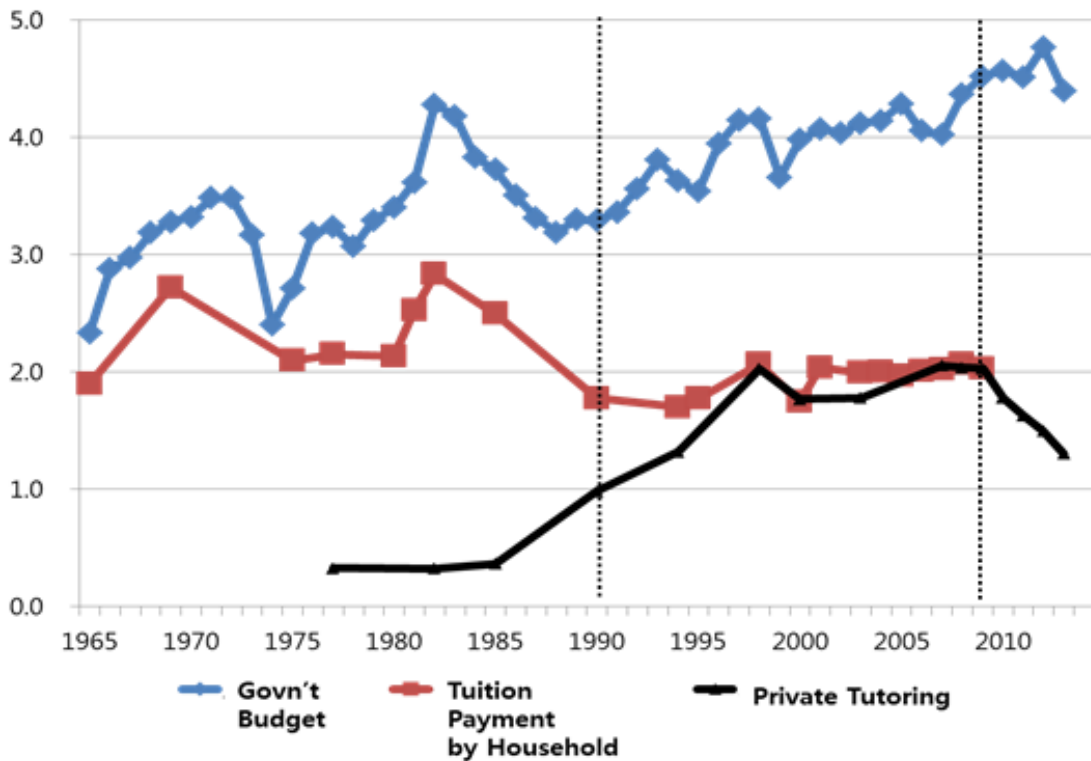
While financial bubbles lead to inconsistent fluctuations in the price of financial assets and vulnerability to a sudden collapse (Blanchard, 1982), education bubbles cause even more serious damage on long-term economic growth and equity. If a country is caught in an education bubble and a high degree of increase in education expenditure does not lead to human capital accumulation, the country's growth and equity will be dampened significantly in the long run, according to important works on human capital (Ehrlich, 2007; Goldin and Katz, 2008; Acemoglu and Autor, 2012) that point out the enormous impact of human capital on economic growth and equity. Therefore, education bubble should become an important subject not only for academic analysis but also for imminent policy agenda in many countries.

Figure 13 shows the trend of education expenditure in Korea by the government and private sector. For the last half century, although the Korean government's educational budget to GDP ratio steadily increased from 2.3% in 1965 to 4.6% in 2010, students and parents still spend almost 2% of GDP for tuition payment. Furthermore, private tutoring expenditure to GDP ratio began to rapidly increase in the late 1980s up to 2.1% in 2007. Although private tutoring rapidly increased beginning in the late 1980s, college tuition to GDP ratio decreased when the college enrollment quota was controlled by the government during the same period. Thus, all in all, we can see that the era of education bubble began in the 1990s, and it was preceded by expansion of private tutoring in the 1980s. The increase in private tutoring expenditure and college tuition turned around in 2010 when the effect of education reforms began to bear fruits. Therefore we will define the twenty years from 1990 to 2009 as the period of education bubble in Korea.

We see in Figure 13 that household expenses paid to schools and colleges increased from 1.9% in 1965 to 2.5% in the 1980s, and have remained at the 2.0% level. In particular, college tuition to GDP ratio has continuously risen from 0.8% in 1980 to 0.7% in 1990, and 1.2% in 2000 to 1.3% in 2005, and covers 67.4% of total education expenditure of household in 2010. Tuition expenditure at the primary and secondary school level decreased due to the expansion of

free middle school education and the abolishment of extra fees in addition to the regular tuition. At the same time however, the number of students advancing to higher education greatly increased and college tuition increased rapidly, leading to increase in college tuition expenditure. If we look into the trend of expenses on private tutoring by households for primary and secondary school students¹⁸, it increased rapidly from 0.49% in 1985 to 1.2% in 1989 and from 2.0% in 1997 to 2.1% in 2007, and after the education reform, the rate gradually decreased to 1.8% in 2010 and to 1.5% in 2012. As the major purpose of private tutoring is better college advancement, it is natural that private tutoring expenditure rose prior to the drastic increase in higher education in the 1990s.

Figure 13: Educational Investment as a Percentage of GDP

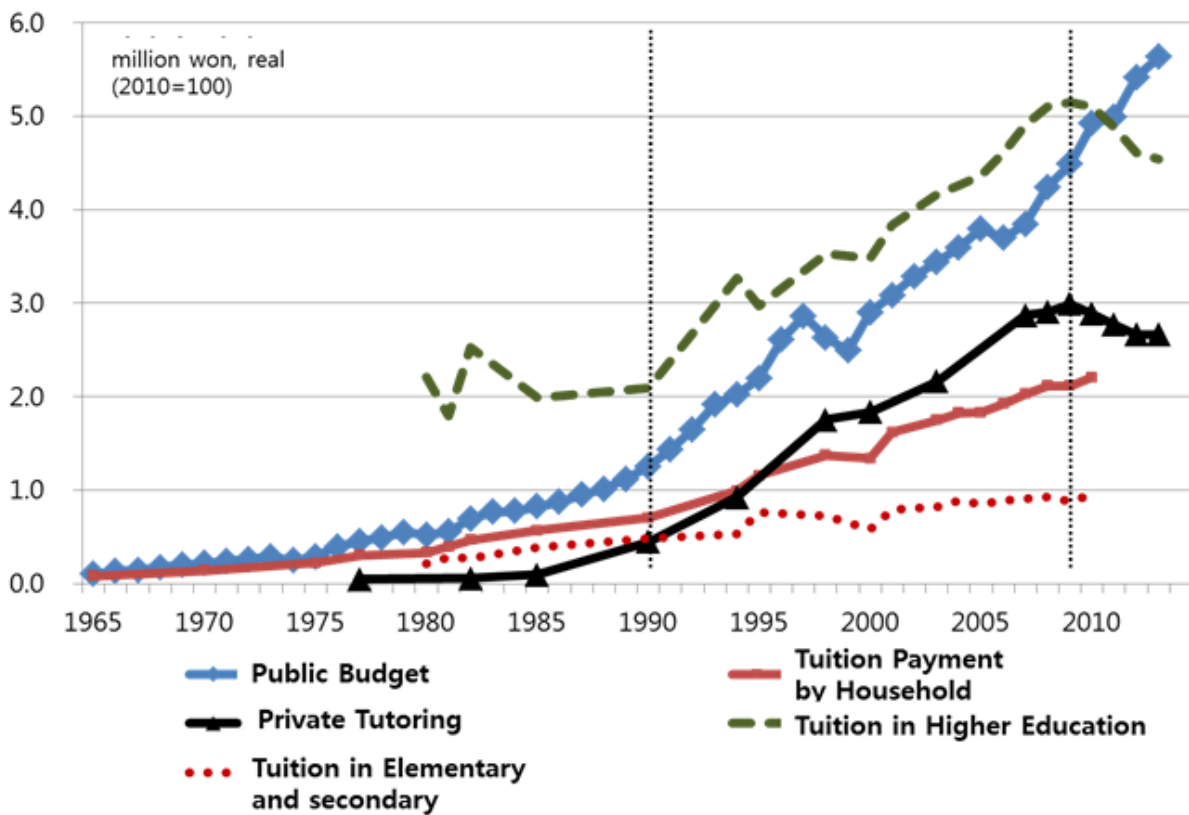


Source: Data of budget and tuition are from the various years of *Statistical Yearbook of Education*, KEDI (2013). The expenditures of private tutoring are from Kim et al (1998), Choi et al (2003), and Statistics Korea (2014).

¹⁸ Data on private tutoring expenses was collected intermittently by Korea Education Development Institute since 1997, and has been officially collected by the National Statistics Office since 2007. Official data defines private tutoring as students who are enrolled in primary and secondary schools and receiving paid lessons outside of the school, and it does not include private tutoring for pre-school children and college students. Thus, we recalculated the entire data based on this definition, and private tutoring expenses before 2007 are much smaller than figures shown in the previous research.

Figure 14 demonstrates education expenditure per student. During the education bubble period, education expenditure per student by household sharply increased. From 1990 to 2009, education budget per student increased by 3.6 times, tuition payment rose by 3.0 times, and private tutoring expenses increased by 6.7 times. In particular, during this period, private tutoring expenditure per student exceeded regular school and college tuition payment per student and that gap continues to grow bigger.

Figure 14: Educational Investment per Student



Source: same as Figure 13

During the period of the education bubble (1990-2009), the rapid expansion of higher education has been accompanied by steady increase in private tutoring expenditure and college tuition expenditure. Figure 15 shows the enrollment rates (number of students to schooling population ratio) by level of education. During the Korean War, primary school enrollment decreased to 69.8%, and increased to 96.4% in 1959 due to the 5-year plan for compulsory education that started in 1954, and even exceeded 99% in 1963. Middle and high school enrollment exceeded 90% in 1979 (92.4%) and 1995 (91.9%) respectively. Based on rapid growth in enrollment rates from primary to secondary school, college enrollment rates rose quickly after 1991¹⁹. It increased by two folds in just 10 years and spiked to 115.8% in 2007. The net enrollment rate, which indicates the percentage of students of official schooling age that are actually enrolled in school, started at 23.6% in 1990 and rapidly increased to 36.0% in 1995, and increased from 52.5% in 2000 to 70.1% in 2010.

Korea's expansion in higher education was largely affected by the government's regulation over colleges through the quota on entering students. Therefore, it is important to look at the trend of the percentage of new high school graduates' entering college (college advancement rate), as shown in Figure 16²⁰. First of all, from the early 1960s to mid-1970s, the college advancement rate displays a decreasing trend. This is due to the government controlling the scale of college education in accordance with the Five-Year Economic Development Plan and focusing on supplying technical manpower through vocational high schools. During this period, the number of high school graduates continuously increased, but as the government did not allow colleges to increase its quota on entering students, the college advancement rate decreased from 32.7% in 1965 to 21.6% in 1977.

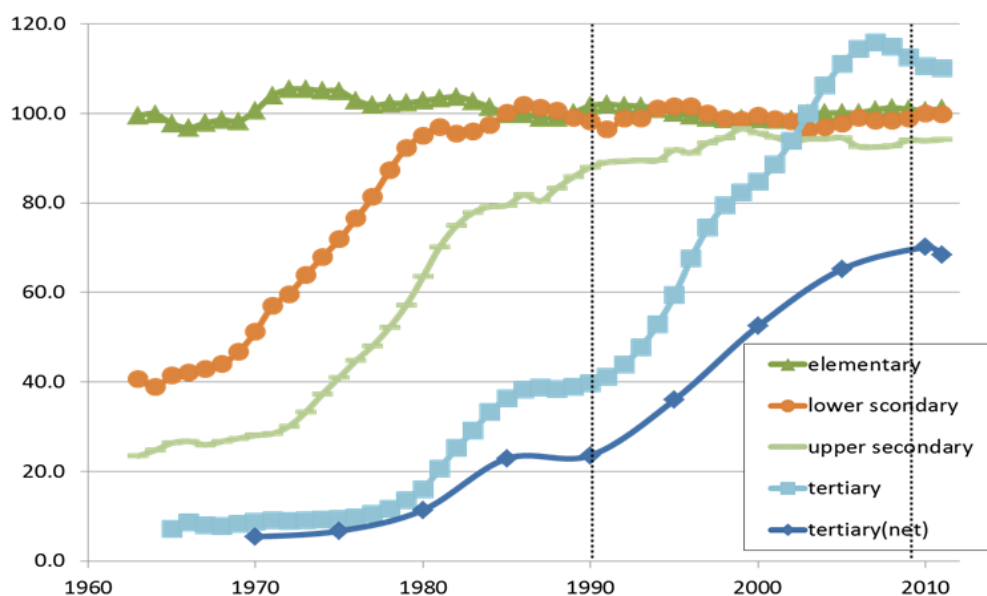
Beginning in the late 1970s, the demand for technical manpower increased continuously due to the continuous upgrading of industries. In response, the government began to expand enrollment quotas of 2-year colleges and 4-year colleges mainly for science and engineering

¹⁹ We calculated enrollment in 4-year colleges and 2-year colleges based on the National Statistical Office's standard on schooling age, which is between 18 and 21. Other organizations such as UNESCO define ages between 18 and 22 as criteria for schooling age, and at times they include graduate school students as part of the schooling age. Total enrollment rate is high in Korea not because there are adult learners who work and study at the same time, but there are many male students who return to school after their military service.

²⁰ Graduates that are not included in advancement and employment are either unemployed or unknown, and can be estimated that the majority of them are repeaters. Students enlisted in the army are eliminated from the denominator, and then we calculated the percentage of advancement and employment.

departments, and in turn, the college advancement rate increased. In particular, the new government which took power in 1980 implemented quotas on the number of graduating students instead of entering students in order to relieve extreme competition for higher education admission and this led to a sudden increase in college enrollment in a short period of time. The enrollment rate rapidly increased from 27.4% in 1980 to 35.4% in 1981. However, due to the difficulty of limiting bachelor's degrees to a certain proportion and opposition by college students, graduation quotas were abolished. The original entrance quota policy was re-implemented, and the college advancement rate decreased again. In 1990, the college advancement rate of general high school graduates was 47.4%, while that of entire high school graduates was 33.3%.²¹

Figure 15: Enrollment Rates by Level of Education: 1963-2011

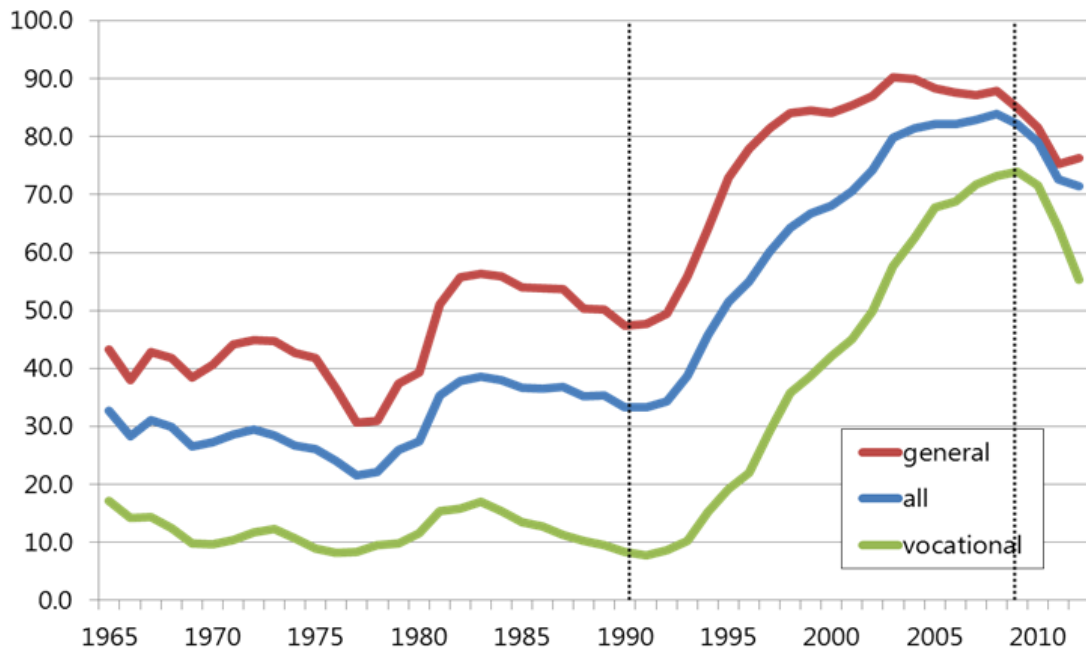


Notes: Gross ratio except 'tertiary (net)'. Tertiary includes students enrolled in 4-year colleges and 2-year colleges, whose ages are from 18 to 21, excluding those in cyber institutions and graduate schools.

Source: KEDI (2013) and Statistics Korea (2014)

²¹ State of employment and college advancement of high school graduates in a certain year are counted and announced the year after, and we have used data based on the year that it was announced. For instance, the rate of advancement in 1991 was calculated by using previous year's data on students' advancement.

Figure 16: Percentage of New High Schools Graduates Who Enter Colleges (Advancement Rates)



Source: KEDI (2013)

A large change in the trend of high school graduates advancing to higher education started around 1990 along with sociopolitical changes in 1987.²² Beginning in 1990, admission quotas on higher education were greatly enlarged mainly for 2-year colleges, and the Kim Young Sam administration, which took power in 1993, announced that admission quotas could be abandoned for local colleges starting in 1995. The average annual enrollment quota on higher education showed an increasing trend; from 1990 to 1995, it increased by 5.6% (4-year college 4.7%, 2-year college 11.1%), and from 1996 to 2000, it increased by 4.5% (4-year college 4.5%, 2-year college 6.5%). Along with this trend, the college advancement rate gradually increased from 51.5% in 1995 to 70.5% in 2001 and to 83.9% in 2008. The desire to advance to higher education, which was restricted by the government prior to 1990, erupted amid sociopolitical

²² After 1990, Korean society faced drastic changes. After years of political repression, the demand for democratization strengthened and led to the Democratization Movement in 1987. As an outcome of the movement, a direct presidential election system was put in place, and in 1988, through a peaceful change of regime, the Roh Tae Woo administration was elected into office. There was a strong demand for democratization in various sectors of society including education, and people demanded deregulation of college enrollment quotas and college establishment.

democratization, and the strong demand for higher education led to a wide expansion of colleges during the education bubble period.

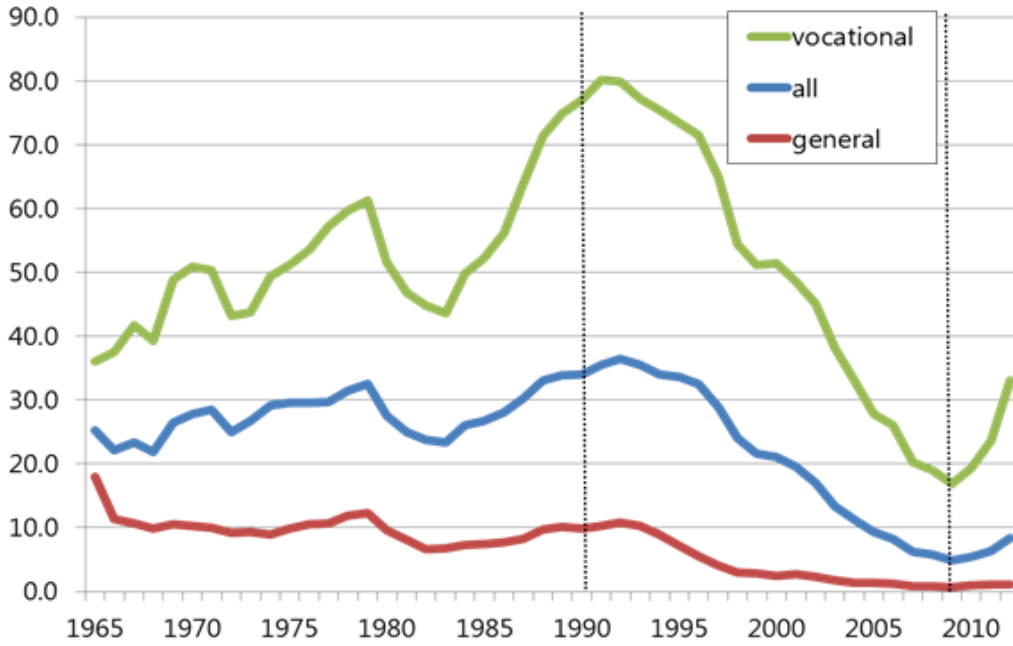
The rapid expansion of higher education during the education bubble period is closely related to the trend of more vocational high school graduates selecting to advance to college instead of directly entering the labor market upon graduation. As can be seen in Figure 16, the college advancement rate of vocational high school graduates drastically increased from 7.8% in 1991 to 49.9% in 2002 and even reached 74% in 2009. On the other hand, the percentage of new high school graduates' employment, as displayed in Figure 17, show opposing trends from Figure 16. The percentage of new vocational high school graduates' employment was 80.1% in 1991²³, but as more students advanced to college, the percentage of employment rapidly decreased and went down to 16.8% in 2009.

The percentage of high school graduates' employment decreased not only due to the increase in the college advancement rate, but also due to the reduction in percentage of vocational high schools itself. As demonstrated in Figure 18, the ratio of vocational high school graduates (in dotted line) to overall high school graduates increased from 40.8% in 1965 to 50.6% in 1973 and decreased to 39.7% in 1987. After 1996-1998, it continuously decreased to 29.9% in 2005 and to 23.0% in 2012.

During the education bubble period between 1990 and 2008, the government failed to vitalize vocational education to strengthen horizontal differentiation in education. In other words, policies could not remove students, regardless of academic capacity, from taking part in the fierce competition to enter prestigious colleges where expensive private tutoring is deemed a necessity and also could not upgrade the quality of vocational education starting at the high school level. If high-quality vocational education institutions with strong partnership with business and consistent full-scale government support existed, many students would not have advanced to college blindly. Although vitalizing vocational education could have been an effective solution for overcoming vertical differentiation, vocational high schools shrunk and this reinforced expansion of higher education and vertical differentiation.

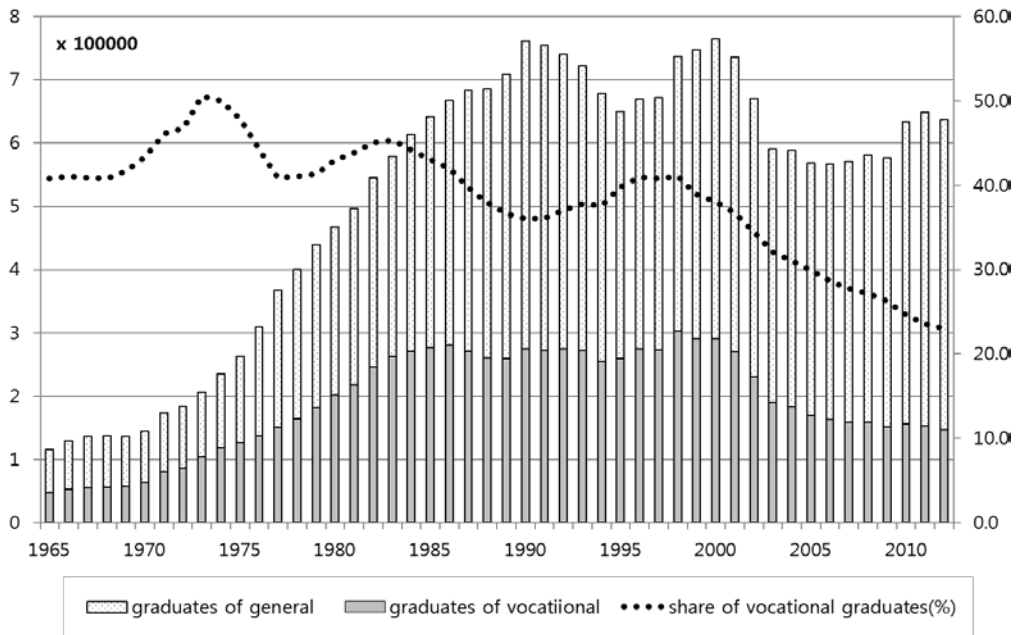
²³ Percentage in employment which increased continuously until the late-1970s, decreased rapidly in the early 1980s due to high advancement rates and economic contraction. In 1980, the advancement rate of total high school graduates began to surpass the percentage of employment. However, until 1990, college enrollment did not increase as much and employment in vocational high schools greatly increased.

Figure 17: Percentage of New High School Graduates Employed



Source: same as Figure 16

Figure 18: Percentage of New Graduates from Vocational High Schools out of all High Schools



Source: same as Figure 16

An important fact related to the education bubble is that in the process of rapid higher education expansion, not only were qualities of colleges not improved, but under strict vertical differentiation, advancement of high school graduates to low-quality colleges largely increased more so than to top-quality colleges. Figure 19 shows the change in college enrollment by decile groups between 2000 and 2012 based on colleges' newly admitted students' KSAT scores in 2000.²⁴ Enrollment in colleges in the top 20% (81-100%) increased by 7.4% in 2012 compared to 2000, and the degree of such increase is one-third of those of other decile groups during the same period. For middle-ranking colleges in the 61-80% and 41-60% decile groups, enrollment increased by 23% and 21.5% respectively during the same period. However, the enrollment increase in low-ranking colleges was much higher than the other groups. Colleges in the 21~40% group showed the fastest increase with 27.2%, and the colleges in the bottom 1-20% showed an increasing rate of 21.5%. In particular, for the top ten colleges, all included among the ARWU 500 universities in 2012, the percentage of enrolled students did not change significantly compared to 2000.²⁵

There are several reasons why the size of enrollment in top colleges did not increase relatively to other colleges.²⁶ In 1999, the government planned large investments in research-oriented graduate schools. As part of efforts to become recipients of government funding, the top colleges put more emphasis on research, and thus decreased the percentage of undergraduates while increasing the percentage of graduate school students. Also, top colleges have sensitively reacted to policy that connected downsizing enrollment and financial support. Moreover,

²⁴ We used newly entering students' KSAT score in decile in 2003, but 2000-2002 data was used instead if it was not available. If two colleges were merged, then the sizes of students prior to the merger were added up, and if schools were closed down as of 2012, they were excluded from the analysis. Due to limited data, nine college branches which are operated separately were calculated together with their main campuses (6 colleges in rank 1-2, 1 college in rank 3, and 2 colleges in rank 4).

²⁵ Korean colleges that are included in the ARWU 500 universities increased from 8 in 2004 to 10 in 2012, which indicates that while the international competitiveness of research universities did not improve much, the total number of college students increased. The size of students in 4-year colleges increased from 1.29 million in 2000 to 1.56 million in 2010, but the number of students in the top 10 colleges only increased by 7,000 during the same period. In particular, the percentage of enrollment in the top 10 colleges decreased from 14.3% in 2000 to 12.3% in 2012. On the other hand, the percentage of doctorate graduates in the top 10 colleges decreased from 47.8% in 2000 to 40% in 2012.

²⁶ Among top ranking colleges many teacher's colleges are included, and due to decrease in schooling population, enrollment quota in teachers' colleges were reduced and this is another reason why the size of top colleges did not increase as much. However, the percentage of enrolled students in colleges in the top 20% (81-100%) also decreased from 22.4% in 2000 to 20.1% in 2012 even when teacher's colleges were excluded.

enrollment quota was applied to colleges in metropolitan areas where most of the top colleges are located. Mid- and low-ranking colleges did not react as sensitively towards the policy, and rather increased the size of enrollment in order to enlarge revenue through tuition. Eventually, the percentage of students who received education in the top colleges decreased and the percentage of those who received education from low-ranking colleges steadily increased.

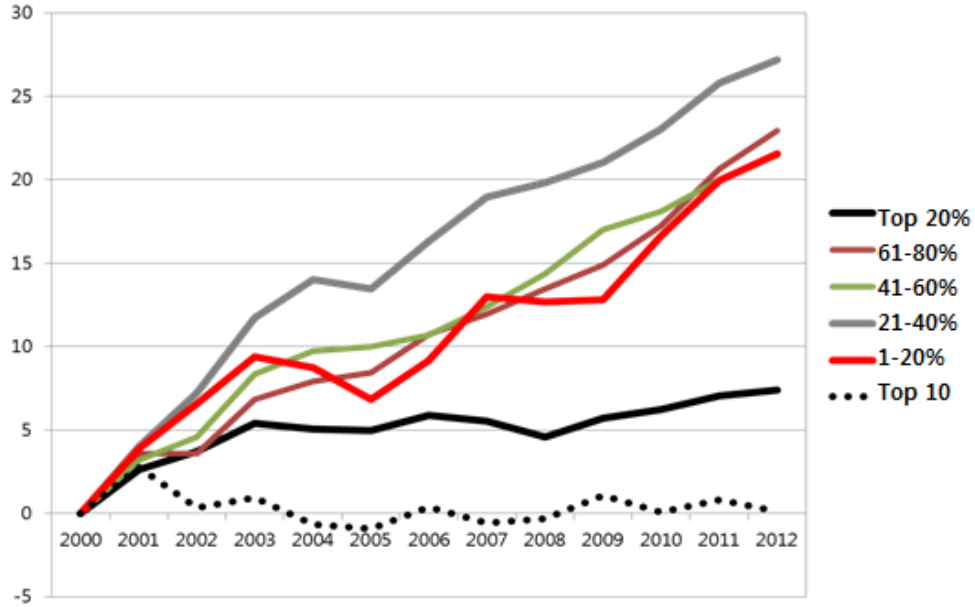
Figure 20 provides newly admitted students' KSAT percentile scores from 1994 to 2003. As college advancement rates increase²⁷, newly entering students' average KSAT percentile scores would decline. But the problem is that the declining rate of scores in low-ranking colleges is much stronger than the top colleges. Entering students' KSAT scores for colleges in the top 10% (91-100%) have shown little change and remained roughly around the upper 96% level, and the scores for colleges in the upper 81-90% range also did not change significantly and stayed at the upper 91% level. However, as the ranking goes down to the bottom, newly entering students' average KSAT percentile scores decline continuously. In particular, newly entering students' average KSAT percentile scores for the bottom ranking (1-10%) 4-year colleges decreased from 63.5% in 1994 to 37.1% in 2003, and though it was 15% points higher than the average scores of 2-year colleges in 1994, it was even lower than the average scores of 2-year colleges in 2001. Also, 4-year colleges in the 11-20% range showed a decreasing gap with average percentile scores of the upper 50% among 2-year colleges.

We have to carefully look into the fact that more than 20% of 4-year colleges have lower KSAT scores than the average KSAT scores of 2-year college students. Selectivity in Korea's top colleges is much higher than the colleges in the United States²⁸ as it is often expressed that they sweep away almost all of the top students. On the other hand, low-ranking colleges experience the problem of students' average KSAT scores decreasing drastically in a much shorter period than the United States. The educational quality of low-ranking colleges will fall with rapid decline in newly entering students' average KSAT scores unless financial or other conditions of colleges are improved.

²⁷ College advancement rate of high school graduates increased from 45.8% in 1994 to 79.8% in 2003.

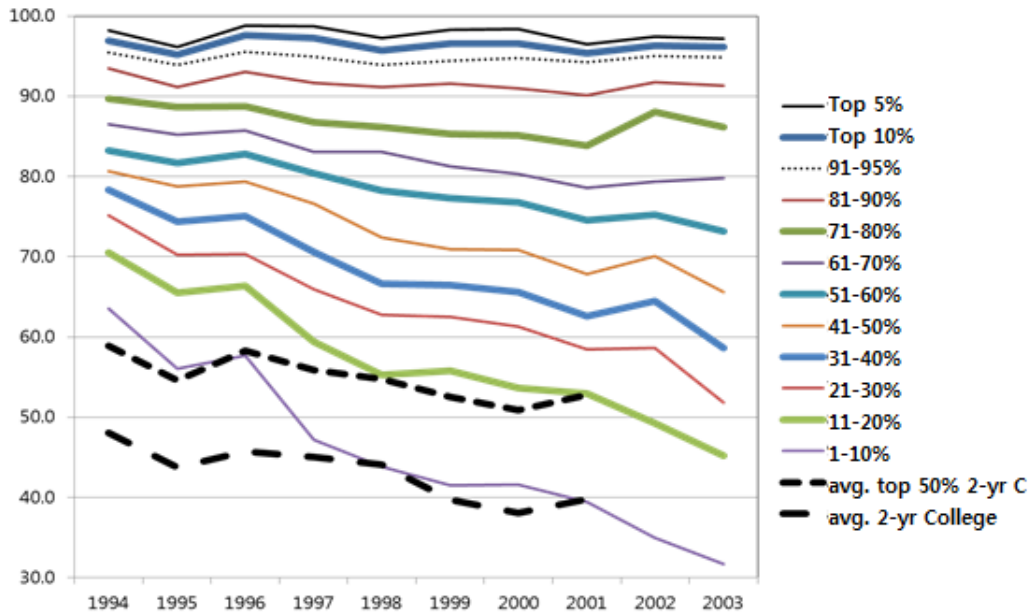
²⁸ In the United States, data analysis on newly entering students' percentile scores of SAT and ACT from 1962 to 2007 shows that colleges in the top 10% (91-100%) became even more selective in the admissions process as the percentage distribution increased, whereas other colleges' average scores decreased and a fan-out trend was displayed (Hoxby, 2009).

Figure 19: Percentage Change in Enrollment by Decile Groups of Colleges



Source: same as Table 1, KEDI (2013) and Shanghai Ranking Consultancy (2013)

Figure 20: Mean KSAT Percentile Scores of 4-year Colleges and 2-year Colleges (1994-2003)



Source: same as Table 1

The education bubble, where continuous increase in educational expenditure does not lead to human capital investment, is a concept that covers the overall problem of education from excessive private tutoring to students in low-quality colleges. In fact, the problem of private tutoring is closely connected to the problem of increasing number of students in low-quality colleges. If the qualities of colleges improve and horizontal differentiation is strengthened, the excessive expenditure on private tutoring used for advancing to high-quality colleges can be relieved.

Figure 21 shows the expansion of the private tutoring business in Korea from 1993 to 2012²⁹, and shows that the number of private tutoring institutions increased by four times from 15,638 in 1993 to 68,120 in 2012, and the number of employees in private tutoring institutions increased from 68,752 persons in 1993 to 317,014 persons in 2010. Though the number of employees decreased gradually after the education reform, as of 2012 there are still 310,821 persons working in the private tutoring businesses. The enormous increase led to the size of employees in private tutoring institutions in 2010 nearly reaching 77% of the total number of teachers in primary and secondary schools. Regulation on private tutoring was gradually relieved following the 7.30 Policy Measures that banned private tutoring in 1980, and in 2000, the Constitutional Court determined that it is unconstitutional to ban private tutoring.

There are numerous studies showing that private tutoring could hardly lead to human capital accumulation in Korea. Kim (2011) empirically shows that increasing the self-study time of high school students improves KSAT scores more significantly than increasing private tutoring time. According to Ryu and Kang (2013), instrumental variables estimates suggest that a 10 percent increase in private tutoring expenditure of middle school students raises test scores by 0.03 standard deviations, comparable to the modest effects of public school expenditure in previous studies. Dawson (2010) points out that the practice of “learning-in-advance”³⁰ of *Hagwon* (private tutoring institution) is related to the marketing strategy to ease anxiety for

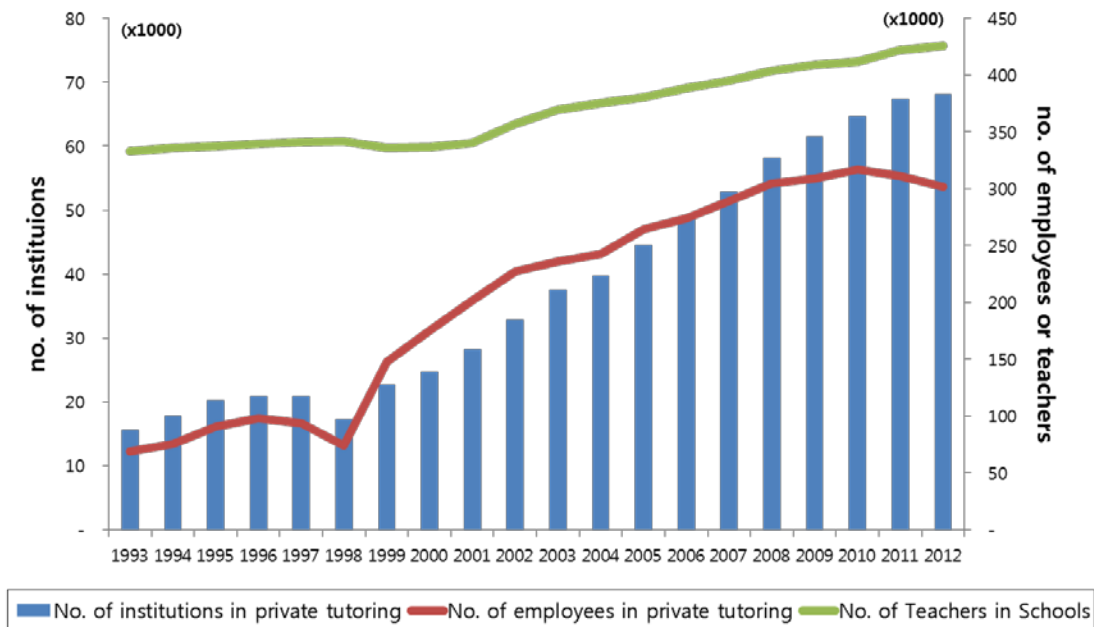
²⁹ The number of private tutoring institutions and employees were collected from the National Statistics Office, the number of teachers were collected from Statistical Yearbook of Education by each year, and private tutoring institutions includes language schools, home visit lessons, and preparatory courses for college entrance exam, and computer classes.

³⁰ *Hagwon* teach students for two months during vacation before the beginning of the academic year, and they teach the curriculum at a more rapid pace than the school during the school term (Dawson, 2010).

students and their parents who register, and to cause anxiety in other students who do not register, leading them to become future customers.

In Korea, the 20 years from 1990 to 2009 can be referred to as a period of education bubble as educational expenditure by households on private tutoring and tuition rapidly expanded by more than four times from 114.8 million won per student to 510.6 million won per student. The following four changes occurred simultaneously during the period of education bubble. First, the percentage of students advancing to higher education from high school increased from 33.3% in 1990 to 83.9% in 2008. Second, the percentage of new vocational high school graduates' employment largely decreased from 80.1% in 1991 to 16.8% in 2009. Third, the problem of college quality and vertical differentiation intensified particularly for low-ranking 4-year colleges and 2-year colleges. Lastly, the size of employees in private tutoring institutions increased rapidly to nearly reach 77% of the number of teachers in primary and secondary schools in 2010, which means private tutoring business emerged as one of the major industries in Korea.

Figure 21: Number of Institutions and Employees in Private Tutoring Business



Note: Teachers in elementary and secondary schools

Source: National Business Survey by Statistics Korea (2014), and KEDI (2013)

Although there were several efforts to remove the education bubble in Korea, many of them were unsuccessful until 2008 when the government enforced education reform for education diversification. The government coherently enforced policies to strengthen vocational high school education and career guidance education, including the implementation of Meister High Schools. Emphasis was put on enhancing autonomy and accountability of schools and colleges, restructuring colleges by closing down the ones that have low quality and are poorly managed, increasing the quality of research universities, and lowering the burden of expenditure on private tutoring and college tuition (Lee et al. ed., 2012; Lee, forthcoming). Around 2010, the trend of high school graduates blindly advancing to college became reversed and expenditure on private tutoring by households' decreased, indicating that the education bubble has begun to be removed.

Given the long time lag of education policies, there are two major empirical evidences which show that the education bubble is beginning to be removed through the education reform.

First, the trend of high school graduates advancing directly to college has shifted. Figure 15 shows that the net college enrollment rate increased rapidly and is gradually decreasing since 2010, and Figure 16 shows that the college advancement rate of high school graduates increased until 2010, but the trend reverses and shows rapid decline. In particular, we can observe from Figure 17 that the share of employment among vocational high school graduates gradually decreases until 2010, and bounces back up after 2010.

Second, private tutoring expenditure, which consistently increased, began to show signs of decline. Figure 13 and Figure 14 show that the increasing trend in private tutoring expenditure and higher education tuition was reversed in 2010. The decline in private tutoring can be also observed from Figure 21 where the number of employees in private tutoring institutions begins to gradually decrease since 2010. Certainly, we should consider the fact that decline in private tutoring expenditure per household may have been affected by factors other than education reform. A decrease in the number of students may be a possible factor, but as seen in Figure 14, expenditure per student clearly demonstrates a reversal trend after 2010, thus the effect of education reform cannot be denied.

These positive changes might be induced not only by education reforms but also by market forces. Very low or even negative college premium of graduates for low-quality colleges

could help reverse ever-increasing trend of both the college advancement rate and private tutoring expenditure. We will turn to this issue in the next section.

5. Labor Market Evidence for Education Bubble

According to the human capital theory, e.g. by Becker (1990), people invest time and resources into education to embody the capital within their own and the main part of the value of such capital can be measured by the wage premium to higher education in the labor market. Based on this simple intuition, by checking the wage premium or the rate of return to higher education, we can infer how effectively the educational spending contributed to the formation of human capital of the workers.

In exploring this question, we need to consider the supply and demand issues. For example, as more people invest in education and the supply of the educated work force increases, the wage premium tends to be smaller, which would reduce income inequality. Goldin and Katz (2008) show that such changes took place in the U.S. from the early 20th century until the 1970's, but the U.S. education system failed to properly respond to skill-biased technological changes, which led to significant increases in the college wage premium and income inequality. They focus on the lack of “college readiness” of students after primary and secondary education due to the weaknesses of public schools, and that has led college enrollment rates to remain stagnant despite an ever-increasing demand for college graduates.

Contrary to the United States, where the quantity of the supply of higher education, i.e., the sluggish college enrollment seems to be a problem, Korea's college advancement rate has increased more than 50% points from 1990 to 2009. However, such rapid expansion of Korean higher education involved a different kind of supply-side issue, i.e., the heterogeneous quality of college-graduate workers supplied to the labor market. It is not surprising to expect the rates of return to college education would differ depending on the quality of different colleges, particularly when the colleges are strongly vertically differentiated as in Korea. Thus, we analyze not only the average wage differences across schooling groups, but also the differential rates of return to college education across the heterogeneous groups of college graduates, specifically differentiated by their wage ordering. This way we can capture the relative wage structure among the college graduates, hence the heterogeneous contribution of educational investment to human

capital formation among them.

We use the Occupational Wage Survey (OWS) of Korea for the period between 1980 and 2011. The OWS collects the labor market information on various sources of wage earnings, work hours, work types and socio-economic characteristics of workers from the establishment records.³¹

Figure 22 shows the changes of population shares by educational attainment levels. The population share of middle school graduates monotonically decreased from 56% in 1980 to 4% in 2011, while that of 4-year college graduates increased rapidly from 10% in 1980 to 37% in 2011, and that of 2-year college graduates increased from 3% in 1980 to 19% in 2011. The population share of high school graduates increased from 31% in 1980 to 50% in 1996 and then decreased to 40% in 2011. It is interesting to note that the combined share of middle and high school graduates is much lower at 44% than the combined share of 2-year and 4-year college graduates at 56% in the year 2011, which manifests the rapid expansion of higher education of Korea. In the year 1980, the share of the former low education group was 87% while that of the latter high education group was only 13%.

In Figure 23, the average wages by educational attainment levels are plotted in logarithmic scale so that the changes in their slope indicate the changes of growth rates. There is a clear wage ordering by educational attainment level: middle school graduates or lower (labeled "MS"), high school graduates (labeled "HS"), 2-year college graduates (labeled "2Y-C"), and 4-year college graduates or higher (labeled "4Y-C"). It shows that the overall growth patterns are more or less similar, but the magnitudes of the growth rates differ across the educational

³¹ The sampling scheme is the stratified random sampling with differential weights across strata. The strata are classified by the administration units covering the entire region of Korea. For the over-time compatibility, we select the sample as follows. For the 1980-1998 period, small establishments with less than ten employees are excluded in the original sample, but after 1998, the establishments with less than five employees are excluded. Thus, we consistently exclude the sample of workers in the establishments with less than ten employees. We exclude the agricultural sector. The working-age population, defined by the age group of 18-65, is included. Our focal point of analysis is to explore the "rate of return" to high education rather than the overall inequality issues. Hence we use only the full-time workers, defined by those who work more than 155 hours per month. The size of our selected sample varies from 375,987 in 1980 to 542,291 in 2011. Our wage is measured by the regular salary earnings including the regular allowances but excluding the over-time pay and special bonus.

attainment groups over the three phases of wage growth (from rapid to slow growth, and then to stagnation).

The wage grew by 4.8% each year on average during the whole period. However, the annual average growth rate of wage is 6.7% for the 1980-1997 period, while it decreased to 3.4% for the 1997-2008 period and to -0.6% after 2008. It is interesting to note that the two turning-point years of 1997 and 2008 correspond to those of the Asian and global financial crises. However, these changes in wage growth may well be the responses of the labor market to the rewards to human capital accumulation, which are triggered by those macroeconomic shocks rather than the direct outcomes of the financial crises. For example, the above changes of wage growth over time might reflect the changes of the returns to human capital; the bubbles in which are busted by the stings of such macroeconomic shocks. Another possibility would be simple degradation of technological progress.

Figure 22: Composition of the Workforce by Educational Attainment

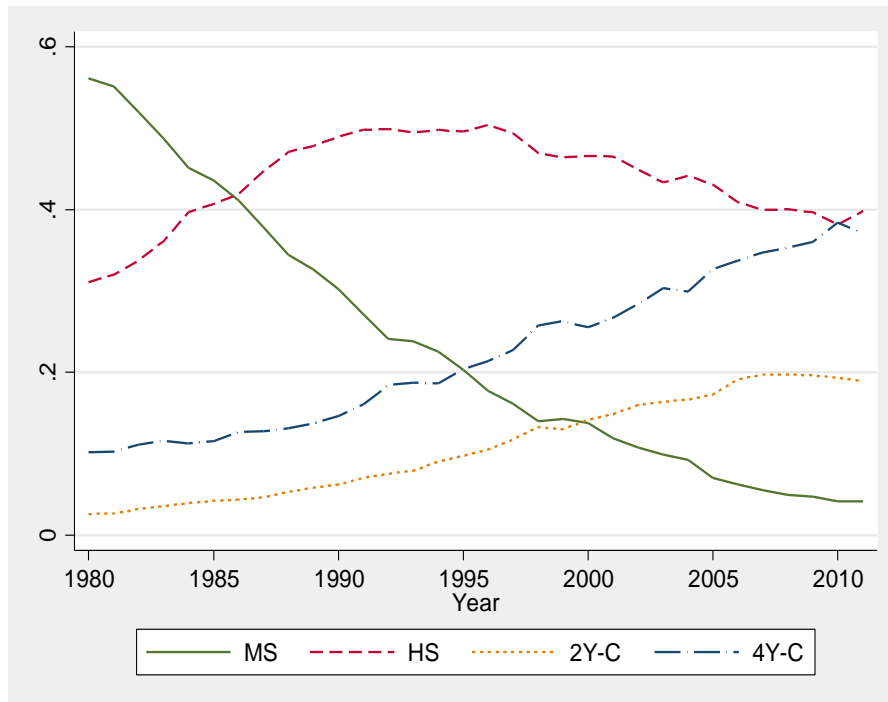
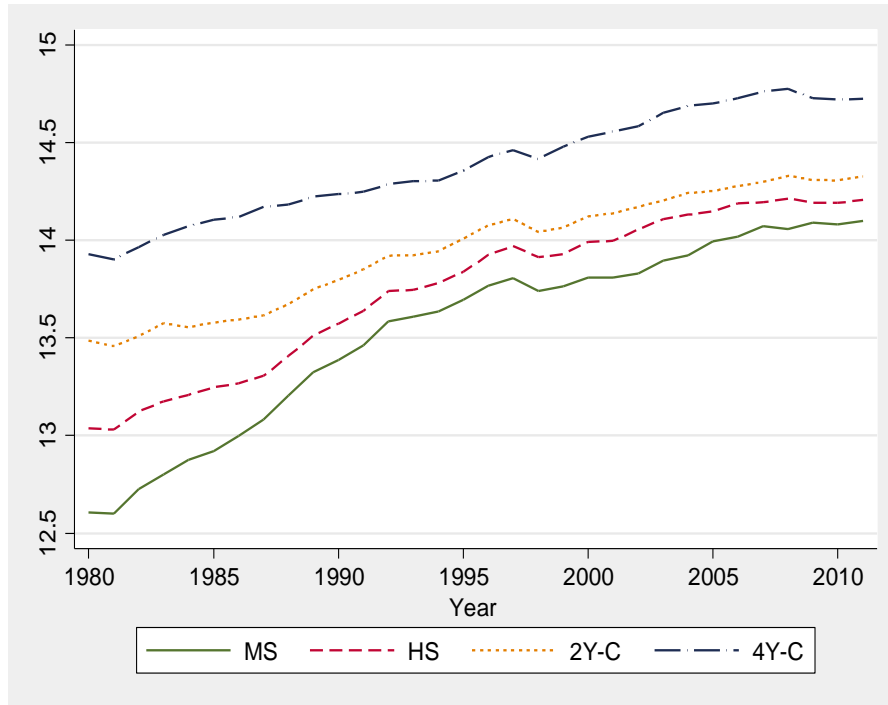


Figure 23: Log Wage by Educational Attainment



The annual average growth rates of wage are in reverse order of the wage level across education groups for the rapid growth period (1980-1997): 7.3%, 5.6%, 3.7%, and 3.2% for the graduates of middle school-or-lower, high school, 2-year college, and 4-year college, respectively. For the slow growth period (1997-2008), the wage of 4-year college graduates grew at the fastest rate of 2.9% per year, while the wage grew at 2.3%, 2.2% and 2.0% per year for the graduates of middle school-or-lower, high school, and 2-year college, respectively. During the stagnation period (2008-2011), 4-year college graduates suffered the most at negative annual average growth rate of -1.7%, while the growth rates are 1.4%, -0.2% and -0.1% for the middle school-or-lower group, high school group, and 2-year college group, respectively.

The entire college graduates are further categorized into wage-decile groups according to their wage ordering and we explore if the features of the 4-year college premium evolution are common across the wage-decile subgroups within college graduates. We repeat the same exercise for the 2-year college premium over high school. Observing these decomposed features of the 4-year or 2-year college premia gives us important evidence whether the rewards to higher education in Korean labor market are consistent with the strong vertical differentiation across

colleges and the formation of the education bubble during 1990-2009 in Korea.

Figure 24 shows the striking fact that after the late 1980's, the 4-year college graduate wage of the first decile group (1-10%), i.e., the bottom 10%, has been lower than the average high school graduate wage throughout the sample period. For the second decile group (11-20%) of 4-year college graduates, the wage was higher until the early 1990s but became similar to or lower than the average wage of the high school graduates afterwards. In contrast, the wage of college graduates in the upper decile groups rapidly increased since the late 1990's.

Figure 25 shows the wage growth of 2-year college graduates differentiated by wage-decile groups in comparison with the average wage of high school graduates. Surprisingly, the wage of the fifth decile group (41-50%) of the 2-year college graduates was similar to or lower than the average wage of high school graduates after early 1990s. That is, the bottom 50% of the 2-year college graduates earned less than the average high school graduate. Unlike the 4-year college group comparison, the gaps between the top decile groups of the 2-year college graduates and the average high school graduate were not widened much after the late 1990s.

Figure 24: Log Wage of 4-Year College Graduates Decile Groups in Comparison with High School Graduates.

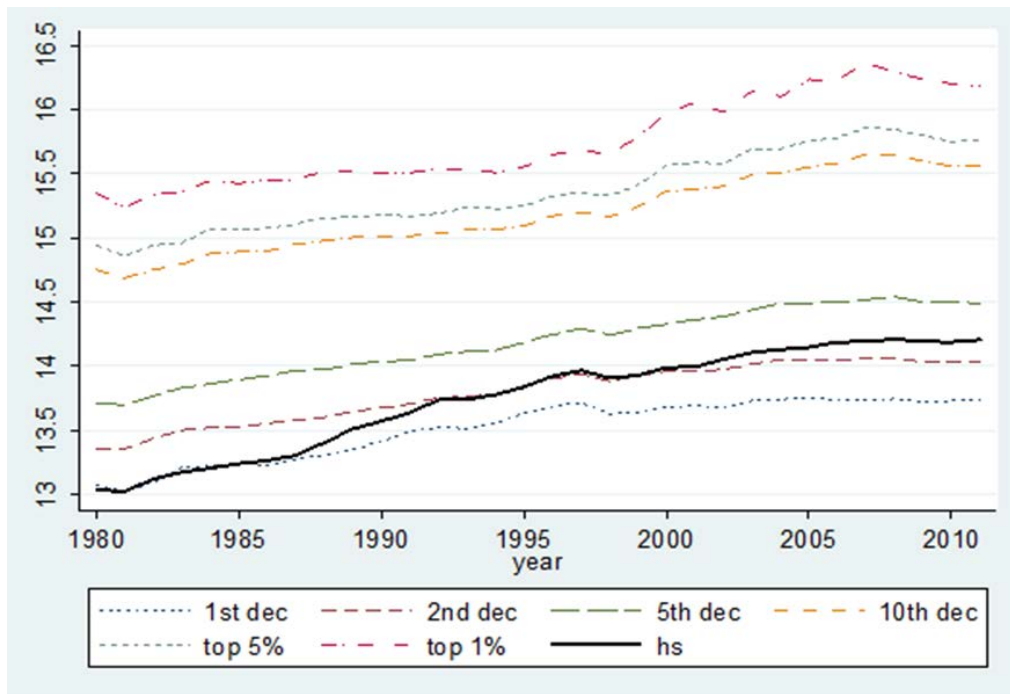
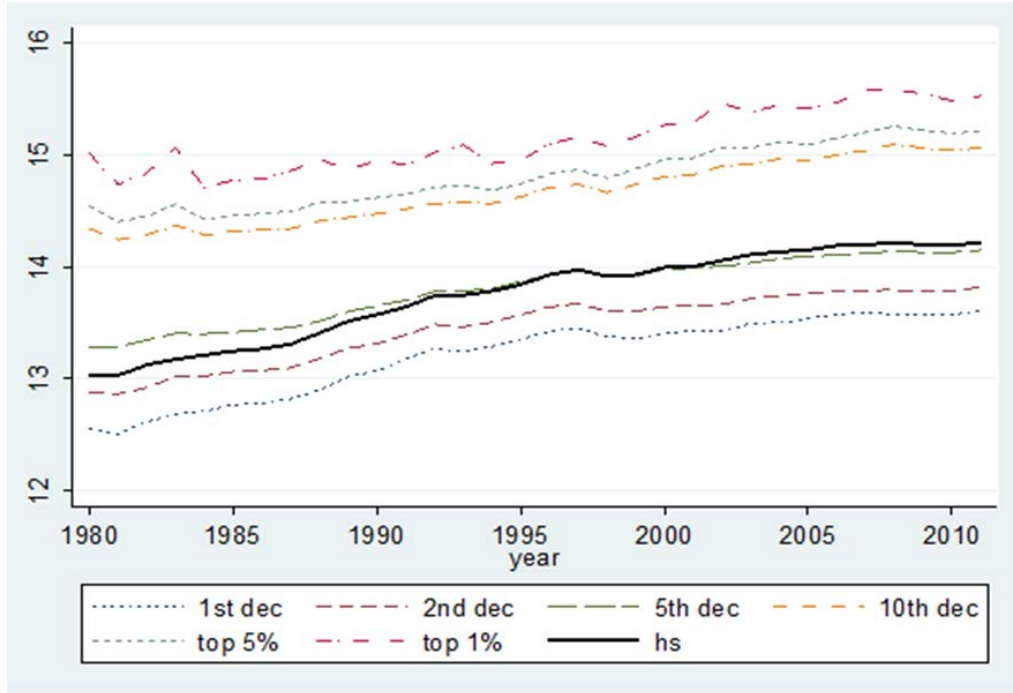


Figure 25: Log Wage of 2-Year College Graduate Decile Groups in Comparison with High school Graduates

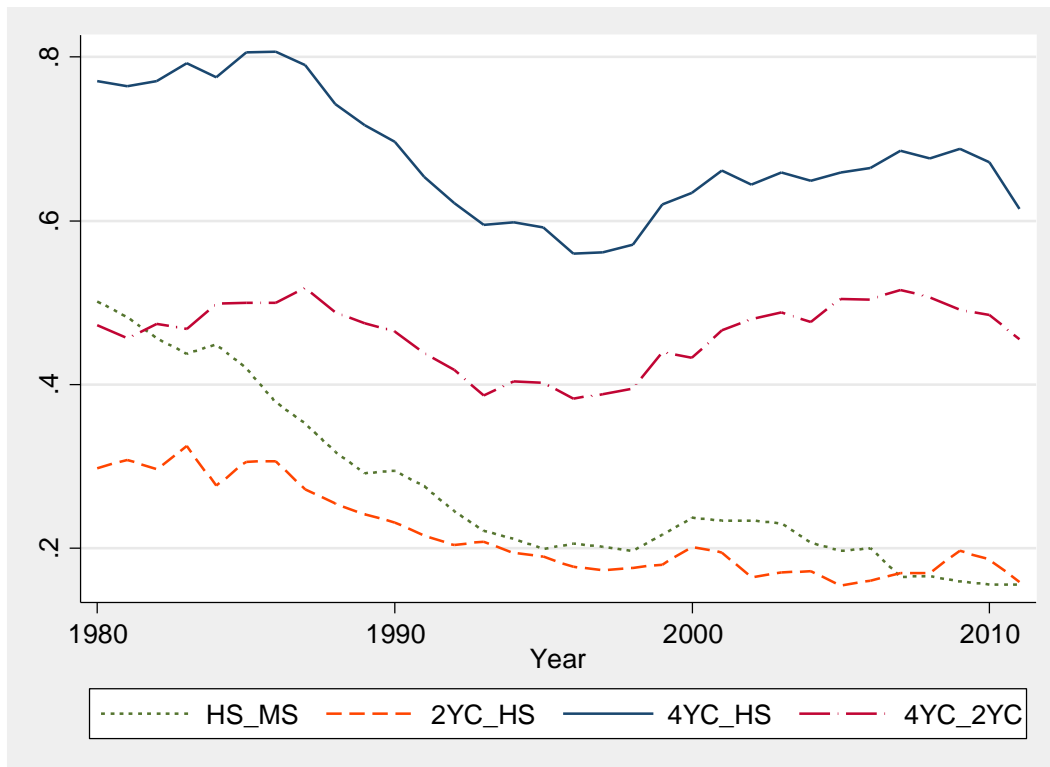


The above comparisons are about the *unconditional* means of wages across different schooling groups. However, those patterns of wage comparison may be due to the changes in their demographic composition. For example, when the female or the less-experienced workers earn lower wages than the males or the experienced workers among college graduates and the fraction of those low-paid college workers is increasing asymmetrically at the bottom wage groups of the college graduates, we may observe such results above. If this were the case, we should not draw a conclusion that such changes of the relative wages across heterogeneous college graduates are to be related to the heterogeneous returns to college education. Therefore, we calculate the college premium using the fixed-weight method following Katz and Murphy (1992) to control for these compositional change issues. We create the population cells by the four education groups as above, two gender groups, and 46 work-experience groups, where the work experience is measured by the years of potential experience ($\text{age} - \text{years of schooling} - 6$). Thus, we have 368 cells for each year.

The changes of the rates of return to pursuing higher level of education between

schooling groups are shown in Figure 26. The rate of return to high school from middle school is labeled as "HS_MS," that to 2-year college from high school as "2YC_HS," that to 4-year college from high school as "4YC_HS," and that to 4-year college from 2-year college as "4YC_2YC." This figure shows that the wage premium to high school over middle school as well as the premium to 2-year college over high school almost monotonically fell throughout the sample period. In contrast, the 4-year college premia show non-monotonic movements. The 4-year college premium over high school was constant until late 1980s, fell until the mid-1990s, rose until 2008, and then fell afterwards. The premium of 4-year college over 2-year college shows similar patterns of movement over time. Two things are worth mentioning from this figure. First, the *average* college premia are all positive between the 4-year college and the high school and also between the 2-year college and the high school ("average" rate of return in a sense that within-education group average wages are used). Second, the college premia rose despite the rapid expansion of college education after mid-1990s.

Figure 26: College Premium Using Fixed-Weight Method



In the previous Figures 24 and 25, we showed the patterns of the differences in relative wages of college graduates over high school graduates across college wage-decile groups. We can calculate the different rates of return to college education by applying the same fixed-weight method after further partitioning the college graduate group into wage-percentile groups. This way we can infer if the patterns of different relative wages of college graduates across wage-income groups are indeed due to the different rates of return of different college education groups rather than the compositional changes.

Figure 27 compares the wage premia between different wage-income subgroups of the 4-year college graduates and the high school graduates. For example, the college premium of the first decile group (labeled "1st Dec." in Figure 27) is the log wage difference between the lowest 10% (1-10%) of college graduates and the average high school graduates, after controlling for the compositional changes of gender and work experience within these education groups, and so on. It turns out that the college premium was in fact *negative* for the bottom 10% (1-10%) of the 4-year college graduates throughout the sample period, and the premium turned to negative in the mid-1990s for the second-decile of the 4-year college graduates as well. That is, after the mid-1990s, the bottom 20% (1-20%) of the 4-year college graduates have been earning less than high school graduates. Furthermore, the rates of return of the bottom 20% (1-20%) of the 4-year college graduates are in declining trend, moving further away from zero.

On the contrary, the college premium of the top decile group (91-100%) of the 4-year college graduates (labeled "10th Dec." in Figure 27) is not only very high around 450% but also has increased after 1997. This increasing trend of the 4-year college premium for the top college graduates are reinforced among the top 5% (95-100%) and top 1% (99-100%) groups. Combining these contrasting patterns of college premia across college income groups display the fanning-out feature of the college premia as illustrated in Figure 27.

We repeat the same exercise for the 2-year college graduates and found similar patterns as shown in Figure 28. In this case, however, the wage premia are solid negative among the *bottom half* of the 2-year college graduates. The fanning-out feature is also observed for the 2-year college premia, though being weaker than the 4-year college premia. Note that unlike the crossing patterns of unconditional relative wage between the fifth decile (41-50%) 2-year college and the high school shown in Figure 25, the rates of return of the fifth decile (41-50%) or lower group of the 2-year college graduates are strictly lower than zero and do not show much trends.

This illustrates that the reverse of the wage ordering between the fifth decile (41-50%) of the 2-year college and the high school is due to the compositional changes. This indicates the importance of controlling for the compositional changes in calculating the true rate of return to higher education. In case of Korea, controlling for the compositional effects, the presence of the substantial mass of college graduates with negative rates of return is in fact reinforced.

Considering the massive and rapidly expanding private-sector investment on educational expenditure to enter into college, the above findings are striking and they seem to provide clear evidence that the educational bubble in Korea is real. The typical calculation of the rate of return based on averages seems to mask these underlying features of educational bubbles. These findings suggest the need to reconsider the effectiveness of current human capital policies. Specifically, they suggest that educational bubbles have been formed among the lower tail groups of 2-year or 4-year college graduates, and more surprisingly that such lower tails are very thick (20% for 4-year colleges and 50% for 2-year colleges). According to the perspective of the human capital theory, e.g., by Becker (1990), this mass of college graduates did not accumulate the human capital valuable in the Korean labor market, despite the huge investment to go through the higher education.

Our findings on the education bubble are also consistent with previous studies on the college premium. Utilizing the data set of KRIVET,³² Kim (2007) shows that the wage premium of the 4-year colleges below the top 100 disappear after controlling for KSAT scores of students. Using the Korean Labor and Income Panel Study (KLIPS) data, Ko (2011) also finds that the wage differential of graduates among elite colleges (top 10 colleges) and the other colleges widened in the period between 1999 to 2008.³³

³² Korea Research Institute for Vocational Education and Training (KRIVET) surveyed the economic activities of 2-year technical colleges and 4-year colleges in 2005.

³³ There are studies (Black and Smith, 2003; Brewer et. al., 1996; Hoekstra, Forthcoming; Saavedra, 2008) focusing on the labor market returns to college quality. However, most studies focus on elite colleges, not the low-quality colleges.

Figure 27: 4-Year College Premium by Wage Income Groups

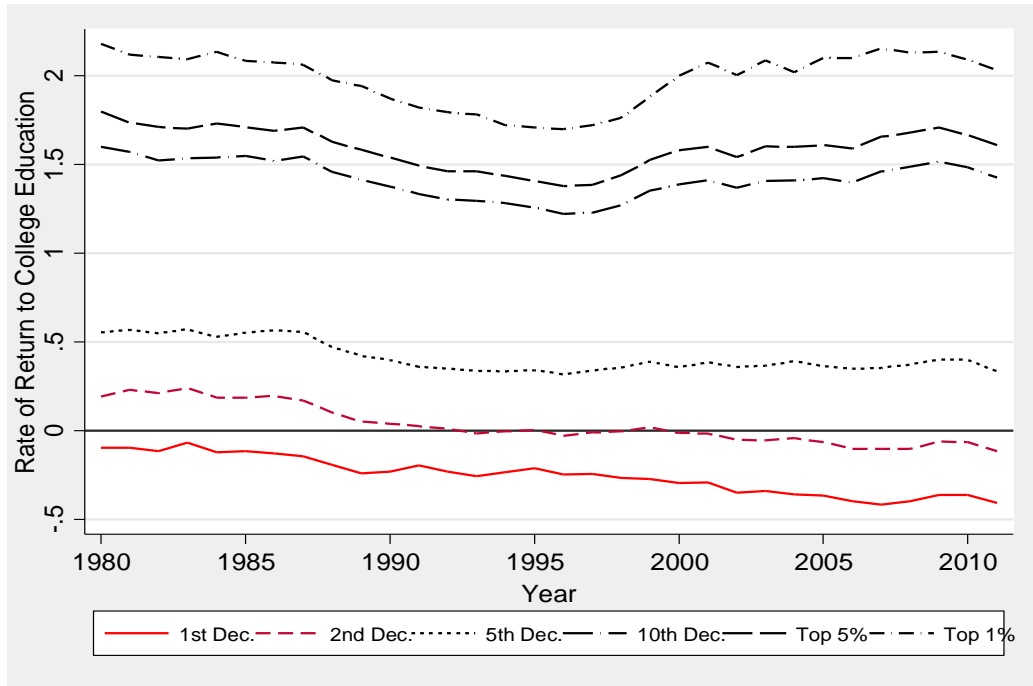
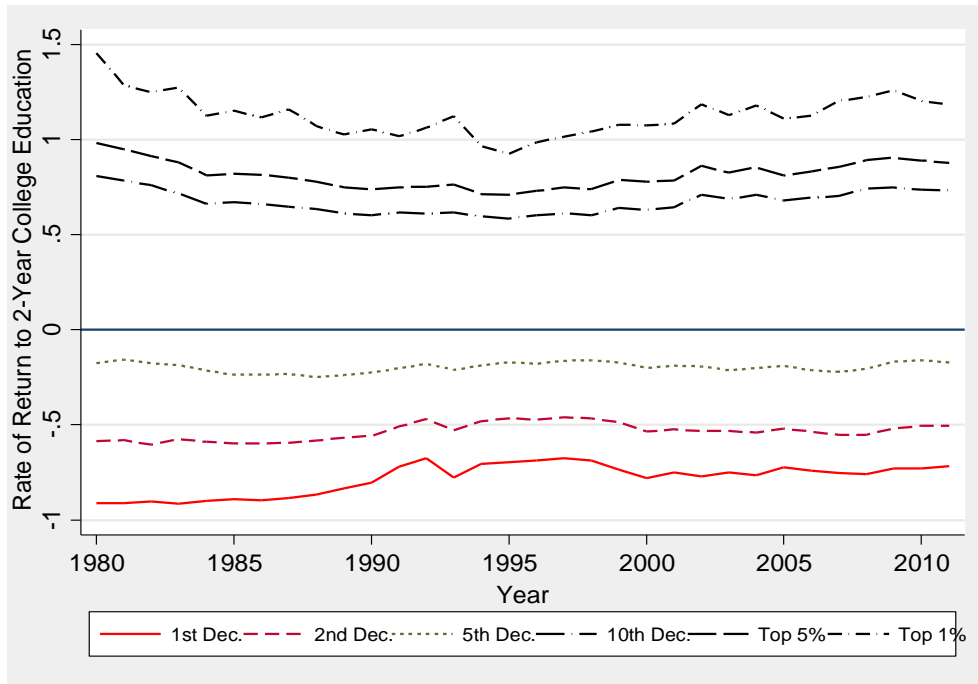


Figure 28: 2-Year College Premium by Wage Income Groups



The education bubble negatively affected the wage inequality of Korea. The features of growth and inequality of Korean wage for our sample period are displayed in Figure 29. For the rapid wage growth period of 1980-1997, wage inequality (measured by Gini coefficient) fell dramatically from 0.388 in 1980 to 0.262 in 1997. For the low-growth period, the Gini coefficient rose sharply to 0.313 in 2008. For the stagnation (slightly negative growth) period, the Gini coefficient slightly fell to 0.301 in 2011.

These nonlinear movements of wage inequality associated with the different phases of wage growth may well reflect the different patterns of human capital accumulation and the formation of the education bubble. The rapid decrease in inequality during the 1980-1997 period can be explained by the catch-up growth of the poor. The 1997 Asian financial crisis incurred the negative wage growth for the workers of the entire distribution but the damage was greater among the poor (lower tail of the wage distribution) than among the rich (upper tail of the wage distribution) for the 1997-2008 period, which induced the increase in inequality. In contrast, for the 2008-2011 stagnation period, triggered by the global financial crisis, the upper tail wages declined in absolute amounts, while the lower half of the workers could maintain their wages or gained a slight raise. Figure 30.a illustrates the changes of the wage income shares of the bottom 40% (1-40%) and that of the top 10% (91-100%) together with the ratio of the latter to the former, which is the so-called Palma index. This is an index capturing inequality by comparing the income shares between income groups. In case of Korea, the two income shares moved in mirror images and the Palma index nearly move in perfect coherence with the overall wage inequality measured by the Gini coefficient, which Figure 30.b confirms. This feature of Korea's wage inequality seems to suggest the importance of the changes of income shares of the different income groups in understanding the wage dynamics of Korea.

Figure 29: Growth and Inequality (Gini Coefficient) of Korean Wage

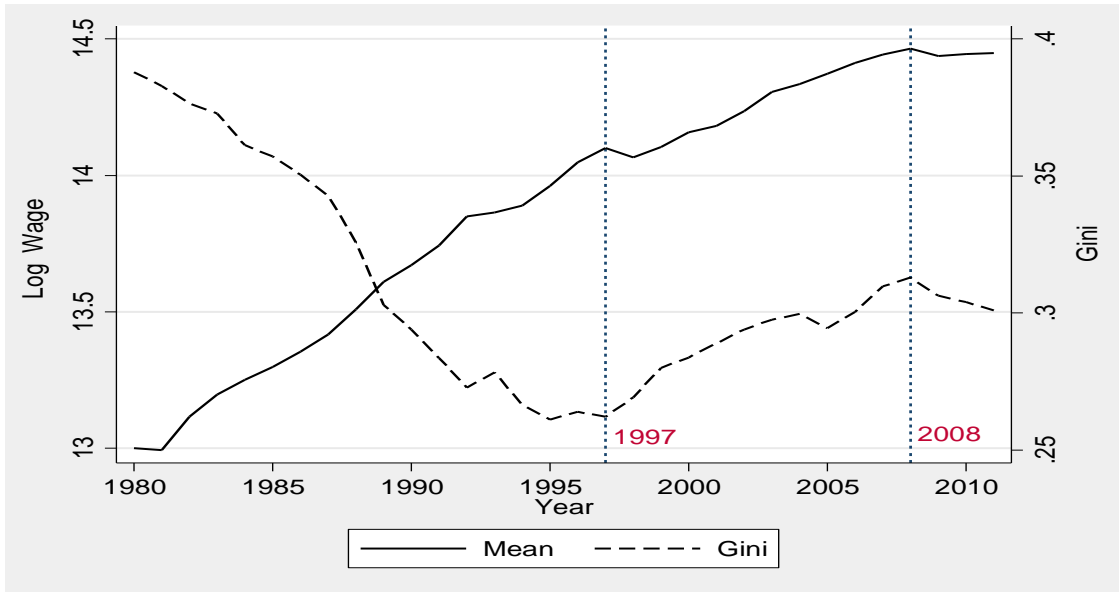
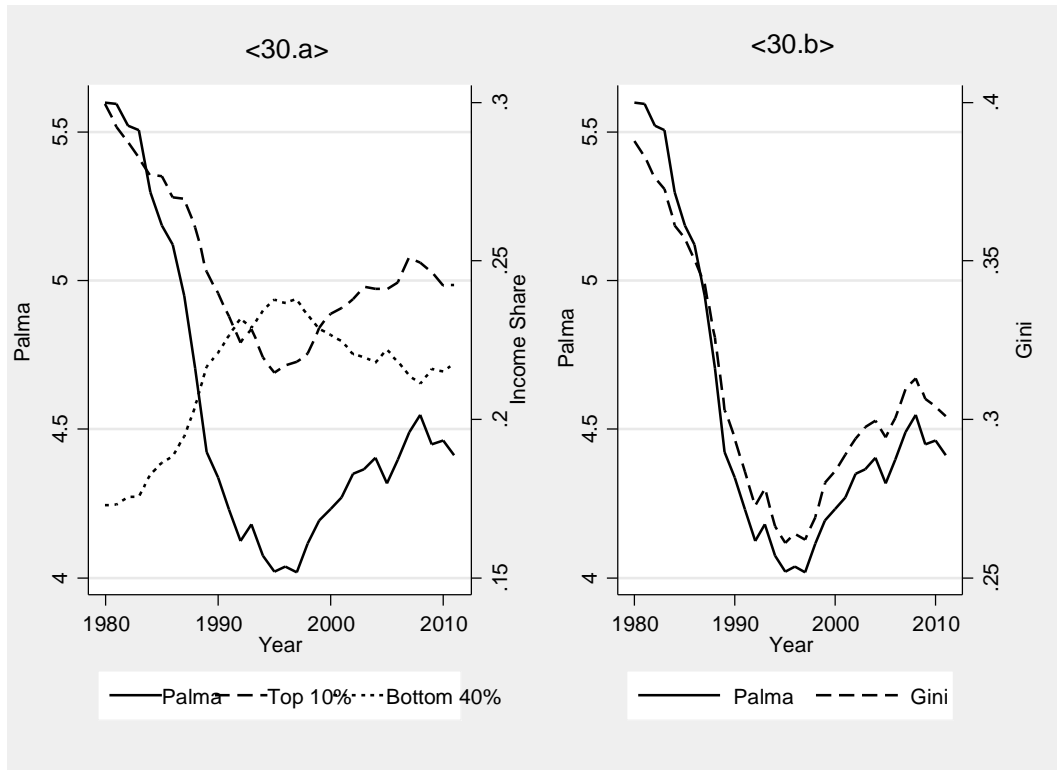


Figure 30: Income Shares and Inequality (Palma Index)

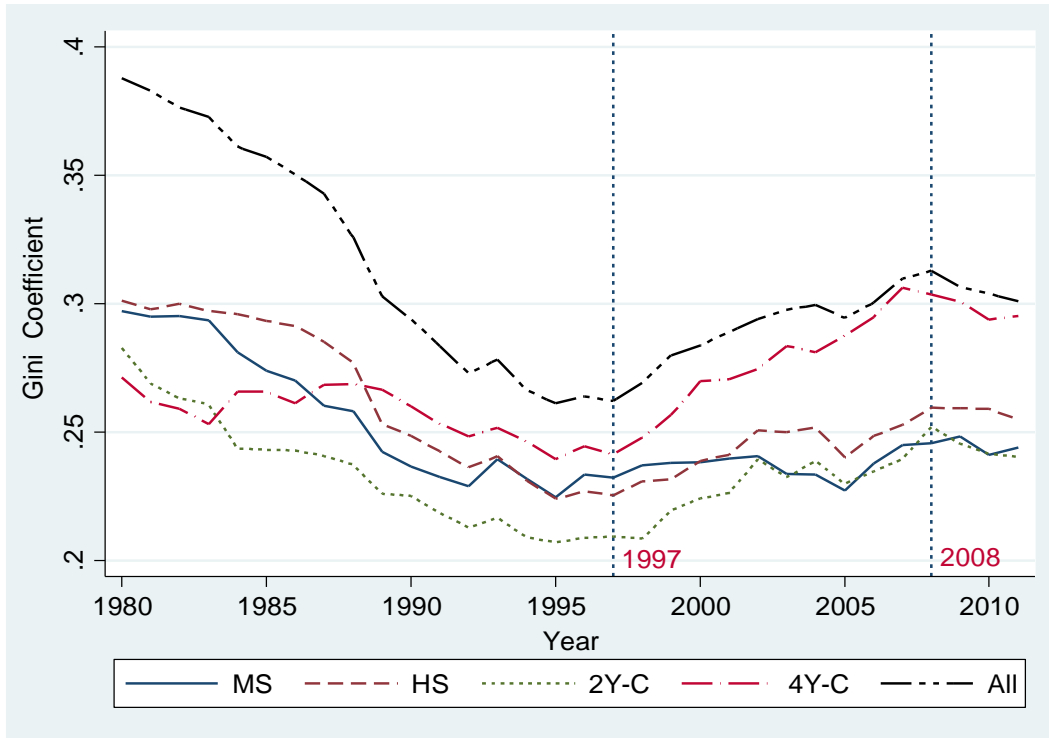


Here, we argue that the rise of wage inequality after 1997 is related to the education bubble that we discussed above. We considered that the education bubble started to be formed in early 1990s. It takes at least 4 years to take college education, and most Korean males spend an additional 2 years for military service. Thus, the period of widening wage inequality around the year 1997 overlaps with the period when the college graduates who went through the education bubble period started to enter the labor market. Thus, the timing of the changing trend of inequality seems consistent with the education bubble story.

There are possible reasons other than the education bubble for the rise of inequality after 1997. For example, the skill-biased technical change can raise the inequality through the increase in college premium. However, in Figure 26, we already observed that the increase in college premium for this period was rather mild. Furthermore, Figure 27 showed that the increase in the rate of return to 4-year college education happened only among the top 10 percent (91-100%) of the college graduates. For the remaining 90% of the college graduates, the college premium was rather constant or even decreasing at the bottom 20% (1-20%). Thus, the skill-biased technical change seemed to play only a minor role unlike the case of the U.S.

Another macroeconomic factor would be the Asian financial crisis, which occurred in 1997. We may well imagine that such adverse aggregate shock could have affected the rich and the poor asymmetrically, hence resulted in the rise of inequality afterwards. If this were the entire story, we would observe more or less similar movements of the within-education-group inequality across different education groups. Thus, by comparing the similarity of the dynamics of the within-education-group inequality, we can check if such macroeconomic story is the major reason for the rise of inequality after 1997. Figure 31 performs such comparison. This figure first shows that the movements of the within-group inequality do not seem coincide across education groups. Furthermore, the main factor contributing to the increase in the overall inequality is the rise of within-group inequality for the 4-year colleges. In fact, the rise of the within-group inequality of the 4-year college group is so pronounced after 1997 that it is only the 4-year college group in which the within-group inequality increased in the end compared to the initial level in 1980. We know that this rapid increase in within-group inequality for the 4-year colleges is due to the fanning-out rates of return to the 4-year college education (as was illustrated in Figure 27) behind which the education bubble is involved.

Figure 31: Within-group Inequality by Educational Attainment



To recap, we confirm the existence of an education bubble by analyzing the microeconomic labor market data from Korea. The returns to college education were negative for 20% of the 4-year college graduates and 50% of the 2-year college graduates. In particular, among the 4-year college graduates, such negative returns of the bottom 20% (1-20%) declined even more while the positive return of the top 10% (91-100%) got even larger after 1997, which was the main reason for the rise of the overall wage inequality in Korea. That is, the huge expansion of educational investment after the 1990s created a bubble in human capital formation and provided a root cause of the worsening income distribution of Korea, because of its imbalanced emphasis on quantity over quality.

6. Conclusion

The education bubble exists in Korea. It may also exist throughout the world and perhaps particularly among East Asian countries albeit with some differences. Low-quality colleges are

mushrooming in many countries (Pritchett, 2011). At the same time, the size of the private tutoring industry is growing rapidly in many countries as well (Dang and Rogers, 2008; Bray, 2006). Thus, along with existing agendas of education reform, such as “education for all,” emphasizing more access to education opportunity, the policy agendas to skim off the education bubble are worthy of gaining more attention for sustainable development.

This paper illustrated the phenomenon of the education bubble in Korea. For the last half century, Korea experienced the fastest educational expansion in the world. However, Korea went through the education bubble period from 1990 to 2009. During this period the total private educational expenditure increased by more than four times. Although the college advancement rate of high school graduates increased from 33.3% in 1990 to 83.9% in 2008, the expansion of low-quality 2-year and 4-year colleges intensified amid strict vertical differentiation. The share of vocational high school graduates obtaining jobs sharply decreased from 80.1% in 1991 to 16.8% in 2009, and the private tutoring business became an enormous industry.

We found that the bottom 20% (1-20%) of the 4-year college graduates and the bottom half of the 2-year college graduates earned less than the average high school graduates after controlling for the composition and relative wage differences across the gender and work-experience groups. This is a stunning result for Korean policymakers who would have considered the problem of the heated higher education to be related to the cost-effectiveness, i.e., that too much educational expenses are spent to earn “higher” wages through graduating colleges. The truth is that the substantial mass of the college graduates in fact have earned less wages than the high school graduates in absolute amount, despite the enormous expenditures that are used for college preparation and college tuition. Furthermore, we also found that this kind of educational expansion contributed to increasing inequality unlike the common wisdom of taking educational expansion as one of the most important instruments of reducing inequality. All this can happen when the educational expansion is achieved only by quantitative measures, particularly by the unwarranted increase of low-quality colleges.

We do not explicitly discuss the possible policy reforms that would fix this kind of problem. Rather we would like to leave this as a future research agenda because designing the explicit policy solution requires another deep analysis on the governance, incentive structure, and political economy issues of the Korean educational system. We still hope to share Korea's experience with international academia and policymakers who are concerned about various

forms of human capital policies for sustainable development. The main lesson from the education bubble story in Korea is that the quality improvement of education may not come hand in hand with the quantity expansion, and if this happens, we may end up losing efficiency as well as equity.

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