Economic Literacy of Korean High School Students

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It has long been suspect that the economics education in Korean high schools is not adequate, as the number of hours economics is taught is insufficient and the teachers who majored in economics in college are few. Less than adequate economics education in high schools would produce citizens who do not have a good understanding of how the economy works and are unable to make sensible economic decisions for themselves. In October, 2002 the Center for Economic Information of KDI conducted an economic literacy test on Korean high school students.

This paper reports on the test. Section 1 describes the test. It introduces the test material used, presents for reference the results of the tests that were administered on American students, and it talks about the test itself and the participants in the test. Section 2 discusses the test results and compares them with the American results by content category and by cognitive level. Section 3 tries to discern the common characteristics among questions that test participants found easy and also those that they found difficult. Section 4 attempts to see what the test results say about the effect of economic education. Finally Section 5 concludes.

1. Test of Economic Literacy

The test material used was the third edition of *Test of Economic Literacy* (TEL) developed and published in 2001 by National Council of Economic Education (NCEE), a private organization based in New York to promote economic literacy. It comes in two forms: Form A and Form B, supposedly of the same difficulty. As shall be discussed below, Form B was used to conduct the test on Korean high school students. It is a "standardized test for measuring the achievement of high school students in economics" and "designed primarily to aid the teachers in assessing and improving the quality of high school economics teaching".[1]

TEL has 40 questions, and each question has four alternative answers, from which a testee is supposed to pick one correct answer. As shown in Table 1, the questions are distributed among four categories: 14 questions, or 35 percent of the total, are in fundamental economic concepts, 10 in microeconomics (25%), 11 in macroeconomics (27.5%), and five in international economics (12.5%). The questions may also be classified by cognitive level: knowledge, comprehension, and application. The knowledge level tests recognition and recall – ability to remember facts in a form close to the way they were first presented. The comprehension level tests whether one grasps the meaning and intent of information – ability to tell or translate in own words, and the application level, use of information – ability to apply learning to new situations and circumstances.[2]

<Table 1>

[1] Walstad, William B., and Ken Rebeck (2001), *Test of Economic Literacy*, New York: National Council of Economic Education, p.1 and p.9
[2] *ibid*, p.9

In the fall semester, 1999 and spring semester, the next year 7,243 high school students across the U.S. participated in the test. Table 2 reports for later reference on the results of the test where Form B was used and 3,955 students participated. The mean score of the test was 24.5 correct answers on 40 questions, or 61.25 per cent.

Perhaps not surprisingly, as the students' grade went up, so did the test score. It went up a little between freshmen and sophomores, and it jumped between sophomores (correct answers accounted for 55.45 per cent out of total) and seniors (64.88 percent). Female and male students each accounted for about half of the total participants, and the mean test score was substantially higher for the male students, 63.75 vs. 59.30 in percentage terms. Whether or not a student had an economics course (or courses) prior to the test made a big difference in the performance. Those students with economics had on average 64.35 percent correct while those without economics had 47.60 percent correct, a difference of nearly 17 percentage points. As shall be discussed below, this is a very big improvement when compared with Korean test results.

This must account for much of the substantial difference in performance between sophomores and seniors. It turned out that among seniors 95 percent had had economics compared to about 50 percent for the sophomore students. [3]

<Table 2>

Form B of TEL was used in testing Korean students' economic literacy. It was first translated into Korean with minor changes to suit Korean situation, for example, 'Bank of Korea' for 'Federal Reserve'.

The test was conducted nationally (excluding Jeju Island) in February 2002, and 2,658 high school students from 25 high schools participated in the test, of which three were vocational schools. In each school three classes participated, one class from each grade level.

As shown in Table 3, of all participants 49 percent were female (1,302 in number), and 51 percent were male students (1,356). The students are distributed roughly equally among three grade levels of high school: freshmen accounted for 32.2 percent of total participants, and sophomore and senior students 33.6 percent and 34.2 percent, respectively. Of the test participants 87.0 percent were non-vocational school students, and 13.0 percent were vocational school students; those who had had economics prior to the test accounted for 31.4 percent and the remainder of 68.6 percent had not.

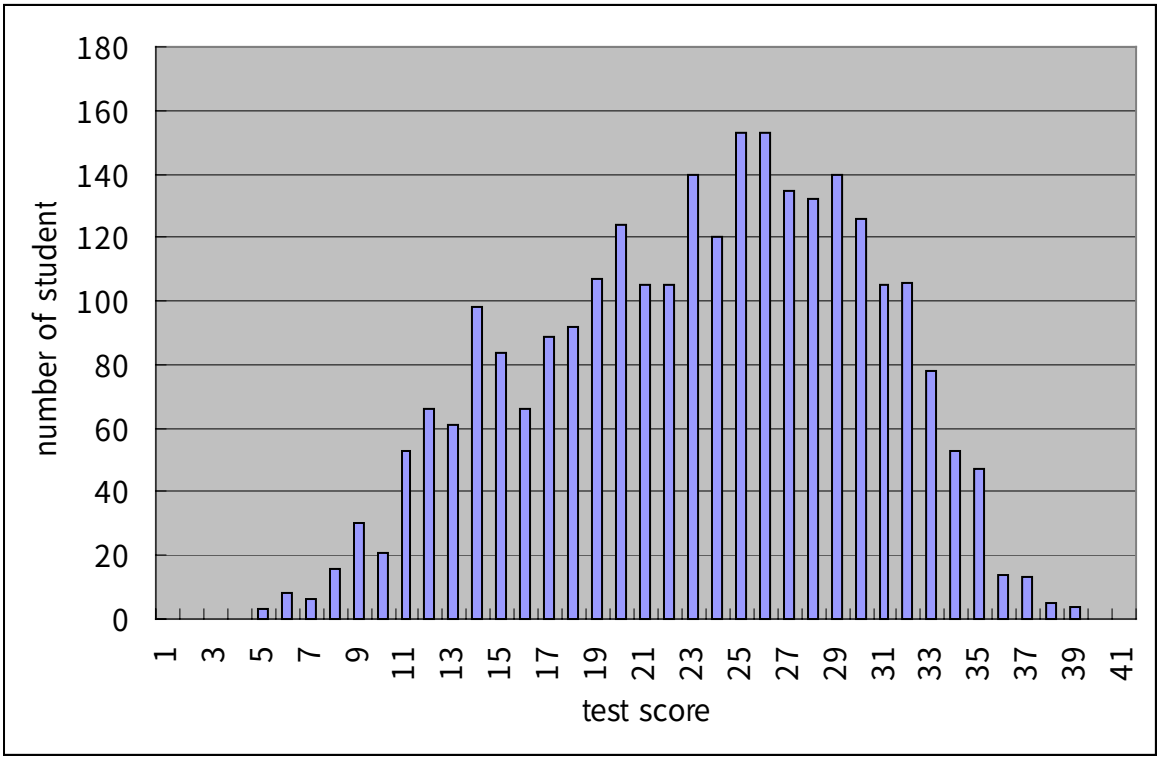
<Table 3>

2. Test Results

On average Korean high school students had 22.7 correct answers on a total of 40 questions, or 55.7 per cent, and the standard deviation 6.91. The median was 23 correct answers, or 57.5 per cent of the total. On average Korean students had about two fewer correct answers, and the

[3] *ibid*, p.31

dispersion was smaller for Korean students than American: the standard deviation being 6.91 vs. 8.32. In percentage terms Korean students' mean test score was lower by 5.25 points than that for American students.



<Figure 1> Score Distribution of Students

Total number of students: 2,658
Average score: 22.7 (55.7 percent)
Standard deviation: 6.91

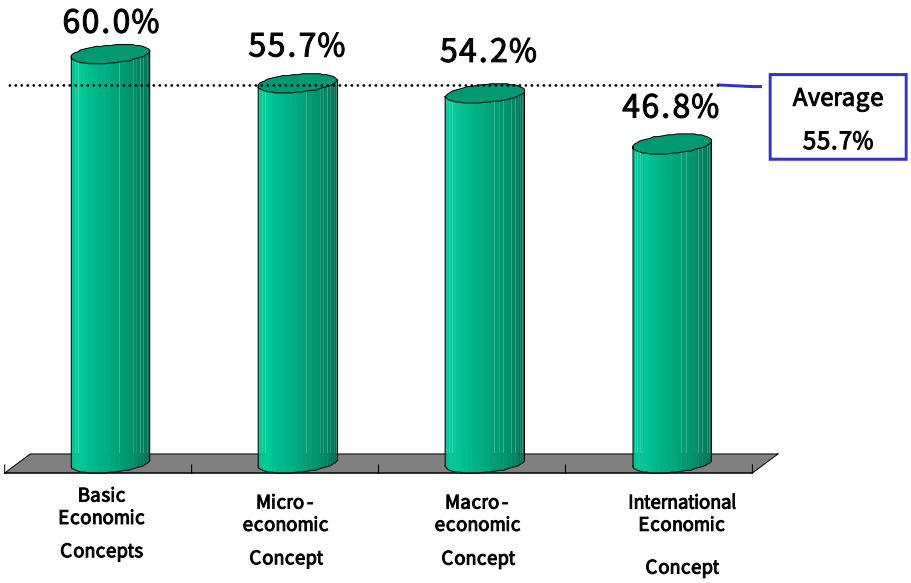
Students' grade level tended to make some difference. As the grade went up, the mean test score rose but not by much, about 2 ~ 4 percentage points. Thus, unlike American students, the score gap between senior and lower grade students was small. Again, unlike the American case, Korean female students had higher mean test score (56.7 percent) than male students (54.7 percent). Most contrasting in the test results of the two countries was the difference that an exposure to economics education appeared to make. In Korea it made some difference but not very much. The mean test score for students who had had economics was 57.8 per cent and that for those who had not was 54.7 per cent. Apparently, the effect of taking an economics course was to raise the test score by only 4 percentage points in Korea. In the U.S. the students with economics performed better than those without by nearly 17 percentage points.

Another interesting thing was that the mean test score of Korean students who had not had economics was higher than that of the American students without economics, 54.7 vs. 47.6 percentage points. (Table 2 and 3) The reason why American students' mean test score was higher than Korean students' was two folds: apparently higher effectiveness of economic

education in the U.S. and a higher percentage of those with economics in the sample among American students than among Korean students.

Test scores by content category

Korean students test scores were not the same across four content categories. The mean test score in fundamental economic concepts was 60 percent (8.4 correct answers on 14 questions), the highest among the content categories. It was followed by 55.7 percent in microeconomics concepts (5.57 on ten) and 54.2 percent on macroeconomics concepts (5.96 on eleven). The score was lowest on international economic concepts, 46.8 percent (2.34 correct answers on five questions).



<Figure 2> Percentage of correct answers by content category

Among the questions belonging to the "fundamental economic concepts" more than 70% of the students had correct answers on questions dealing with division of labor and specialization (76.0%), entrepreneurs (74.1%), effect of raising interest rates (73.4%), mechanism of the market economy (71.1%), scarcity (70.8%), opportunity cost (70.0%). However, students did poorly on a question on what problem every economic system faces (46.4%) and on a question dealing with money supply (11.1%).

In "microeconomics" students did relatively well on the questions dealing with changes in supply and demand when a monopoly becomes competitors (76.9% of them were correct), the reasons why the government produces public goods (69.7%), and the supply and demand in a competitive market (63.8%). However, students scored poorly on questions dealing with types of income tax (37.1%) and the effect on price of a decrease in supply in a competitive market (36.8%).

In “macroeconomics” most students (85.3% of all) had correct answers on questions dealing with unemployment and recession. They also did well on questions on the concept of gross domestic product (72.8%) and the purpose of government's tax policy (60.5%). However, students exhibited a poor level of understanding of factors limiting maximum output (44.1%), impact of inflation (38.4%), and monetary policy for curbing inflation (21.5%).

On “international economics” students did relatively well on questions regarding the reason for international trade surplus (60.9%), effects of specialization and international division of labor among nations (58.4%), effect of raising tariff rates (56.7%). However, the scores were poor on questions on the effect of depreciation of won against another currency (31.6%), and the principle of comparative advantage (26.2%).

<Table 4>

Table 4 compares the test results of Korean and American high school students by content category. As mentioned earlier, American students’ overall mean score was about 5.5 percentage points higher than Korean students’. “Fundamental economic concepts” was the category where Korean students’ mean score was highest, but at the same time it was the content category where they were farthest behind their American counterparts, by 7.3 in percentage terms. In international economic concepts and microeconomics too Korean students were not much better comparatively. Relatively speaking, Korean students did better in macroeconomics than in other content categories: their mean test score was lower than American students’ “only” by 1.9 percentage points.

A similar story emerges, when comparison is made of those Korean and American students who had had economics. In this comparison, too, Korean students were relatively strongest in macroeconomics, relatively weak in microeconomics and international economics, and relatively weakest in fundamental economic concepts. This fact and the fact that those with economics account for more 80 percent of American students in the sample (Table 2) suggest that the performances of American students were heavily influenced by the economics education in the U.S.

However, the relative strength of Korean students looks very different when we compare those students who had not had economics in the two countries, also shown in Table 4. Korean students without economics were relatively strong in macroeconomics and fundamental economic concepts, while they relatively weak in microeconomics and international economics. As mentioned earlier, Korean students without economics had a higher mean test score by 7.1 percentage points than American students without economics. The gap in the test scores between Korean students and American students is largest in macroeconomics (10.5 percentage points), next largest in fundamental economic concepts (8.6), smaller in microeconomics (4.0), and smallest in international economics (1.3).

Thus, Korean students’ relative strength compared with American students appears to have changed “after” taking economics, if we attribute all the differences in performances in the two countries’ students with economics and without to the effect of taking economics. Korean students’ relative strength in macroeconomics “after” taking economics was the

same as “before”. But in fundamental economic concepts their relative performance that was rather strong turned weakest “after” economics education.

It seems that the difference in overall performance between Korean and American students is mainly the result of the difference in economics education between the two countries. The economics education in the U.S. had a much larger impact than that in Korea. It raised the mean score by 16.7 percentage points in the U.S. whereas it raised it by 3.1 percentage points in Korea. The impact seems to have been particularly strong in fundamental concepts among four content categories.

Test scores by cognitive level

As mentioned earlier, TEL questions may be classified into three different cognitive levels: knowledge, comprehension, and application. There were seven questions at the knowledge level, or 17.5 percent out of the total of 40 questions, 11 questions at comprehension level (27.5 percent), and 22 questions at application level (55 percent). Supposedly, it is easier to pick correct answers at knowledge level than it is at the comprehension level, as it requires a better understanding of economics at the latter level; and it is hardest to pick correct answers to questions at application level.

Table 5 shows that among three cognitive level Korean high school students had highest mean test score at the knowledge level, 61.4 in percentage terms, next highest score of 58.9 percent at the comprehension level, and lowest score of 52.2 percent at the application level. This tendency of falling scores according as the cognitive level becomes progressively harder holds true for both female and male students, except that the mean score was higher for female students. At the application level the difference between female and male is less than 1.0 percentage points, but it become about two percentage points at the comprehension level and about 5 percentage points at the knowledge level. In contrast, for American students the mean score was almost the same between the knowledge and comprehension levels at 64.3 percent, while it drops nearly 6 percentage points at the application level.

<Table 5>

It has been already mentioned that Korean students who had had economics performed marginally better than those who had not, and the difference in scores between the two groups was three to four percentage points at each cognitive level, remarkably invariant across the three levels. It is interesting to note that economics education in the U.S. seems to have made a big improvement and that the improvement varies across the cognitive levels. It made the biggest difference at the comprehension level by raising the mean score from 47.0 to 68.3 percent, an improvement of 21.3 percentage points, next highest at the knowledge level by nearly 17 percentage points, and about 14 percentage points at the application level.

3. Questions of High Score and Questions of Low Score

Less than perfect test scores obviously mean that students find some questions more difficult than others. It would be instructive to find out which questions students found easy and which ones difficult. Table 6 lists 15 “questions of high score”, that is, the first fifteen questions when the questions were ranked in a descending order by the percentage of students who made correct answers.

Of the 15 eight questions, more than a half, were related to fundamental economic concepts. Perhaps, it is not surprising that students find them easy, as the questions were "fundamental". Three questions of the 15 were related to microeconomic concepts, another three to macroeconomic concepts, and only one was related to international economic concepts. As mentioned earlier, each content category did not have the same number of questions. For example, fundamental economic concepts had a total of 14 questions, and microeconomics 10, and so on. To neutralize this effect, the number of questions of high score from each content category is expressed in percentage terms of the total number of questions related to the category. Still, it turned out that the fundamental economic concepts had the highest proportion of its total questions belonging to the group of questions of high score. International economics concepts had only one of five questions, or 20 percent, belonging to the group.

<Table 6>

In terms of the cognitive level, four of the 15 questions of high score were from the knowledge level, five from the comprehension level, and six from the application level. The total number of questions across the three cognitive levels was not the same, either: knowledge has 7 questions; comprehension, 11; and application, 22. Thus, the knowledge level had 57.1 percent of its questions belonging to the group of 15 questions of high score, a highest percentage among the cognitive level. The comprehension level had 45.5 percent of its questions in the group, and the application level, 27.3 percent of its questions. Again, it is not surprising that the students found questions progressively more difficult, as they move from knowledge level to comprehension level and to application level.

Table 6 also shows the same information regarding American high school students' test scores. The distribution of the 15 questions across the four content categories appears not much different except that Korean students found easy more of macroeconomic concepts and less of microeconomic concepts than American counterparts. The distribution looks much different across cognitive levels between Korean and American cases. Interestingly, American students found more questions at the comprehension and application levels easier in the relative sense than the questions at the knowledge level, the lowest cognitive level. For them only one out of seven questions at the knowledge level, 7.1 percent, belongs to the group of 15 questions of high score. This may be related to the fact we noted earlier that economics education in the U.S. improved the performance most at the comprehension level (Table 5).

Table 7 lists 15 "questions of low score", that is, the last fifteen questions when they were ranked in a descending order by the percentage of students who made correct answers. Ten of the 15 questions belong to the application level. Among the content categories macroeconomics and microeconomics both accounted for five questions each, representing roughly a half of all questions in the respective categories, while fundamental economic concepts had three questions belonging to the group and international economic concepts had two. Since the "fundamental" category had 14 related questions and the "international" had just five, relatively speaking, students found the latter category more difficult than the former.

<Table 7>

In the same table one can see that the distribution of the questions of low scores across content categories and cognitive levels for American students is remarkably similar to that for Korean students. Both Korean and American students found the questions at the application level more difficult than at lower cognitive levels. Also, about two thirds of the questions of low scores were related to micro- and macroeconomic concepts. While it appears in the table that the questions of international economic concepts were more difficult for American students than Korean counterparts, it may not have been a significant difference, since the difference was made by one question out of a total of five.

4. Effects of Economics Education

Among the student participants in the test some had taken economics, and their test scores were higher than others who had not. The difference in test scores between the two groups must have something to do with the effect of economics education. This suggests that the test results may be analyzed to find out the effect of economics education. Furthermore, since the test results of American students are available, the effect of economics education in Korea and America may be compared. Thus, the test results may even tell us something about the comparative effectiveness of economics education in the two countries.

An obvious thing to do for this purpose is to compare the test scores of the student participants who had had an economics course with the test scores of those who had not. One caution should be taken. Korean high schools do not offer a separate economics course in the freshmen year, and the students elect to take a course in economics in their sophomore and senior years. For this reason it would be better to exclude the freshmen from the group of students who had not taken economics before we get the test scores of the group without economics. For, as mentioned earlier, the test score tends to rise as the grade goes up. The test scores of freshmen may be lower than those of higher grades for reasons other than the exposure to economics.

Appendix Table 1 compares the performances of the Korean sophomore and senior participants with and without economics. The performance is represented by the percentage of student participants who chose correct the answer to a question. As one can see, the mean percentage of correct students in the group *with economics* was 57.8, only 1.2 percentage points higher than that of the group *without economics*, 56.6 percent. Moreover, for 17 questions the percentage difference was negative, that is, a smaller percentage of students in the group *with economics* were correct compared with the group *without economics*.

How surprising this is can be seen by considering the case of American students in Appendix Table 2. As Appendix Table 1, it shows the percentage of American student participants who chose the correct answers to a question. The effect of taking economics course(s) seems highly positive for American students. The percentage of correct students in the group with economics rises substantially over the other group without economics. The rise ranges from 35.5 percentage points for question 2 to 3.7 points for question 38. Not for a single question the student group *without economics* performed better than the group *with economics*.

It seems that the economics education in Korean high schools was not effective. The

difference of 1.2 points in the mean percentage of correct students between the groups with and without economics is not significantly different from zero in a statistical sense. In other words, the hypothesis that there was no difference in economic literacy between groups with and without economics cannot be rejected at 5 percent level of significance.[4] As for the individual questions, while for ten questions the economic education significantly improved the performances of those students with economics, there were six questions for which it significantly worsened. (Appendix Table 2) Put differently, for only 10 out of 40 questions of TEL the high school economics education improved students performance. For 30 out of 40 questions either the evidence was not strong that the education improved students' economic literacy or the evidence was strong that students' literacy worsened after economics education.

It would be worthwhile to take a look at the individual questions of "a negative percentage difference", where the group *without economics* had a greater percentage of its students chose correct answers than the group *with economics*. Question 12 of TEL asks the effect of an increase in real interest rates on saving and borrowing. While a high proportion of more than 70 percent of students chose correct answers, there was a negative percentage difference of 4.7 points between the group *without economics* and the group *with economics*. Question 17 is about the cause of a rise in the market price and a simultaneous decline in sales. The answer was a decrease in supply. Simply one has to know this, if one is about to begin to understand how the market works. The responses to the questions were rather alarming. There was a negative percentage difference was 5.2 points. Furthermore, the number of students with wrong understanding was greater than the ones who understood correctly. On this question only 36.8 percent of all participants in the test had the right answer, and 37.8 percent chose "a decrease in demand" as the reason why the market price rises and the sales decline simultaneously.

Question 18 asks why medical doctors generally earn more than farmers. The correct answer is that "medical doctors are more scarce, given the demand for their services." On this question of wage determination and income distribution the negative percentage difference between the groups without and with economics was largest, 7.1 points. Also, a third of the student participants chose as correct the alternative that says, "medical doctors provide a service rather than make a product." Question 20 asks about the effect of a breakup of a monopoly, to which the correct answer was an increase in output and decrease in price. While a rather high proportion of more than three quarters of the students were correct, there was a negative percentage difference of 4.6 points between the groups without and with economics.

Question 22 applies optimization technique to pollution control, the answer being that the most efficient approach is to "reduce pollution as long as the additional benefits are greater than the additional costs." The general level of understanding of the students was low, and the negative percentage difference was substantial at 5.2 points. Question 28 tests whether or not students understand that unemployment tends to rise during a recession. A very high percentage of students had correct answer to this question, but it is hard to see why the group with economics had 4.4 percent more students than the group without economics, who had wrong ideas such as "imports increases" or "the economy grows" during a recession.

5. Summary and Conclusion

Using as the test material Form B of the third edition of *Test of Economic Literacy* (TEL) developed and published in 2001 by National Council of Economic Education (NCEE), Center

[4] The t-value of the difference in the mean was 1.45 with d.f.= 1,801.

for Economic Information of KDI conducted a test on Korean high school students. The mean score was 22.7 correct answers on a total of 40 questions, or 55.7 percent. It was lower than the mean score for American high school students by 5.25 percentage points. When students without economics education were compared between the two countries, however, Korean students' mean score of 54.7 percentage points was higher than that of American students by 7.1 percentage points. Economics education in the U.S. was much more effective in improving students' performance. With regard to this point, it should be noted that the economics education that the sample of American students took included the advanced placement economics, which is a course at the college level.

Korean students' performance was best in the category of fundamental economic concepts, followed by microeconomic concepts, next by macroeconomic concepts, and it was worst in international economic concepts. Korean students' relative strength compared with American students appears to have changed "after" taking economics. Especially, their' relative strength in fundamental economic concepts turned weakest "after" economics education.

Among three cognitive levels, not surprisingly, Korean students' performance was best at the knowledge level, followed by comprehension level and then by application level. In contrast, American students did equally well at the knowledge and comprehension levels and much less well at application level. The reason seems to lie in the economics education in the U.S. that boosted by most the score at the comprehension level.

When the questions were ranked by the order of percentage of students with correct answers, 15 questions ranked high and another 15 questions ranked low were examined. Korean students compared with their American counterparts had relatively more questions at the knowledge level and less at the comprehension and application levels in the 15 "questions of high scores". Again, the reason for this difference between Korean and American students seems to lie in the economics education. For the 15 "questions of low scores" their distribution across the cognitive levels and content categories appears to be similar between Korean and American students.

The effect of economics education at Korean high schools, as measured by the difference in the performances of the students who took economics and did not, was almost non-existing. Between the two student groups the difference in the mean score was only 1.2 percentage points, which was not statistically significant. Out of 40 questions, in only 10 questions the evidence was statistically strong that the education improved students' performance. For 30 out of 40 questions either the evidence was not strong that the education improved students' economic literacy or the evidence was strong that students' literacy worsened after economics education.

It appears that economics education fails to improve students' understanding of the workings of a market economy at the most basic level. However, it is not very clear whether the responsibility for the failure should be entirely placed on the high school economics education. One needs to ask if in Korean reality the market works as it is supposed to in the textbook. Students may see enough counter examples where market transactions are determined by something else than demand and supply. Entry barriers, special privileges, government regulations, and so on may distort the way the market works.

While there is no doubt that the economics education was ineffective, it seems highly probable that an effective education in Korea can let students achieve a much higher level of understanding of the economy than that achieved in the U.S. For Korean students without

economics appears to be better prepared than their American counterparts. This is another message that one can obtain from the results of the test.

Table 1. Distribution of Question items: TEL Form B

	Cognitive Level		
Content Categories	**Knowledge**	**Comprehension**	**Application**
Fundamental Economic Concepts	**3**	**6**	**5**
1. Scarcity	*3*	*1,2*	
2. Opportunity cost/trade-offs			*4,5*
3. Productivity		*6*	*7*
4. Economic systems		*8,9*	
5. Economic institutions & incentives	*10,11*		*12*
6. Exchange, money, & interdependence		*14*	*13*
Microeconomic Economic Concepts	**0**	**2**	**8**
7. markets & Prices			*18*
8. Supply & demand			*16,17, 19*
9. Competition & markets structure			*15,20*
10. Income distribution		*21*	
11. Market failures		*23*	*22*
12. Role of government			*24*
Macroeconomic Economic Concepts	**3**	**3**	**5**
13. Gross Domestic Product	*25*		
14. Aggregate Supply & demand		*26, 40*	*27*
15. Unemployment		*28*	
16. Inflation & deflation	*29*		*30*
17. Monetary Policy			*31,32*
18. Fiscal Policy	*33*		*34*
International Economic Concepts	**1**	**0**	**4**
19. Comparative advantage/barriers to trade			*35,36, 37*
20. Balance of payments & exchange rates	*38*		*39*
Total Number of Questions **Percent of Total**	**7** **17.5**	**11** **27.5**	**22** **55.0**

Note: Italicized are the identifying numbers of the questions.

Table 2: Results of the Test of US High School Students

		Participants (number)	Test scores
All		3,955	24.50 (61.25)
Gender	Female	1,868	23.72 (59.30)
	Male	1,845	25.50 (63.75)
Grade	Freshman	210	21.92 (54.80)
	Sophomore	1,005	22.18 (55.45)
	Senior	2,354	25.95 (64.88)
Economics	With	3,224	25.74 (64.35)
	Without	731	19.04 (47.60)

Note:
(1) Sum of parts does not equal the total. For example, the sum of female and male students is 3,713, falling short of the total of 3,955. This may be due to no answers and "don't know's"
(2) The numbers in the parentheses are the scores in percentage terms.
(3) The standard deviation of the test scores was 8.32

Table 3. Participants and Test Result, Korean High School Students

All		Participants Composition (%)	Test Scores
		100	22.27 (55.7)
Gender	Female	49.0	22.67 (56.7)
	Male	51.0	21.88 (54.7)
Grade	Freshman	32.2	21.02 (52.55)
	Sophomore	33.6	22.46 (56.15)
	Senior	34.2	23.26 (58.15)
Students Type	Non-vocational	87.0	22.97 (57.43)
	Vocational	13.0	17.57 (43.93)
Economics	With	31.4	23.12 (57.8)
	Without	68.6	21.88 (54.7)

Note :
(1)Since Korean high Schools do not offer Economics as a separate for the freshmen, all of them are classified as belonging the group who had not had economics. The group without economics includes five participants who did not answer whether one had or had not economics.
(2)The numbers in the parentheses represent test scores in percentage terms.

Table 4. Test Results by Content Category: Comparison of Korean and American Students

	Korean High School Students			American High School Students		
	All	With Economics	Without Economics	All	With Economics	Without Economics
Fundamental Concepts	60.0	62.9	58.6	67.3	71.3	50.0
Microeconomics	55.7	57.3	55.0	62.1	64.6	51.0
Macroeconomics	54.2	55.5	53.6	56.1	59.1	43.1
International Economics	46.8	50.0	45.4	53.8	56.0	44.1
Total	55.7	57.8	54.7	61.25	64.34	47.61

Table 5. Test Results by Cognitive Level: Comparison of Korean and American Students

		Knowledge	Comprehension	Application
Number of questions		7	11	22
Scores of Korean high school Students (%)				
All		61.4	58.9	52.2
Gender	Female	64.0	60.0	52.7
	Male	58.9	57.9	51.8
Economics	With	64.0	61.0	54.3
	Without	60.2	58.0	51.3
Scores of American high school Students (%)				
All		64.3	64.4	58.7
Economics	With	67.4	68.3	61.4
	Without	50.6	47.0	47.0

Table 6. Fifteen Questions of High Score

Korean High School Students				
	Knowledge	Comprehension	Application	Sum
Fundamental Economic Concepts	*3,11*	*1,6,9*	*4,5,12*	8(57.1)
Microeconomic Concepts	-	*23*	*16,20*	3(30.0)
Macroeconomic Concepts	*25*	*28*	*34*	3(27.3)
International Economic Concepts	*38*	-	-	1(20.0)
Sum	4(57.1)	5(45.5)	6(27.3)	
American High School Students				
Fundamental Economic Concepts	*3*	*1,2,8,9*	*5,7,12*	8(57.1)
Microeconomic Concepts		*26*	*15,16,19,20*	5(50.0)
Macroeconomic Concepts		*28*		1(9.1)
International Economic Concepts			*35*	1(20.0)
Sum	1(7.1)	6(54.5)	8(36.4)	

Note: Italicized are the identifying numbers of the questions. "Sum" represents either a horizontal or vertical sum. The numbers in the parentheses are the percentage points of total questions in the list. For example, horizontal sum of 8(57.1) corresponding to "Fundamental Economic Concepts" means that eight questions related to the concepts are part of the fifteen questions of high score, and eight represents 57.1 percent of 14 questions related to "Fundamental Economic Concepts".

Table 7. Fifteen Questions of Low Score

Korean High School Students				
	Knowledge	Comprehension	Application	Sum
Fundamental Economic Concepts	*10*	*8,14*	-	3(21.4)
Microeconomic Concepts	-	-	*15,17,18,22, 24*	5(50.0)
Macroeconomic Concepts	*33*	*26*	*27,30,32*	5(45.5)
International Economic Concepts			*36,39*	2(40.0)
Sum	2(28.6)	3(27.3)	10(45.5)	
American High School Students				
Fundamental Economic Concepts		*14*	*4,13*	3(21.4)
Microeconomic Concepts		*21*	*17,22,24*	4(40.0)
Macroeconomic Concepts	*25*		*27,30,31,32*	5(45.5)
International Economic Concepts	*38*		*36,39*	3(60.0)
Sum	2(28.0)	2(18.2)	11(50.0)	

Note: see the note to Table 6.

Table 8. Fifteen Questions of Low Score for Students without Economics

Korean High School Students				
	Knowledge	Comprehension	Application	Sum
Fundamental Economic Concepts	*10*	*8, 14*	*7*	4(28.6)
Microeconomic Concepts	-	-	*15, 17, 18, 22, 24*	5(50.0)
Macroeconomic Concepts	*33*	*26*	*30, 32*	4(36.4)
International Economic Concepts			*36, 39*	2(40.0)
Sum	2(28.6)	3(27.3)	10(45.5)	
American High School Students				
Fundamental Economic Concepts	-	*1, 2, 14*	*4*	4(28.6)
Microeconomic Concepts	-	*21*	*17, 18, 24*	5(40.0)
Macroeconomic Concepts	*25*	-	*30, 31, 32*	4(36.4)
International Economic Concepts	-	-	*36, 39*	2(40.0)
Sum	1(14.3)	4(36.4)	9(40.9)	

Note: see the note to Table 6.

Appendix Table 1: Percentage of Participants with Correct Answers: Korean Students

Questions	With Economics	Without Economics	Difference	
1	71.3	72.5	-1.2	
2	62.4	54.9	7.5	*
3	77.1	73.6	3.5	
4	72.8	74.0	-1.2	
5	66.1	67.6	-1.5	
6	76.7	77.2	-0.5	
7	61.3	53.2	8.1	*
8	52.0	45.2	6.8	*
9	75.1	70.4	4.7	*
10	53.0	48.0	5.0	*
11	69.5	64.6	4.9	*
12	72.8	77.5	-4.7	*
13	55.4	59.7	-4.3	
14	14.6	8.2	6.4	*
15	60.4	56.2	4.2	
16	65.0	64.7	0.3	
17	33.7	38.9	-5.2	*
18	50.0	57.1	-7.1	*
19	59.7	61.7	-2.0	
20	76.0	80.6	-4.6	*
21	58.9	59.4	-0.5	
22	50.1	55.3	-5.2	*
23	72.7	69.4	3.3	
24	46.0	41.6	4.4	
25	71.1	73.7	-2.6	
26	45.9	43.5	2.4	
27	54.9	54.8	0.1	
28	82.9	87.3	-4.4	*
29	59.1	56.2	2.9	
30	39.4	32.5	6.9	*
31	57.2	54.5	2.7	
32	27.6	17.6	10.0	*
33	53.4	52.7	0.7	
34	60.4	64.4	-4.0	
35	64.7	55.7	9.0	*
36	27.6	25.6	2.0	
37	59.4	59.6	-0.2	
38	64.7	63.3	1.4	
39	33.5	31.4	2.1	
40	58.0	59.5	-1.5	
Number of Participants	834	967		
Mean Score	57.8	56.6	1.2	
Standard Deviation	19.3	16.3		

Note: * indicates that the difference is statistically significant at 5 percent level.

Appendix Table 2: Percentage of Participants with Correct Answers: American Students

Questions	With Economics	Without Economics	Difference
1	78.5	44.5	34.0
2	75.6	40.1	35.5
3	85.6	59.5	26.1
4	61.5	32.3	29.2
5	76.9	61.3	15.6
6	66.9	44.6	22.3
7	82.7	64.2	18.5
8	77.1	47.2	29.9
9	76.9	57.1	19.8
10	70.7	51.3	19.4
11	69.1	56.2	12.9
12	82.7	70.3	12.4
13	55.1	49.1	6.0
14	38.6	22.6	16.0
15	73.9	63.2	10.7
16	80.3	65.1	15.2
17	47.6	42.3	5.3
18	63.4	40.2	23.2
19	72.3	59.8	12.5
20	71.6	59.0	12.6
21	57.8	41.0	16.8
22	55.2	47.1	8.1
23	63.9	49.9	14.0
24	60.0	42.4	17.6
25	59.1	39.7	19.4
26	72.3	50.1	22.2
27	36.3	25.4	10.9
28	75.1	61.2	13.9
29	67.1	47.3	19.8
30	48.9	38.9	10.0
31	47.6	27.6	20.0
32	41.0	23.1	17.9
33	67.5	51.0	16.5
34	66.4	50.6	15.8
35	70.2	53.9	16.3
36	52.4	33.1	19.3
37	62.7	51.6	11.1
38	53.0	49.3	3.7
39	41.5	32.6	8.9
40	68.7	58.8	9.9
Number of Participants	3224	731	