WORKINGPAPER

IS THE TUCE A SUFFICIENT MEASURE OF STUDENT PERFORMANCE IN SOUTH AFRICA?

A Potchefstroom campus study

by

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Abstract

The test of understanding college economics (TUCE) is a test developed by a number of American economists that was and still is widely used to allow lecturers and instructors of economics to compare student performance in economics in their classes. Students are tested prior to and after a course in economics to establish whether students improved on their knowledge of economics and if so how much improvement took place. The TUCE was distributed amongst first year economic students at the North West University, Potchefstroom Campus on the first week of class in 2013 determining their level of economic knowledge. The same test will be distributed amongst the same group of students at the end of September 2013 in order to determine their economic performance and to determine if the TUCE is a suitable measure of testing economic knowledge.

JEL classifications

A21, A22, A23

Introduction

Economic events and matters such as growth, unemployment, inflation, interest rates, deficits, policy, government spending, opportunity cost, and the value of the rand forms part of everyday life and affects each individual whether that individual majored in economics or not. The importance of economics is evident but unfortunately are there few individuals that have formal training in economics and truly can think like economists. It is therefore of the essence to insure that students that have had exposure to economics can truly gasp and apply the concepts.

Introductory economics is a subject taught to a diversity of students with different vocational aspirations and fields of study. Introductory economics is aimed to provide students with basic knowledge on economics. It is essential to test a student's economic literacy and understanding of economics by at the end of a one year introductory economics course to establish whether or not students can apply their knowledge that they have learned such as: scarcity, decision making, trade, markets and prices, the role of prices, competition and market structure, money and inflation, interest rates, income, economic growth, role of the government, unemployment and monetary and fiscal policy.

One way to test economic knowledge is the Test of Understanding College Economics (TUCE). The TUCE was developed in the United States of America to test economic literacy of economic students. The TUCE however cannot be used in South Africa due to a standard mismatch. Economics as subject in high school in South Africa is not a required course and the amount of students choosing economics as subject is scares. According

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h Africa, in 2012, only 134 369[1] students were enrolled for who wrote the National Senior Certificate examination.

Therefore, South African students enrolling for a *Bachelor of Commerce* degree at a tertiary institution knowledge of economics is limited. The TUCE developed in America will not be a sufficient measure to test economic literacy for South African students due to their limited knowledge of economics and due to discrepancies in the level of academic standards.

Literature

The TUCE is a test that has been used for nearly 40 years and has an extensive history of use by researchers, academia and teachers. In the 1960's the Council of Economic education appointed a committee to supervise the construction of the TUCE (Fels, 1967:660). . The committee consisted out of six economists (G. L. Bach, William G. Bowen, R. A. Gordon, Paul A. Samuelson, George J. Stigler, and Fels, R). The committee decided on a multiple-choice form of question (Fels, 1967:660) (Walstad, Watts and Rebeck, 2007:2). . The objectives of the TUCE are: 1) to test the hypothesis that a one year college economic course has no lasting effect by George Stigler[2]. 2) to offer a reliable and valid assessment instrument for students in principles of economics courses; and 3) to provide norming data for a large, national sample of students in introductory economic classes (Fels, 1967:663). The TUCE was distributed to several universities in the United States testing the knowledge of introductory economic students before the start of the introductory economics course and after the completion of the introductory economic course. Since the 1960's the test has been revised three times and are currently still used to measure student's understanding of the subject and to test the real effect of introductory economics (Walstad, Watts and Rebeck, 2007:2).

The TUCE consisted out of 60 multiple choice questions, 30 microeconomic questions and 30 macroeconomic questions. The microeconomic questions consisted out of six categories namely: The basic economic problem, markets and price determination, theories of the firm, factor markets, the microeconomic role of the government and international economics. The macroeconomic questions consisted out of six categories namely: Measuring aggregate economic performance, aggregate supply and aggregate demand, money and financial markets, monetary and fiscal policies, policy debates and international economics.

In 2005 the TUCE 4th edition was distributed to over 10 000 students. The microeconomic and macroeconomic test questions were distributed to 5480 and 5517 students respectively across the United States. . The results of the TUCE indicated that the majority of students struggled with the questions of the TUCE with the mean scores for the microeconomic and macroeconomic test reported as 31.3 per cent 32.7 per cent respectively. Never the less, the TUCE is a reliable test reporting an alpha coefficient of 0.70 and 0.77 for the microeconomic and macroeconomic sections respectively indicating internal consistency amongst the two sections of the TUCE. Furthermore, in only six microeconomic and twelve macroeconomic questions more

[1] From the 134 369 students, only 97 842 students passed economics.
[2] The Stigler's hypothesis suggested that there would be no difference in the performance of those college seniors who have had an introductory course in economics than those students who have not.

ed. With regards to the microeconomic content categories: 100 cent on basic economic problems, 57 per cent on markets and prices, 75 per cent on theories of firms, 67 per cent on factor markets, 71 per cent on micro economic role of the government and 67 per cent on international (micro). With regards to the macroeconomic content categories: 25 per cent of students obtained less than 50 per cent on measuring aggregate performance, 44 per cent on aggregate supply and demand, 50 per cent on money and financial markets, 60 per cent on monetary and fiscal policy, 100 per cent on policy debates and application and 67 per cent on international (macro). Overall, it seems that students struggle more with microeconomics than with macroeconomics.

Empirical analysis

During the first week of February 2013 a sample of [3]30 pre-selected TUCE questions were distributed to 1006 first year students at the North West University, Potchefstroom Campus. A sample was selected out of the original TUCE due to a standard mismatch. Certain questions in the TUCE is based on the assumption that students answering the TUCE has already got an understanding of economics since a one credit economic course is required in high schools in the United States. Economics in South Africa as subject in high school is a choice subject and a mere few students choose economics as subject in high school. It is therefore unreasonable to ask students questions on topics that they have never heard before.

Table 1 and 2 specifies the questions that were picked out of each of the six TUCE categories for the microeconomic and macroeconomic section of the test.

Table 1: Microeconomic questions picked from the TUCE

Question classification		Full set of TUCE Questions	15 Questions picked	New Question numbers
A	Basic problem (Scarcity, opportunity cost, choice)	8, 10	8, 10	9, 11
B	Markets and Prices (Supply, demand, utility, elasticity, price ceilings and floors)	1, 2, 3, 9, 11, 18, 19	1, 2, 9, 18, 19	5,6,10,13,14
C	Theories of firms (Revenues, costs, marginal analysis, market structures)	4, 11, 12, 14, 17, 21, 20, 22, 13	22	15
D	Factor Markets (Wages, rents, interest, profits, income distribution)	5, 23, 24	5, 23	7,16
E	Role of Government (Public goods, externalities, taxation, income redistribution, public choice)	6, 25, 27, 7, 15, 16, 26	6, 27, 16	8,17,12

[3] The author can be contacted for a copy of the questions asked.

	[illegible]	29, 30	29, 30	18,19

Source: Compiled by author

Table 2: Macroeconomic questions picked from the TUCE

	Question classification	Full set of TUCE Questions	15 Questions picked	New Question numbers
A	Measuring aggregate performance (GDP and its components, real vs. nominal, unemployment ,inflation)	1, 2, 11, 19	1, 2, 11	20,21,26
B	Aggregate supply and aggregate demand (Potential GDP, economic growth, and productivity, determinants and components of AS and AD, income and expenditure approaches to GDP, the multiplier effect	4, 17, 3, 13, 14, 21, 23, 15, 20	4, 17, 21,	22,27,29
C	Money and financial markets (Money, money creation, financial institutions)	5, 12, 16, 22	5	23
D	Monetary and fiscal policies (Tools of monetary policy, automatic and discretionary fiscal policies)	8, 17, 6, 7, 18, 23, 20, 24, 25, 27	6, 7, 18, 23	24,25,28,30
E	Policy debates (Policy lags and limitations, rules vs. discretion, long run vs. short run, expectations, sources of macroeconomic instability)	9, 10, 26	26	31
F	International economics (Balance of payments, exchange rate systems, open-economy macro)	28, 29, 30	28, 29, 30	32,33,34

Source: Compiled by author

The descriptive statistics of the demographic information of the students answering the pre-selected TUCE questions are found in *Table 3*. From the 1006 students 56.1 per cent were female and 47.8 per cent were males. Majority of students are between the ages of 18 and 20 where 74 per cent did not have economics as subject in high school in comparison to 25 per cent of students that had economics.

information

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Did not answer	6	.6	.6	.6
Male	481	47.8	47.8	48.3
Female	519	51.6	51.6	100.0
Total	1006	100.0	100.0	
Age in years				
Did not answer	6	.6	.6	.6
18-20	915	91.0	91.0	91.6
21-23	76	7.6	7.6	99.1
24 and older	9	.9	.9	100.0
Total	1006	100.0	100.0	
Language				
Did not answer	4	.4	.4	.4
Afrikaans	852	84.7	84.7	85.1
English	74	7.4	7.4	92.4
Setswana	41	4.1	4.1	96.5
Other	35	3.5	3.5	100.0
Total	1006	100.0	100.0	
Highschool economics				
Did not answer	12	1.20	1.20	1.20
Yes	251	25.0	25.0	25.6
No	743	73.9	73.9	100.0
Total	1006	100.0	100.0	

The overall results for the test were bleak. The average percentage for the test was 34.98 percent with the percentage for correct microeconomic questions being 31 percent and the macroeconomic test being 26 percent. An outline of the percentage correct answers for the microeconomic and macroeconomic section of the test is indicated in *Table 4 and 5.*

Table 4: Percentage correct microeconomic questions

Question number	Correct Answer	Frequency	Per cent	Valid Per cent
5	1	227	22.6	22.6
6	2	347	34.5	34.5
7	3	362	36.0	36.0
8	3	374	37.2	37.2
9	1	40	4.0	4.0
10	4	185	18.4	18.4

			23.3	23.3
			37.3	37.3
13	2	442	43.9	43.9
14	3	409	40.7	40.7
15	1	556	55.3	55.3
16	3	280	27.8	27.8
17	2	297	29.5	29.5
18	1	115	11.4	11.4
19	4	285	28.3	28.3

Source: Compiled by author

Table 5: Percentage correct macroeconomic questions

Question number	Correct Answer	Frequency	Per cent	Valid Per cent
20	1	265	26.3	26.3
21	2	550	54.7	54.7
22	4	361	35.9	35.9
23	1	98	9.7	9.7
24	2	344	34.2	34.2
25	2	406	40.4	40.4
26	4	153	15.2	15.2
27	3	204	20.3	20.3
28	1	131	13.0	13.0
29	1	156	15.5	15.5
30	1	183	18.2	18.2
31	3	274	27.2	27.2
32	4	257	25.5	25.5
33	4	377	37.5	37.5
34	4	283	28.1	28.1

Source: Compiled by author

The average percentages for each of the question classifications for the microeconomic and macroeconomic sections are reported in *Table 6 and 7*. In the microeconomic section the classification on theories of firms yielded the highest percentage of 55.3 per cent correct answers and the classification on the basic economic problem the lowest with 13.7 per cent. With regards to the macroeconomic section, the classification measuring aggregate performance yielded the highest percentage correct answers with a percentage of 32 per cent and the classification money and financial markets the lowest with a mere 9.7 percent correct. Unlike the results in TUCE in the United States it seems that South African student's struggle more with macroeconomics than with microeconomics.

tage correct for each classification

Question classification		Average percentage correct for each classification
A	Basic problem (Scarcity, opportunity cost, choice)	13.7
B	Markets and Prices (Supply, demand, utility, elasticity, price ceilings and floors)	32.4
C	Theories of firms (Revenues, costs, marginal analysis, market structures)	55.3
D	Factor Markets (Wages, rents, interest, profits, income distribution)	31.9
E	Role of Government (Public goods, externalities, taxation, income redistribution, public choice)	26.7
F	International Economics (Comparative advantage, trade barriers, exchange rate)	19.9

Source: Compiled by author

Table 7: Macroeconomic - Average percentage correct for each classification

Question classification		Average percentage correct for each classification
A	Measuring aggregate performance (GDP and its components, real vs. nominal, unemployment ,inflation)	32.1
B	Aggregate supply and aggregate demand (Potential GDP, economic growth, and productivity, determinants and components of AS and AD, income and expenditure approaches to GDP, the multiplier effect	23.9
C	Money and financial markets (Money, money creation, financial institutions)	9.7
D	Monetary and fiscal policies (Tools of monetary policy, automatic and discretionary fiscal policies)	26.4
E	Policy debates (Policy lags and limitations, rules vs. discretion, long run vs. short run, expectations, sources of macroeconomic instability)	27.2

	ments, exchange rate systems, open-economy	30.4

Source: Compiled by author

Conclusion

From the results it is clear that students struggled with the pre-selected TUCE questions with the majority of students failing the test of economic literacy. It seems from the results that students may have difficulty with some of the questions due to limited exposure to the subject field of economics. Majority of the questions asked in the TUCE include economic terms such as: economic rent, marginal, monopoly and perfect competition. Students therefore without previous knowledge of the subject will have difficulty gasping these terms.

Furthermore, the questions of the TUCE that are asked are in a very theoretical matter and does not test the student's true understanding of the subject field of economics. The test needs to include more practical questions so that researchers and lecturers can test whether students can think like economists and can apply certain theories rather than to memorize certain definitions and graphs.

It is therefore important to develop a test of understanding economics for South Africa taking into account that introductory economics students have limited exposure to the subject field.

Further research

The 30 pre-selected TUCE questions will be run as a post-test at the end of September 2013 measuring the effect of two semester's introductory economics and establishing the effect thereof on economic literacy. Furthermore a Test of Understanding Economics in South Africa is in the process of development and will be ready for testing in October 2013.

ALLGOOD, S, BOSSHARDT, W, KRAKOW, W AND WATTS, M. 2004. What Students Remember and Say about College Economics Years Later. *The American Economic Review*. 94(2):259-265.

ANDERSON, G., BENJAMIN, H. AND FUSS, M.A. 1994. The determinants of success in university introductory economic courses. *Journal of Economic Education* 25: 99-119

BRASFIELD, D.W, HARRISON, D.E, AND MCCOY, J.P. THE Impact of High School Economics on the College Principles of Economics Course. *The Journal of Economic Education*. 24(2):99-111. (Spring)

BUTTERS, R.B & ASARTA, C.J. 2011. A Survey of Economic Understanding in U.S. High Schools. *The Journal of Economic Education*. 42(2): 200-205.

CHAN, N. AND KENNEDY, P.E. 2002. Are Multiple-Choice Exams Easier for Economics Students? A Comparison of Multiple-Choice and "Equivalent" Constructed-Response Exam Questions. *Southern Economic Journal.* 68(4):957-971.

COHN, E., COHN, S., HULT, R.E, BALCH, D.C AND BRADLEY, J. 1998. The effects of Mathematics Background on Student Learning in Principles of Economics*. Journal of Education for Business. Sep:18-22. 16*

CROWLEY, R.W. AND DAVID A. 1974. A Preliminary Report on the Efficiency of Introductory Economics Courses. *The Journal of Economic Education*. 5(2):103-108

EDWARDS, L. 2000. An Econometric Evaluation of Academic Development Programmes in Economics. *The South African Journal of Economics*. 68(3):455-483.

FELS, R. 1967. A New "Test of Understanding in College Economics". The American Economic Review. 57(2):660-666

KENNEDY, P.E and SIEGFRIEDT, J.J. 1997. Class Size and Achievement in Introductory Economics. Evidence from the TUCE III Data. *Economics of Education Review*. 16(4): 385-394.

LEWIS, D.R. AND DAHL, T. 1971. The Test of Understanding in College Economics and Its Construct Validity. *The Journal of Economic Education*. 2(2):155-166.

O'MELAUGH, D. AND ELZINGA, K.G. 2009. 35,000 Principles of Economics Students: Some Lessons Learned. *Southern Economic Journal*. 76(1):32-46.

RIDDLE, T. 1978. Student Opinions on Economic Issues: The Effects of an Introductory Economics Course. *The Journal of Economic Education*, 9(2): 111-114.

RUTKOWSKI, D, RUTKOWSKI, L & LANGFELDT, G. 2001. Reading economics, thinking education:The relevance—and irrelevance—of economic theory for curriculum research. *Journal of Curriculum Studies*. 44(2): 165-192

e State of Economic Education. AEA Papers and

SAUNDERS, P. 1991. The Third Edition of the Test of Understanding in College Economics. *The Journal of Economic Education.* 22(3): 255-272.

SAUNDERS, S. 1980. The Lasting Effects of Introductory Economics Courses. *The Journal of Economic Education*. 12(1):1-14

SIEGFRIED, J.J AND FELS, R. 1979. Research on Teaching College Economics: *A Journal of Economic Literature*. 17(3):923-969.

SIMKINS, S AND ALLEN, S. Pretesting Students to Improve Teaching and Learning

STEENKAMP, E.A. 2006. The Structure and Content of Undergraduate Economics Curricula Offered by South African Universities. Potchefstoom: NWU. (Dissertation – M.Com) 1-143p.

SWARTZ, T.R, BONELLO, F.J. & DAVISSON, W.I. 1980. The Misuse of the TUCE in Explaining Cognitive Achievement. *The Journal of Economic Education* 12(1):23-33.

TIETENBERG, T.H. 1991. The Economics Major: Can and Should We Do Better than a B-. AEA Papers and Proceedings, 81(2):20-25, May.

WALSTAD, W.B. 1997. The Effect of Economic Knowledge on Public Opinion of Economic Issues. The *Journal of Economic Education*. 28(3):195-205

WALSTAD, W.B. 2010. The effect of economic knowledge on public opinion of economic issues. *Journal of economic education*. 28(3):195-205.