

The Test of Understanding of College Economics: Revision and Preliminary Results

William B. Walstad

and

Michael Watts*

(December 12, 2005)

**Not to be used for citation
or quotation without
authors' permission**

*Paper prepared for presentation the American Economic Association annual meeting, Boston, Massachusetts (January 6, 2006). The authors are professors of economics at the University of Nebraska-Lincoln (Walstad) and Purdue University (Watts). Authors contact information: wwalstad1@unl.edu or mwatts@purdue.edu. We thank Claire Melican and Reina Utsunomiya for preparation of the data and Ken Rebeck for his help with the analysis of the pretest data.

The Test of Understanding of College Economics: Revision and Preliminary Results

This edition of the *Test of Understanding in College Economics* (TUCE-4) is the fourth revision of a test that was first developed almost forty years ago, and has an extensive history of use by teachers and researchers in the economics profession. The previous editions and their use have been described in earlier studies (Fels, 1967; Welsh and Fels, 1969; Saunders, 1981; Saunders, Fels and Welsh, 1981; Saunders, 1991a; and Saunders, 1991b) and in three reviews of research in economic education at the college and university level (Siegfried and Fels, 1979; Becker, 1997; and Siegfried and Walstad, 1998).

As with past editions, TUCE-4 has two main objectives: (1) to offer a reliable and valid assessment instrument for students in principles of economics courses; and (2) to provide norming data for a large, national sample of students in principles classes, allowing instructors to compare performance in their classes on both pretests and posttests to the performance of the national sample of students and instructors. Separate exams were prepared in microeconomics and macroeconomics. Both exams consist of 35 multiple-choice items, which can be administered within the time constraints of a single class period for most course formats. The same exams are used for the pretest and posttest, as with the third edition of the TUCE. The following sections explain the revision process for TUCE-4 and provide some preliminary results from the pretest national norming.

The Revision Process

This revision of the TUCE was once again a joint effort of the Committee on Economic Education of the American Economic Association and the National Council on Economic Education (NCEE), which provided the funding for the TUCE-4 revision from a grant from the Spencer Foundation. The committee members responsible for selecting, writing, and editing the questions on TUCE-4 were Stephen Buckles, Vanderbilt University; William Bosshardt, Florida Atlantic University; Rae Jean Goodman, U.S. Naval Academy; Paul Grimes, Mississippi State University; Claire Melican, NCEE; William Walstad, University of Nebraska-Lincoln; and Michael Watts, Purdue University. Walstad was the general project director and Watts served as the chair of the revision committee. Melican was the NCEE administrator for the project. Ken Rebeck, St. Cloud State University, also reviewed questions and analyzed test data as the associate project director. The NCEE recruited instructors and classes to participate in the norming sample, and organized and collected the norming data.

The TUCE-4 Revision Committee began working in spring 2004, with the selection of the committee members made by the project director and NCEE administrator. The committee prepared content specifications; reviewed, revised or replaced existing test questions; and wrote new questions to fill content gaps. This work was conducted over a 15-month period, entailing four drafts of the two exams. The final draft was nationally normed in the fall semester, 2005.

Content and cognitive specifications were completed in July 2004, and the committee met in August 2004 to produce the first draft of TUCE-4. After further review and revisions by the committee, a second draft was field-tested as a pretest at the beginning of the spring 2005 semester. The microeconomics test was administered to 660 principles students at six

universities, and the macroeconomics test was administered to 1,820 students at seven universities. For comparative purposes, each test was also administered to students taking an intermediate theory course in microeconomics or macroeconomics (with 40 students in micro and 43 in macro).

The results from the pretest field-testing were analyzed to identify and replace a relatively small number of items with problems. Those revisions yielded a third draft of TUCE-4 for a “posttest” field-testing conducted at the end of the spring 2005 semester. The third draft of the micro exam was administered to 635 principles students at six universities and the third draft of the macro exam was administered to 1,879 principles students at seven universities.

During this time period, comments on the third draft were provided by a national panel of distinguished economists. The members of this review panel were: Ted Bergstrom, University of California-Santa Barbara; Daniel Hammermesh, University of Texas at Austin; Alan Krueger, Princeton University; W. Douglas McMillin, Louisiana State University; Arthur J. Relnick, Federal Reserve Bank of Minneapolis; Paul Romer, Stanford University; and Michael Salemi, University of North Carolina-Chapel Hill. Most members of the panel reviewed either the micro or macro exam, but a few reviewed both exams.

The comments from this national panel and the data analysis from the spring posttesting were reviewed by Watts, Walstad, and Melican at a July 2005 meeting. Test items with weak item statistics were eliminated, and other questions were deleted or revised to address concerns raised by the national panel, often to strengthen a particular distractor or wording in a question stem. The full TUCE-4 revision committee participated in writing replacement questions and revising these questions. This resulted in the fourth and final draft of TUCE-4, which was used for the fall 2005 national testing.

Content Specifications

The test development committee adopted the following content categories for microeconomics and set the following recommended percentage ranges (shown in parentheses) for the allocation of test items.

- A. The Basic Economic Problem** (scarcity, opportunity cost, choice) (10–15%)
- B. Markets and Price Determination** (determinants of supply and demand, utility, elasticity, price ceilings and floors) (20–25%)
- C. Theories of the Firm** (revenues, costs, marginal analysis, market structures) (25–30%)
- D. Factor Markets** (wages, rents, interest, profits, income distribution) (10–15%)
- E. The (Microeconomic) Role of Government in a Market Economy** (public goods, maintaining competition, externalities, taxation, income redistribution, public choice) (15–20%)
- F. International Economics** (comparative advantage, trade barriers, exchange rates) (10–15%)

These specification categories are basically the same as those found on TUCE-3, although some of the general descriptions are new, with the older lists of concepts moved to the parenthetical listings of topics for greater format consistency across topics. The stability in general content categories is also reflected in the test items. There are, in fact, only eight entirely new questions on this exam, with 27 items taken from the third edition, though often revised. This “default” position of staying with items from earlier editions, unless there were reasons to change based on minor revisions in the content specifications or problems with item statistics, was explicitly endorsed by the test revision committee. That was done partly because the committee viewed the TUCE-3 micro exam as still generally strong and viable, but also because the time and budget constraints for developing and, especially, field-testing new and substantially revised items were very tight.

As always, it was difficult to find items acceptable to large numbers of economists teaching at different colleges and universities, and which also exhibited good item statistics. In a few cases we tried new items on the field-test version of the exam, but reverted to the old item (sometimes revised) if the item statistics or comments from external reviewers suggested problems with the new question. There are, however, some questions on new topics, and in new formats, on the micro TUCE-4 exam. For example, there is a question on game theory, which is now covered in virtually every leading principles textbook. And for the first time ever on the TUCE, one question features a simple graphical model.

The content specifications and recommended percentage ranges for the allocation of test items on the macroeconomics exam for TUCE-4 are:

- A. Measuring Aggregate Economic Performance** (GDP and its components, real vs. nominal values, unemployment, inflation) (10–15%)
- 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) (20–25%)
- C. Money and Financial Markets** (money, money creation, financial institutions, present value) (15–20%)
- D. Monetary and Fiscal Policies** (tools of monetary policy, automatic and discretionary fiscal policies,) (20–25%)
- E. Policy Debates** (policy lags and limitations, rules vs. discretion, long run vs. short run, expectations, sources of macroeconomic instability) (15–20%)
- F. International Economics** (balance of payments, exchange rate systems) (10–15%)

The macro specifications were revised more because of the greater changes that have occurred in the content and teaching of macroeconomic principles courses since the last revision of the TUCE. For example, aggregate supply and demand models are used in most principles courses and textbooks, but not always, and some recent textbooks written by prominent economists have made a major point in not using them. There has also been some de-emphasis in the coverage of “competing schools” (classical, Keynesian, monetarist, new classical, post-Keynesian, etc.), and in calculating various multipliers. Changes in monetary policy rules and regimes, and in empirical and theoretical models of such topics as economic growth, are also affecting the

content of most macro principles courses and textbooks. This revision reflects those changes and whatever content consensus there is for a course on macroeconomic principles. As a result, there are 15 completely new items on the TUCE-4 macro exam, and extensive revisions on most of the 20 other items taken from third edition of the TUCE.

Tables 1 and 2 classify each of the 35 micro and macro TUCE questions, respectively, in the six broad content categories identified in the content specifications listed above. The main purpose of these content specifications is to ensure that items on the test cover the core content in a “typical” principles course. If that is done successfully, the total raw score on the exam provides a useful measure of students’ general understanding of basic economics principles. Content classifications of individual test items are often difficult to do, however, because questions often cover more than one concept or principle. In cases where the correct alternative deals with a concept or principle in one category and incorrect alternatives deal with concepts or principles in other categories, test items were generally classified in the category corresponding to the correct alternative. For two items on the micro test (#14 and #18), the interaction between the alternatives and the situation posed in the stem was sufficiently complex to justify listing the questions in two different content categories.

An international category is included on both tests. The last three questions on the micro test focus on international concepts with a micro orientation (comparative advantage, trade barriers, and exchange rates), while the last four questions on the macro test focus on international concepts with a macro orientation (balance of payment, exchange rate systems). The committee thought that international concepts are now routinely covered in both principles courses, but recognized that there may be more variance in the coverage or emphasis given to the international concepts, so norms are likely to be produced with and without international items.

Individual questions in each content category vary in difficulty, so no attempt should be made to generalize about the economic understanding of students on a particular concept or principle based on answers to a single question or few questions. It is worth restating that TUCE-4 is an assessment instrument for measuring the general understanding of principles of economics, not a test of understanding each concept or principle included on the test. Individual instructors or researchers who find that the content specification categories or weightings of these tests are not appropriate for their courses should use the detailed item analysis data discussed below to help interpret their results, or perhaps modify the TUCE exams for use with their students. Modifications will, however, affect the validity and reliability measures of the test, and reduce the value of the national norms.

Cognitive Specifications

This fourth edition of the TUCE uses the same cognitive specifications as the previous edition. The three broad cognitive categories defined below that are used to classify question are: Recognition and Understanding (RU), Explicit Application (EA), and Implicit Application (IA).¹

(RU) Recognizes and Understands Basic Terms, Concepts, and Principles

- 1.1 Selects the best definition of a given economic term, concept, or principle

- 1.2 Selects the economic term, concept, or principle that best fits a given definition
- 1.3 Identifies or associates terms that have closely related meanings
- 1.4 Recalls or recognizes specific economic rules, e.g., an individual firm's profit is maximized at that level of output at which marginal cost equals marginal revenue

(EA) Explicit Application of Basic Terms, Concepts, and Principles

- 2.1 Applies economic concepts needed to define or solve a particular problem when the concepts are explicitly mentioned
- 2.2 Distinguishes between correct and incorrect application of economic concepts that are specifically given
- 2.3 Distinguishes between probable and improbable outcomes of specific economic actions or proposals involving no unstated assumptions
- 2.4 Judges the adequacy with which conclusions are supported by data or analysis involving no unstated assumptions

(IA) Implicit Application of Basic Terms, Concepts, and Principles

- 3.1 Applies economic concepts needed to define or solve a particular problem when the concepts are not explicitly mentioned
- 3.2 Distinguishes between correct and incorrect application of economic concepts that are not specifically given
- 3.3 Distinguishes between probable and improbable outcomes of specific economic actions or proposals involving unstated assumptions
- 3.4 Judges the adequacy with which conclusions are supported by data or analysis involving unstated assumptions

Tables 1 and 2 show that three-fourths or more of the items on each test are application questions. This proportion is greater than the two-thirds on the third edition. It is, however, consistent with the general purpose of all previous editions of the TUCE, which have sought to emphasize the application of basic concepts and principles over simple recognition of terms and recall of information. The chair of the original TUCE committee noted: "The test will emphasize the ability to apply economic principles to real problems, including issues of public policy" (Fels, 1967, p. 664).

As with the content categories, classifying test items by cognitive type is not precise. Whether the cognitive processes used by students to answer these questions correspond to the level assigned to each question cannot be known with certainty; and any question for which a student has seen the correct answer can become a recall question, regardless of its classification. Despite these caveats, the main purpose in using the cognitive specifications is to ensure that a large number of questions require application, analysis, or evaluation, not simply recognition and recall. The general goal is for the total score on TUCE-4 to be a useful measure of students' ability to understand and, even more, apply economic terms, concepts, and principles.

One final point on these classifications is worth noting. There is no direct relation between the difficulty of test items and their cognitive level. Item difficulty, as measured by the percentage of correct responses, can vary across all cognitive levels.

Norming Sample and Test Results

TUCE-4 was administered as a pretest at the beginning of the 2005 fall semester in 59 colleges and universities. Using Carnegie-style classifications, the norming sample of schools included seven community colleges offering only an associate's degree, one trade or business school, seven colleges offering only a baccalaureate degree, 33 universities offering up to a master's degree, and 11 doctoral-granting or research universities. The micro test was administered in 40 institutions to 3,159 students and the macro test at 42 institutions to 3,192 students. For the micro test, the number of students tested at each institution ranged from 21 to 398, with an average of 79 students. For the macro test, the number tested at each institution ranged from 18 to 333 students, with an average of 76 students.

The mean scores for both tests show that they are challenging for students as pretests. On the micro exam, the mean score was 10.08 (standard deviation = 3.47). The mean score for the macro test was slightly higher, 10.94 (standard deviation = 3.61). In percentage terms, these means (29 and 31 percent, respectively) were essentially the same as those for the previous edition of the macro test (32 percent), but notably lower than the previous edition of the micro test (37 percent). The pretest percentage correct for both TUCE-4 tests is fairly close to a "pure guessing" level of 25 percent for a four-option multiple choice test. These results mean that there will be a substantial range or "headroom" for increasing test scores from pretest to posttest.

Tables 3 and 4 report the individual item results for the questions on each test. In the tables are the percentages of students responding to each test option plus the percentage who left the item blank. For the micro test the percentage of correct responses ranges from 6 (#1 on scarcity) to 54 (#27 on oligopoly). For the macro test the percentages range from a low of 11 (#5 on the money supply) to a high of 56 (#14 on aggregate supply).

Also shown with each question is the point biserial correlation $(R_i)^2$. This is the correlation of the mean score of those selecting the correct alternative (shown in **boldface**) on that question with the mean score of the total norm group on the respective form of TUCE-4. In theory this correlation can range from -1 to $+1$, but for most standardized tests that use posttest data, the item correlations typically fall in the .10 to .60 range. Items with a positive correlation indicate that they are discriminating between those students with more or less economic knowledge, and thus are contributing to the reliability of the test. On a pretest with means close to random guessing, however, these correlations will be relatively low (or in some cases negative). Presumably, these correlations should increase substantially on the posttest.

Sample Questions

Three sample questions are shown below to illustrate each cognitive category, to indicate how individual test items are constructed on the TUCE-4, and to demonstrate how the detailed item analysis data presented in Tables 3 and 4 can be interpreted. The data following each

sample question show the percentage of students in the pretest norming samples selecting each alternative at the beginning of a principles of economics course.

Macro Question #4. Content Category “B.” Cognitive Category “RU.”

The limit of total productive capacity in an economy is set by:

- A. the amount of money in circulation. (13.4)
- B. business demand for goods and services. (45.4)
- C. the amount of government spending and taxation. (6.5)
- D. the quantity and quality of its productive resources. (34.0) $R_t=19$**

Micro Question #5. Content Categories “B.” Cognitive Category “EA.”

If all of the firms in a competitive industry are legally required to meet new regulations that increase their costs of production:

- A. supply of the product will decrease. (35.4) $R_t=10$**
- B. demand for the product will decrease. (14.8)
- C. the long-run economic profits of the individual firms in the industry will decrease. (36.8)
- D. the short-run economic profits of the individual firms in the industry will decrease. (12.9)

Micro Question #20. Content Category “E.” Cognitive Category “IA.”

“The effect of an excise tax on the products of pollution-producing industries will be a cutback in production. If the tax was levied directly on the amount of pollution generated, the long-run cutbacks in production would be much smaller.” This statement is most likely to be:

- A. false, provided the amount of the taxes on products and pollution is equal. (7.6)
- B. false, because most firms would rather pay the tax than cut back production. (33.4)
- C. true, because firms would have a greater incentive to adopt new technology that causes less pollution. (42.2) $R_t=13$**
- D. true, because most taxes levied on pollution affect the demand curve; taxes on product affect the supply curve. (14.8)

All three of these items illustrate the point that, unless there was a strong content or format-related reason for doing otherwise, the alternatives on each question of the TUCE-4 are arranged uniformly from the shortest to the longest. Similarly, special care was taken to ensure that each of the alternatives (A, B, C, or D) is the correct option about the same number of times. These changes were made so that the longest alternative, which some “testwise” students may think is usually the correct alternative, does not call attention to itself, and to give no advantage in selecting or guessing answers based on its placement in the set. To the maximum extent

possible, the overall TUCE-4 score should be a measure of students' economic understanding rather than multiple-choice test-taking skills.

All three of the sample questions have good statistical properties, even on the pretest. All the alternatives were plausible and attracted some student response. Also, the point biserial correlation (R_t) between the mean score of students choosing the correct answer and the mean total test score is positive and relatively high for the pretest.

Future Work

Once the posttest data are collected, they will be analyzed and compared with the pretest results based on mean scores and also item responses. These data will be used to establish the reliability and validity of the TUCE-4 for measuring student achievement in principles of economics courses. The data will also be used to produce national norms for comparing the results from individual students and classes with those from a national sample of students at different colleges and universities. This instrument can also be used for research studies that seek to compare student achievement in principles across different institutions or classes using a standardized measure. The availability of this instrument should help advance research in economic education, just as with the three previous editions of this test.

NOTES

1. *The Taxonomy of Educational Objectives* (Bloom, 1956) is a widely-cited cognitive scheme. The six categories are: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. The TUCE uses a modified version of that taxonomy. “Recognition and Understanding” is a combination of Bloom’s first two categories. “Explicit Application” and “Implicit Application” may address one or more of the other three categories (synthesis omitted). The first edition of TUCE used “Simple Application” and “Complex Application” (Fels, 1967, pp. 664-66) instead of the current “Explicit Application” and “Implicit Application.”

2. The formula for a point biserial correlation between an individual test item, g , and the total test score (R_t) is:

$$R_{\bar{X}_g} = [\bar{X}_g - \bar{X} / S_x] \sqrt{P_g / Q_g}$$

where \bar{X}_g = mean score of those answering item g correctly; \bar{X} = mean score of the total test; S_x = standard deviation on the total test; P_g = proportion answering item g correctly; $Q_g = 1 - P_g$.

REFERENCES

- Becker, William E. 1997. "Teaching economics to undergraduates," *Journal of Economic Literature*, 35 (3) (September), 1347-1373.
- Bloom, Benjamin S., ed. 1956. *Taxonomy of Educational Objectives*. New York: David McKay.
- Fels, Rendigs. 1967. "A new test of understanding in college economics," *American Economic Review, Papers and Proceedings*, 57 (2), 660-666.
- Saunders, Phillip. 1981. *Revised Test of Understanding in College Economics: Interpretive Manual*. New York: National Council on Economic Education.
- _____. 1991a. *Test of Understanding of College Economics: Examiner's Manual* (Third Edition). New York: National Council on Economic Education.
- _____. 1991b. "The third edition of the test of understanding of college economics," *American Economic Review, Papers and Proceedings*, 81 (2), 32-37.
- _____, Fels, Rendigs, and Welsh, Arthur L. 1981. "The revised test of understanding of college economics," *American Economic Review, Papers and Proceedings*, 71 (2), 190-194.
- Siegfried, John J., and Fels, Rendigs. 1979. "Research on teaching college economics: A survey," *Journal of Economic Literature*, 17 (September), 923-969.
- Siegfried John J., and Walstad, William B. 1998. "Research on teaching college economics," in William B. Walstad and Phillip Saunders, eds., *Teaching Undergraduate Economics: A Handbook for Instructors*. New York: McGraw-Hill.
- Welsh, Arthur L., and Fels, Rendigs. 1969. "Performance on the new test of understanding in college economics," *American Economic Review, Papers and Proceedings*, 59 (2), 224-229.

TABLE 1. Microeconomic Test: Content and Cognitive Specifications

Content Categories	Cognitive Categories			
	Recognition & Understanding	Explicit Application	Implicit Application	Total (Percent)
A. Basic Problem		1, 11	7	3 (8.6)
B. Markets & Prices	18*, 23	2, 3, 4, 5, 12, 13, 14*, 22		9 (25.7)
C. Theories of Firm	15, 24	14*, 17, 21, 26	6, 16, 25, 27	9.5 (27.1)
D. Factor Markets	18*	8	28, 29	3.5 (10)
E. Micro Role of Government	9, 30, 32	10, 19, 31	20	7 (20)
F. International (micro)		33, 35	34	3 (8.6)
Total (Percent)	7 (20)	19 (54.3)	9 (25.7)	35 (100)

Note: The complete description of each content category is given below. Items with asterisk (*) are allocated .5 to each category.

- A. The Basic Economic Problem (scarcity, opportunity cost, choice)
- B. Markets and Price Determination (determinants of supply and demand, utility, elasticity, price ceilings and floors)
- C. Theories of the Firm (revenues, costs, marginal analysis, market structures)
- D. Factor Markets (wages, rents, interest, profits, income distribution)
- E. The (Microeconomic) Role of Government in a Market Economy (public goods, maintaining competition, externalities, taxation, income redistribution, public choice)
- F. International Economics (comparative advantage, trade barriers, exchange rates)

TABLE 2. Macroeconomic Test: Content and Cognitive Specifications

Content Categories	Cognitive Categories			
	Recognition & Understanding	Explicit Application	Implicit Application	Total (Percent)
A. Measuring Aggregate Performance	1	2, 12, 13, 22		5 (14.3)
B. Aggregate Supply & Demand	4	3, 14, 15, 16, 24, 27	23	8 (22.9)
C. Money & Financial Markets	5	6, 18, 25	17	5 (14.3)
D. Monetary & Fiscal Policies	9, 19	7, 8, 20, 26	28, 29, 31	9 (25.7)
E. Policy Debates & Applications	10	11	21,30	4 (11.4)
F. International (macro)		34	32, 33, 35	4 (11.4)
Total (Percent)	6 (17.1)	19 (54.3)	10 (28.6)	35 (100)

Note: The complete description of each content category is given below.

- A. Measuring Aggregate Economic Performance (GDP and its components, real vs. nominal values, unemployment, inflation)
- 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)
- C. Money and Financial Markets (money, money creation, financial institutions, present value)
- D. Monetary and Fiscal Policies (tools of monetary policy, automatic and discretionary fiscal policies,)
- E. Policy Debates (policy lags and limitations ,rules vs. discretion, long run vs. short run, expectations, sources of macroeconomic instability)
- F. International Economics (balance of payments, exchange rate systems)

TABLE 3. Pretest Item Results for Microeconomics Test (n=3159)

Percentage Distribution of Responses									
Item	Cont.	Cog.	Form	A	B	C	D	Blank	R _t
1	A	EA	Pre	13.1	5.6*	50.6	30.0	.7	.11
2	B	EA	Pre	38.3*	46.0	12.8	2.5	.4	.15
3	B	EA	Pre	12.5	45.9	26.1	13.7*	1.9	.18
4	B	EA	Pre	5.4	34.1*	22.5	36.5	1.5	.16
5	B	EA	Pre	34.5*	14.8	36.8	12.9	1.0	.10
6	C	IA	Pre	13.9*	29.2	35.9	19.2	2.0	-.02
7	A	IA	Pre	11.1*	7.8	61.5	18.8	.7	.19
8	D	EA	Pre	28.9	11.0	39.9*	18.9	1.4	.07
9	E	RU	Pre	12.9	12.3	21.2*	52.7	.9	.12
10	E	EA	Pre	7.1	18.9	29.1	43.7*	1.2	.21
11	A	EA	Pre	18.4*	3.1	1.8	75.4	1.4	.23
12	B	EA	Pre	32.0	9.0	36.4	21.9*	.7	.06
13	B	EA	Pre	35.7*	10.2	10.5	42.5	1.1	.08
14	B, C	EA	Pre	11.3*	24.8	15.4	46.8	1.7	.08
15	C	RU	Pre	13.1	23.6	24.1*	37.2	2.1	.05
16	C	IA	Pre	7.1	35.9*	39.3	16.6	1.1	.12
17	C	EA	Pre	24.0	31.1*	13.2	29.9	1.9	.03
18	B, D	RU	Pre	55.2	15.7	24.0*	4.4	.7	-.09
19	E	EA	Pre	27.1	11.3	21.4*	38.7	1.5	.08
20	E	IA	Pre	7.6	33.4	42.2*	14.8	2.0	.13
21	C	EA	Pre	13.3	25.6	26.5	32.5*	2.2	.18
22	B	EA	Pre	29.3	30.0*	31.7	7.5	1.4	.13
23	B	RU	Pre	14.0	14.5	43.9*	26.4	1.2	.06
24	C	RU	Pre	20.4	40.4	25.5*	12.1	1.6	.01
25	C	IA	Pre	15.8	49.4	16.2*	16.5	2.1	-.02
26	C	EA	Pre	13.7	16.3	24.9	42.1*	2.9	.18
27	C	IA	Pre	54.0*	19.1	15.1	9.6	2.2	.13
28	D	IA	Pre	14.8	35.2	24.3*	23.1	2.5	.12
29	D	IA	Pre	25.5	40.0*	15.7	16.4	2.4	.12
30	E	RU	Pre	15.8	25.7	31.7	23.6*	3.2	.19
31	E	EA	Pre	15.7	40.7	30.3*	9.6	3.7	.06
32	E	RU	Pre	15.9	28.8*	20.8	30.9	3.7	.06
33	F	EA	Pre	15.6	23.1*	49.8	8.0	3.4	.05
34	F	IA	Pre	31.2*	16.3	38.3	10.8	3.4	.14
35	F	EA	Pre	17.9	17.4	21.1	39.2*	4.2	.17

TABLE 4. Pretest Item Results for Macroeconomics Test (n=3192)

Percentage Distribution of Responses									
Item	Cont.	Cog.	Form	A	B	C	D	Blank	R _t
1	A	RU	Pre	21.7*	4.5	13.7	59.3	.8	.19
2	A	EA	Pre	27.0	48.4*	16.2	7.6	.8	.11
3	B	EA	Pre	45.2*	32.3	20.0	1.9	.7	.11
4	B	RU	Pre	13.4	45.4	6.5	34.0*	.6	.19
5	C	RU	Pre	11.2*	18.2	44.1	25.6	.8	.09
6	C	EA	Pre	32.7	35.5*	18.2	12.9	.6	.07
7	D	EA	Pre	25.7	33.0*	21.5	18.5	1.2	.01
8	D	EA	Pre	19.3	51.2*	21.4	7.8	.4	.10
9	D	RU	Pre	22.4	11.5	39.9*	25.5	.6	.08
10	E	RU	Pre	19.5	32.8	22.4*	24.4	.8	.04
11	E	EA	Pre	31.9	34.7*	17.3	15.2	.9	.06
12	A	EA	Pre	18.8	35.5	14.3	30.7*	.6	.23
13	A	EA	Pre	5.5	37.7*	17.7	38.8	.8	.01
14	B	EA	Pre	11.7	54.6*	18.3	14.9	.5	.21
15	B	EA	Pre	22.9	27.5	28.4*	20.4	.7	.02
16	B	EA	Pre	24.5*	22.5	29.1	23.2	.8	.13
17	C	IA	Pre	11.3	48.7*	24.6	15.1	.3	.16
18	C	EA	Pre	27.0	28.4	26.3*	17.9	.4	.03
19	D	RU	Pre	38.3	16.5	30.7*	14.1	.3	.07
20	D	EA	Pre	16.0*	20.0	47.8	15.9	.4	.09
21	E	IA	Pre	19.0	33.1	22.8	23.8*	1.2	.09
22	A	EA	Pre	32.1*	28.3	24.3	14.4	.9	.09
23	B	IA	Pre	17.8	23.2	50.4*	8.2	.4	.27
24	B	EA	Pre	19.2*	8.8	34.1	37.0	.9	.05
25	C	EA	Pre	32.1	36.1	13.9	16.8*	1.2	.14
26	D	EA	Pre	25.3*	26.3	30.0	17.6	.8	.06
27	B	EA	Pre	27.2*	32.3	24.3	15.2	1.0	.11
28	D	IA	Pre	17.0	32.1	23.6	26.2*	1.1	.08
29	D	IA	Pre	18.8	42.4*	22.7	15.1	1.0	.19
30	E	IA	Pre	22.0*	32.2	27.7	17.1	1.1	.07
31	D	IA	Pre	18.1*	21.3	27.9	31.1	1.5	.14
32	F	IA	Pre	21.1	23.1	19.7	34.6*	1.4	.16
33	F	IA	Pre	19.2	20.4	34.6	24.5*	1.3	.15
34	F	EA	Pre	17.8	26.5	21.6	32.8*	1.4	.14
35	F	IA	Pre	24.9	27.5	23.7*	21.3	2.6	.00