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JOURNAL OF ECONOMICS AND ECONOMIC EDUCATION RESEARCH

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LETTER FROM THE EDITOR

We are extremely pleased to present this issue of the *Journal of Economics and Economic Education Research*, an official publication of the Allied Academies' Academy of Economics and Economic Education Research, dedicated to the study, research and dissemination of information pertinent to the improvement of methodologies and effective teaching in the discipline of economics with a special emphasis on the process of economic education. The editorial board is composed primarily of directors of councils and centers for economic education affiliated with the National Council on Economic Education. This journal attempts to bridge the gap between the theoretical discipline of economics and the applied excellence relative to the teaching arts.

The Editorial Board considers two types of manuscripts for publication. First is empirical research related to the discipline of economics. The other is research oriented toward effective teaching methods and technologies in economics designed for grades kindergarten through twelve. These manuscripts are blind reviewed by the Editorial Board members with only the top programs in each category selected for publication, with an acceptance rate of less than 25%.

We are inviting papers for future editions of the *Journal for Economics and Economic Education Research* and encourage you to submit your manuscripts according to the guidelines found on the Allied Academies webpage at www.alliedacademies.org.

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ECONOMICS EDUCATION ARTICLES

DEVELOPING STUDENT WRITERS IN ECONOMICS: A PROCESS WRITING APPROACH

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ABSTRACT

An intervention developed by the authors that allows inclusion of process writing with peer review was adopted in introductory economics courses. The writing protocol, which took class time to implement, resulted in similar test performance by students without creating excessive demands upon the instructor's time. The process writing intervention, used for essay exams, promotes writing to learn by forcing students to reflect on course content through the peer review process incorporated into the technique. The intervention also addresses writing development by forcing students to critique key writing elements in other students' essays and by encouraging students to revise their written drafts in order to improve.

The structure, style and mechanics of the first draft. The intervention was expected to produce several outcomes. First, the writing process assignments would not detract from content learning. Secondly, students would perceive the activity to be beneficial in terms of their content learning and writing skill. Finally, students would show improvement in their writing and critical thinking skills. Outcomes were assessed with student surveys, analysis of test scores before and after the intervention, and analysis of student papers.

INTRODUCTION

The ability to write and speak well has become a primary concern of employers (Ashbaugh, 1994; Buckley et al., 1989; Porter & McKibbon, 1988). In fact, research conducted in work settings has suggested that content courses (e.g., economics, math, etc.) should emphasize the importance of writing skills (Anderson, 1985). Such concerns have renewed efforts by colleges to implement writing across

the curriculum where writing development is not just the responsibility of the English department, but of other disciplines as well. In short, non-English courses often attempt to develop writing skills of students and/or use writing as a medium for learning about a discipline such as economics.

While many advocate an across the curriculum approach to help students develop writing skills, merely assigning writing assignments is insufficient to meet this goal (Ferrara, 1983; Hansen, 1993). Such development requires students to revise their work and to receive feedback on their writing (Hansen 1993; Cohen & Spencer, 1993). This places a demand on the teacher not only in time taken away from other classroom activities but also being able to comment competently on student papers.

Writing is not solely a subject about itself but a tool of learning (Emig, 1994; Hansen, 1993). Thus, writing assignments within the disciplines serve the added purpose of helping students think in the context of the discipline. By reasoning through content issues and problems in the process of writing, the student is able to learn and reinforce the content or discipline-based knowledge gained. Furthermore, in many professional disciplines, students must learn accepted writing styles, formats, and conventions consistent with the skills and knowledge of the profession.

These two issues-the need to develop written communication skills and the use of writing as a tool for learning-provide a rationale for incorporating written assignments into other disciplines not only for the learning of specific material, but also in developing an important student skill. We developed a process writing protocol that attempts to develop written communication skills through a structured revision process. This article describes the process writing protocol, adapted for essay responses, as implemented in an introductory macroeconomics course. In addition, we will share our assessment of the process writing protocol.

PROCESS WRITING APPROACH

Research has identified several key processes of good writing. First, expert writers are able to plan their writing better than novice writers (Berkenkotter, 1982). This has led Berkenkotter (1982) and others (e.g., Haynes, 1978) to suggest that students be given opportunities to engage in explicit pre-writing activities. The typical essay exam context, however, calls for the student to write a one-draft only response in a time-limit situation. A process writing approach allows time for students to think about the subject and to make revisions to their initial thoughts.

A second important process of good writing is that it is done recursively. That is, the writer must usually go back and forth between putting thoughts together (composing) and re-reading and re-writing those thoughts (revising). Cohen and Spencer (1993) identify revision as a critical process because it gives the writer a chance to organize and style the message so it is readable for the audience. In short, good writing requires a complex coordination between planning, drafting, and revising thoughts and ideas.

In addition to giving student writers more time to compose, reflect, and revise their thoughts, process writing allows for collaboration. Haynes (1978) suggests that an important prewriting activity is peer collaboration. One advantage of collaboration Haynes (1978) asserts is that it provides better opportunities for student-directed revision. Using a process writing approach-where students are given adequate time to plan, draft, and revise and edit their work-also allows the instructor to focus more on the structure and style of the essay, rather than just the grammar or copy-editing.

Copy-editing errors, very common in most student writing, is a final step in the writing process. While teachers often over emphasize copy-editing issues in their feedback (as opposed to the more substantive structure and style issues), a writing process framework must address grammar and punctuation (see Haswell, 1983). Often errors are the result of inadequate proofing and students must develop the attitude of simply taking the time to edit their work. What Haswell (1983) found was that if students were simply cued as to where surface errors might be (by putting check marks in the margin of the line where the error occurs) they could correct many of their own mistakes. Not only does the check system, called minimal marking, help students learn the mechanics, but it also helps focus instructor feedback on the more substantive aspects of the written work.

Although a process writing approach can be used with a variety of forms and in any discipline, the specific protocol described herein was used for essay questions associated with the course exams in a macroeconomics course. The next section describes the writing assignment protocol fully.

THE PROCESS WRITING PROTOCOL FOR ESSAY EXAMS

The new process writing protocol changed the previous procedure calling for the student to write a one-draft only response in a time-limit situation to one where students planned, drafted, and revised and edited their essays over a two-week period (four classes). The course also employed permanent groups, which were

used to support the protocol. These permanent groups also took part in other group activities not related to the essays.

Session One. Two weeks before the assigned exam date, the instructor distributes a list of four or five essay questions to each writing group; group members decide who will prepare which essay response. Before session two, each student drafts a one page or less (typed) answer to his or her assigned question. This essay as well as copies for each member of the group and the instructor is brought to the next class session (session two). Class time required: five minutes.

Session Two. Students bring enough copies of their essay responses to distribute to each of the other group members and to the instructor. The instructor does not evaluate the essays, but does track whether students have completed this step. The instructor can choose to deduct points from the total exam score if it is not completed.

Outside of class and before the next session, students in the group are responsible for reading and preparing a critique of each team member's essay using the peer evaluation form provided by the instructor. (See Appendix A for the peer evaluation checklist.) This critique is structured around four principles: 1) the essay response includes all of the economic content required to answer the question; 2) the response is well organized and readable; 3) the assertions made by the author are supported; and 4) the writing style is acceptable. If time permits, the instructor as an option can spend time (15-25 minutes) demonstrating the writing principles students will be critiquing. For example, the instructor might model a comment for a paper that has problems with organization. In any case, the instructor will likely find that she will need to intervene at some point in the semester to help students make better comments. Class time required: three to five minutes; more time if some kind of support intervention used.

Session Three. Approximately one-half hour of this class period is set aside for the groups to discuss the essays they have critiqued. (Students generally spend five to seven minutes per essay.) Groups may approach this task in several ways, but we suggest students collectively reexamine one essay at a time to suggest areas for improvement using the evaluation form as a guide. As the evaluation form focuses student critique on addressing structure, support, and style problems in the essays, these areas and not copy-editing become the focus of these discussions. This is also the time for students to reassess the content of each essay because this material mirrors that found on the objective part of the exam. During this time, the instructor floats among the groups answering questions regarding the writing components of their essay and, perhaps, providing input on the group's process. The

instructor should not, however, take the critiquing task away from the students. The authors of the essays consider the critiques presented by their fellow group members to make final revisions of their essays so that a final draft can be turned in for session four. In short, this is an intervention that should lead to reflection in terms of content and the way it is presented in writing. Classtime required: thirty minutes.

Session Four. The students bring the final drafts of their essays to class and turn them in to the instructor with the peer evaluation forms from their group members. Evaluation forms are turned in so that the instructor can monitor whether each student is constructively critiquing fellow students' papers. Students are instructed that merely indicating on the peer review form that everything is acceptable does not qualify as constructive criticism. If a student has approached the assignment in this way, seeing each student's critiques allows the instructor to intervene.

The students then sit for the objective portion of the exam. During this time the essays are "quick corrected" by the instructor and other aides. That is, checkmarks are made on the margin next to the lines in which surface or copy-editing errors (i.e. spelling, punctuation, word choice, and grammar) occur (adapted from Haswell 1983). After completing the multiple-choice portion of the exam, students have one last chance to edit their paper using the checkmarks as a guide. These last corrections are completed during the exam period and turned in immediately afterward. When these essays are graded, points are partially awarded on content and partially awarded on writing quality. Class time required: thirty minutes concurrent with the objective part of the exam.

RESULTS OF THE ESSAY PROTOCOL

The assessment of the essay protocol focused on two points of interest. First we were interested in what impact, if any, the protocol had on student performance and student learning for the economic concepts taught in the course. Specifically, did student scores change when the new testing protocol was used and did students perceive that the essay assignment-presumably requiring much more time out of class for composition and revision-was a burden on their ability to study for the other parts of the exam? The second point of interest was a faculty development issue of determining the developmental needs of students in terms of their thinking and writing well within the economics discipline. That is, we needed to learn where students needed help in their thinking and their writing.

Although no experimental designs were attempted, several actions were taken to help us address these issues. First, scores from the objective portions of the exams were compiled from previous semesters (when essays were simply composed in-class during the exam) and compared to those using the process writing protocol. Secondly, an end-of-the semester survey was administered to find out how students perceived the process writing protocol in terms of its impact on their thinking and writing as well as how it impacted their study. Finally, student essays were analyzed to determine any patterns of student errors in mechanics. The analysis looked at changes over the course of the semester and at the specific grammatical and punctuation errors being made in the papers.

From our data, it appears that the protocol assignment had no negative impact on overall student learning of the economics content. In comparing student performance on the objective portion of the exams (multiple-choice questions) we found virtually no difference between scores before the protocol and after. The multiple choice questions, varying in difficulty from definitional/identification questions to complex application questions, were similar to ones used in the instructor's previous macroeconomics courses (pre-intervention), thus serving as a basis for comparison. In comparison of pre-intervention sections (N=138) and post-intervention sections (N=139), percentage of correct answers was nearly identical for all four course exams.

In an end-of-the-course survey, students reported their perceptions of how the process writing protocol affected their learning of concepts and the impact on writing skills. A majority of students reported that the protocol helped them study for exams (77%); likewise, a majority reported that the protocol helped their learning of the content (88%). Only 14 students (11%) reported the protocol took time away from their study preparation for the tests.

After the new protocol had been used for two semesters, a peer review guide (see Appendix A for copy) was added for the subsequent third semester to improve student feedback. Further analysis comparing pre-guide vs. post-guide shows the post intervention group having a slightly lower regard for the protocol's affect on student preparation. That is, when the peer review guide was introduced into the protocol, slightly more students reported that the process took time away from learning. Table 1 compares the pre and post peer review guide perceptions.

Table 1: Comparison between Pre-Study Guide and Post-Study Guide Student Perceptions			
Perception Factor	Pre-Study Guide (N=80)	Post-Study Guide (N=44)	Post-Study Guide Difference
Helped Study	82.6%	68.2%	(16.4%)
Took Time Away From Study	5.0%	22.8%	(17.8%)
Helped Learning	92.5%	77.2%	(15.3%)
Took Time Away from Learning	2.5%	6.8%	(4.3%)

The impact of the essay writing protocol on student writing development seems to be more tentative. While a majority of students reported that the process writing protocol did help them improve their writing at least somewhat, only 42% reported that the essay protocol helped them significantly. Students were less sure about how the protocol helped them with specific skills like organization and punctuation than more general processes such as revising drafts and giving feedback (see Table 2).

Table 2: Student Perceptions on How Testing Protocol Affected Writing Skills				
Student Rating	Organizing Ideas	Punctuation	Revising Drafts	Giving Feedback
Improved a Great Deal	12%	4%	23%	15%
Improved Significantly	28%	26%	35%	47%
Improved a Little	35%	40%	29%	27%
Had no Effect	25%	30%	13%	11%

Evaluation of the effectiveness of quick-correcting or minimal marking was based on errors identified in student essays. The reviewers who checked student essays (step 4) in step four of the protocol looked for errors in punctuation, agreement, word choice, possessive use, pronoun referent, spelling, proofing, and

sentence construction. We analyzed the essays to identify which of these errors students were making and how often they were correcting them.

Using three of the most recent classes (88 students), we computed the total number of errors checked during the procedure as well as the percentage of times the error was corrected by the student. Table 3 summarizes the results. Although there were some slight variations among classes, the results were consistent among classes and essay assignments. Furthermore, the rate of errors corrected remained stable from the first to the last essay, averaging around 45% throughout.

Table 3: Number of Errors Checked and Percentage Corrected on Essays

	Essay 1		Essay 2		Essay 3	
Class (N)*	Errors Checked Per Student	% Corrected by Student	Errors Checked	% Corrected by Student	Errors Checked Per Student	% Corrected by Student
A (41)	5.08	46%	7.67	45%	5.19	47%
B (18)	5.17	42%	7.13	49%	4.79	37%
C (29)	5.62	52%	5.66	41%	5.80	46%
Total	5.28	47%	6.87	45%	5.39	45%

* The N represents total number of people in class. Some of the essays were not subject to the quick correct procedure because of absences; these were not calculated in the averages.

The errors that students made were further audited according to type of errors. Errors were categorized according to punctuation (correct use of commas); agreement (subject-verb, pronoun-verb, verb tense); spelling (often homonym errors); pronoun referent; proofing (e.g., errors in spelling that were obvious typos); sentence (splices, run-ons, or sentences that don't make sense because of missing words); possessive, word choice errors (e.g., using less instead of fewer), and miscellaneous errors (such as mispunctuating a citation). Table 4 shows the frequency of errors checked for these categories.

Table 4: Types of Surface Errors* Made in Essays

	Punctuation		Agreement		Spelling		Proofing		Sentence		Word Choice	
	E	C	E	C	E	C	E	C	E	C	E	C
A (41)	2.47	51%	.54	28%	.68	37%	.59	76%	.68	43%	.48	51%
B (18)	2.23	49%	.64	33%	.85	20%	.53	68%	.55	58%	.36	53%
C (29)	2.18	57%	.70	29%	.96	31%	.29	79%	.77	52%	.24	40%
Totals	2.33	53%	.61	30%	.81	31%	.48	75%	.68	49%	.37	49%

* Note that errors in pronoun referent and possessive were also counted: Avg. of .26 possessive errors per person with 20% corrected; Avg. of .18 referent errors with 34% corrected. All other errors in this study fell into Miscellaneous
E = Errors checked in margins
C = % of errors corrected

CONCLUSIONS

The process writing intervention was intended to positively affect writing development of students in an introductory economics classroom-without degrading student learning of content. In using this protocol and reflecting on its results, several things have been learned.

First, students need guidance in giving peer feedback. At first, the instructor simply facilitated the review discussions. However, this was difficult because of the number of groups (typically the class has 30-40 students, and as many 8 groups) and the lack of structure provided for feedback. Unable to get immediate instructor guidance, groups either stumbled along or they tended to focus on surface level details of the writing. For example, a group might pass around a paper making nothing but editing corrections on it, but little on more substantive issues such as organization and development of the ideas.

Therefore, a feedback guide was developed to help focus peer feedback (see appendix A). Grammar and punctuation issues were deliberately eliminated from the form so that students would not focus on that area. While it is unclear whether the feedback guide actually helped improve student writing, we did find it helped students focus on more than surface errors.

Secondly, although the feedback guide was helpful in getting students to improve their feedback and to focus it on non-editing aspects, feedback was not always well used. We informally checked to see how the student author used the

comments, finding that not all students used the feedback they received, even if it was valid. That is, students did not necessarily revise their essays even if given helpful feedback. Fortunately, however, some did revise and improve their essay. This is certainly an area worthy of further study; especially, in helping to determine how students can be further encouraged and enabled to actually revise their essay drafts.

Third, use of the process writing protocol requires more from the instructor. Before using the process writing protocol, essays were graded mostly on coverage of the salient content points. While the old system was easier to apply, it was inadequate for the process writing essays. At first, we simply added a writing component; that is, the content was evaluated separately from a writing evaluation. Still, this was a bit simplistic and more holistic evaluation methods have been tried. We are in the process of developing a set of standard responses related to structural and style issues to help streamline the grading and commenting activity. In any case, there will continue to be an effort to integrate the evaluation as a formative input to student writing development.

Finally, while students did correct surface errors, they did not automatically correct them when given the check mark. Haswell (1983) reported 61% of checked errors were corrected in his classes; in this sample it was less than 50%. Some errors like agreement, spelling, and punctuation errors were more resistant to correction; proofing was the most correctable error. Furthermore, students would make similar type mistakes in the subsequent essays. Therefore, it became apparent, that a short workshop was needed when the first essays were handed back. In the ten-minute workshop, the common, uncorrected errors are shared, using examples from the student writing. This is a good time, for example, to point out how to correctly reference acronyms such as GNP, punctuating introductory clauses, or correcting the noun-pronoun pair of "country" and "their" (to "country and its").

Even with this intervention, students still made almost as many surface mistakes in terms of number of checks in the last essay as they did in the first (on average). Two reasons may account for this. First, students seemed to use more compound sentences and sentences using subordinating clauses in the later essays. Haswell (1988) found in an empirical study he conducted on surface errors of college students that while student errors (in areas such as spelling, punctuation, agreement, etc.) tended to increase as college students moved from freshman to juniors, student writing became more sophisticated causing more opportunities for those errors. In fact, a majority of the surface errors were ones of punctuation, which may have been caused by the more sophisticated writing forms used. A

second, though less likely, reason may relate to the types of essay questions as the later ones may have called for more sophisticated synthesis (no attempt was made to do that in writing the questions).

While we continue to develop our own ability to implement the process writing protocol, including evaluation of the writing component, the assignment seems to be effective in getting students to respond to essay questions in a more organized and competent way. As expected, we found the process essays to be superior in quality to the time limit essays assigned in the past. Importantly, the engagement in the process seems to support both writing development and conceptual understanding. However, the process writing protocol does take some additional classtime, requires that the instructor effectively facilitate peer evaluation, and requires the instructor to give formative feedback and attention to issues of writing, not just content.

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Appendix A: Peer Feedback Form
Essay Evaluation
Peer Evaluation Checklist

Organization	Yes	Needs Work	Comments and/or Suggestions (Try to specifically identify the problems found!)
• ·Does the essay have an introduction that presents a thesis?			
• Is essay ordered logically (making it easier for reader)?			
• Is essay focused? Do all parts relate to the thesis?			
Support	**Yes**	**Needs Work**	**Comments and/or Suggestions (Try to specifically identify the problems found!)**
• ·Are ideas explained concretely (e.g., related to specific examples)?			
• ·Are arguments or ideas supported completely?			
• Are information and content accurate? (e.g., correct terminology used)			
Writing Style	**Yes**	**Needs Work**	**Comments and/or Suggestions (Try to specifically identify the problems found!)**
• Are paragraphs coherent - do they flow easily for reader?			
• Are sentences clear and precise? (i.e., understandable to the reader).			
• Are sentences free of distracting errors in word choice (i.e., are terms precise)?			

Please note: Every reviewer is responsible for identifying problems or inaccuracies in the essay content. Keep in mind that a well organized, well-written, and well-supported essay is still a poor one if it does not answer the questions or substantively address the topic.

TEACHING MONEY, PRICES, INCOME, AND THE QUANTITY THEORY OF MONEY

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ABSTRACT

One problem often encountered in teaching macroeconomics, particularly at the principles level, is the abstract nature of the subject matter. In teaching the quantity theory of money, many students have difficulty with understanding the theory itself and the terms in that equation. In fact, for the students to comprehend the quantity of money, they first need to have a good grasp of such elusive concepts as the quantity of money, the velocity of money, as well as the distinction between nominal income and real income.

This paper describes a classroom simulation technique designed to teach the quantity theory of money and related concepts. The focus of the simulation is to use a concrete classroom situation to help the students relate to more abstract concepts and phenomena. The author has used this simulation to teach macro principles with good results. This paper has two parts: the first part deals with a discussion of simulation method and the second part, with the historical development and policy ramifications of the quantity theory.

The paper begins with an identification of the major problems that may be encountered in teaching the quantity theory to undergraduate students. It then proceeds to describe the simulation exercise in details. Basically, the exercise involves dividing the class into a producer side and a consumer side. The class receives a fixed amount of money and a fixed quantity of good. The students also receive clarifications of the meaning of each of the terms in the equation of exchange, $MV = \sum PQ$. After allowing a short period of "free" exchange of good for money between the two sides,

the students were asked to compute the value of nominal income. To reinforce their understand of the equation of exchange, the simulation goes through a second and third round after changes in the money supply M and the quantity of goods or real income Q.

Upon completion of the simulation exercise, the instructor goes through the meaning of the quantity theory and policy implications. This second phase of the learning is designed to help the student see the functional linkages between money, prices, nominal income, and real income. The students seemed to enjoy a fresh change of venue and gain a better understanding of equation of exchange, a clearer idea about the quantity theory as a theory about money, price, and income.

INTRODUCTION

In undergraduate macroeconomic classes, at the principles level especially, teaching the quantity theory of money can sometimes be a challenging experience. From the students' perspective, the difficulties frequently arise from the first-time encounter with such elusive concepts as the supply of money, money's velocity, and the link between the quantity of money and the price level and nominal income. The challenge with teaching the quantity theory can also comes from student failure to grasp such measures as nominal GDP and real GDP. Even from the faculty's perspective, the modern quantity theory of money is not without controversy. In a nutshell, the controversy concerns the identity-vs.-equation issue, or about the role of money in stabilization policy, or the effectiveness of monetary policy. In other words, the controversy has revolved around issues regarding the nature and direction of causality between the major terms of the equation, namely, money, prices, and output. Interestingly enough, this controversy among economists also finds a parallel expression in the classroom, when the teacher may have a hard time explaining to his students the nexus of money-velocity-price-income relationships. This paper explores a complementary teaching technique aimed at addressing the pedagogical challenge stated above.

If the controversy among economists is concerned with Athe technical difficulty of sorting out the direction of causation running between money and prices," (Laidler 1991) to many undergraduate students, especially those taking principles of economics, the difficulty in understanding causality is further compounded by the abstract nature of entities such as the stock of money, velocity, and the general price level. This paper addresses the "abstract" and "causality" issues by tackling the "abstract" problem first. My experience with the classroom technique described below suggests that, once the students gained a firmer understanding of such abstract terms as the stock of money and the velocity of money, then it is easier to get into a more substantive discussion of such a matter as relationships or transmission mechanism of monetary policy.

In short, it is essential that the students overcome their fear of what they perceive as too abstract macroeconomic words or concepts. For example, once students gain a firmer comprehension of such vocabulary as velocity and quantity of money, they would be more willing to accept the "quantity theory of money"as an identity, and from this acceptance, we can then show them the "quantity theory" as a theory. Thus, before one can expect them to understand the "quantity theory" as a theory, it is helpful to convince them how a complex economy can be reduced to a simple identity VM = PQ. In my experience, I have found the exercise described below helpful in explaining the meaning of the said identity. Briefly, the strategy consists of allowing the students to participate in the Aworking" of an economy-an economy created for them right in the classroom. In other words, the simulation is meant to help the students grasp the fundamental of the circular flow of income and output. Once that objective is accomplished, the next step is to explain the linkages as different theories or schools propose. In short, the simulation exercise is built on the premise that, in teaching the quantity theory of money, the place to start is to help the students master the equation of exchange. Consequently, the exercise is primarily aimed at achieving the latter objective. This paper has two parts. The first part presents the simulation exercise; the second part deals with more substantive issues surrounding the quantity theory.

CLASSROOM SIMULATION

The Money Supply Constant

To begin the simulation, I explain to my class the purpose and strategy of the exercise. Briefly, I said, the idea is to turn the class into a simple economy. By allowing the economy to function, that is by letting the economy engage in an exchange process, one can gain a better understanding of how the quantity theory of money, or more precisely, the equation of exchange can describe the concepts and functional relationship between the stock of money, velocity, and nominal GDP. In that simulated economy, I ask my students to play the role of producers and consumers and I provide the class with given amount of cash to facilitate the exchange. After the introduction, I split my class into two equal halves. Naturally, this works nicely if the class is of an even size, but if it is not, one has to ask one student to abstain and to serve as your assistant/facilitator. For example, if my class has 30 students, I would have two groups of 15 students per group. One group, named group P, comprises of producers only, while the other group, called group C, is made up of consumers only. I then give one-dollar bill to each of the 15 students in group C. Obviously, for this economy, the "money supply" or the "quantity of money" is 15 dollars. Similarly, to each of the 15 students in the group P, I give a token commodity, say, a new pencil. The idea is that the output produced by this economy, as embodied in group P's initial possession, is 15 pencils. In other words, this is the real GDP of the simulated economy.

Now my newly created economy begins to engage in exchange-albeit under some arbitrary rules meant to facilitate the exercise (Mind you I definitely have no intention of creating a "command" economy!). One cardinal rule is budget exhaustion. That is, after the bell announcing the opening of the market, the consumer side, i.e., group C, must spend all of its income on the good sold by the producer side, i.e., group P. The second rule is that the market clearing price for the pencil is one dollar each (sometimes, this rule needs not be stated explicitly). The third rule makes this economy

a debt-free one meaning that borrowing is forbidden, so that the money supply will stay constant during the first phase of the experiment.

Once the economy completes its first round of exchange, group C, which represents the demand side of the market, should now have all of the good and no money, and conversely, group P (supply side) should now have all of the money and no good. I then ask the class to figure out national output of this economy in monetary terms, based on the Fisherian expression $\sum$ (p x Q). The students have no problem finding the answer: nominal GDP = \$1x15 = \$15. My next question to them is about nominal GDP, using the velocity approach. I give them the formula, nominal GDP = M x V, and the definition of velocity as the turnover rate of M, i.e., the number of times the money supply M is exchanged. Again, the student's answer comes readily: nominal GDP = \$15 x 1 = \$15. Eureka! MV = pQ (This formulation of the quantity theory, and its variations, MV = PT, MV = Py, is due to Irving Fisher (1911), one of the first and most ardent defender of that theory in the twentieth century).

Upon inquiry, I have learned that the first round of simulation has enabled my students to visualize in concrete terms how one measures V, M, nominal GDP, and real GDP. To reinforce their comprehension, I ask my classroom economy to engage in a second round of exchange identical to the first. However, this time, for variety's sake, I use pens instead of pencils (the class still keeps the previous quantity of pencils) and I give one pen to each of the members in group C, the side that has pencils at this point. (To avoid interruption, there is a reversal of role, so that the side that has pencils, i.e., group C, now becomes the supply side). Thus, in this second phase of the exercise, one side has 15 pencils and 15 pens and the other side has \$15. Again, the market equilibrium price of each pen is also supposed to be one dollar, and the side that holds money will now buys pens from the other side. The same ground rules apply (budget-exhaustion, no debt, and so on). When the second round of transaction is completed, I ask my class to figure out the latest nominal GDP figure, using the familiar expression $\sum$ (p x Q). The correct answer comes from my class as readily as the first time, namely, nominal GDP = (\$1x15 pencils) + (\$1x15 pens) = \$30. To test their mastering of the velocity concept, I also ask them to calculate the nominal

GDP using the velocity approach. Once again, the students have no difficulty meeting the challenge: MV = \$15 x 2 = \$30. The supply of money has changed hand twice. Thus, to my class, it appears that the equation of exchange as an identity, MV = pQ, has been established beyond a doubt.

Changing The Money Supply

I take a further step to help the student relate to the link of the quantity of money to prices. This time, I start the simulation over again by taking back all the goods and money from this economy. I then give each student in one group two dollars, and each student in the other group one pencil. I ask those who have the money to spend all their money on the good offered for sale by the other group, i.e., per budget-exhaustion assumption. With that restriction, the "equilibrium market" price jumps to two dollars for each unit of the good, namely pencils. Every class member realizes that this economy has experience one hundred percent inflation. Why? The money supply M is doubled, of course. However, what happens to nominal income? The answer is apparent: nominal GDP = $\sum$(p x Q) = \$2 x 15 = \$30. Using the alternative approach, MV = \$30 x 1 = \$30. In short, by comparison with the result of the first round of simulation where GDP = \$15, the conclusion here is that doubling the money supply doubles the price, hence higher nominal income, leaving real income Q constant. This situation is known as the neutrality of money: it is simply a veil. A change in the money supply changes the price level, while leaving the real macro variables untouched! We have taken the first step to try to understand the quantity theory. Further elaboration and explanation are needed, and some historical grounding would be an appropriate place to start.

A HISTORICAL BACKGROUND

From a historical perspective, some crude forms of the quantity theory can be traced back to the times of antiquity in China and Rome. In their writings, disciples of Confucius (551-479 BC) such as Ma-twan-lin and

Chia Yi, and of Socrates (470-399 BC) such as Xenophon had discussed the about the importance of value of money, its relation to prices, in a broad context of demand and supply of money and goods (Hegeland 1969). One of their concerns was the attempt to understand what determines the value of money and how to keep that value stable. Some authors (e.g., Marget 1942; Hechscher 1935; Kemmerer 1907) believe that the Roman lawyer Julius Paulus to be the first expositor of the quantity theory. However, there were authors who maintained that Davanzati is first economic writer who dealt with the specific issue raised by the quantity theory in its modern form (Hegeland 1969). Davanzati was once the head of the Mint House of Naples and was the author of a book published in 1588 that contains what is considered as the original statement of the quantity theory by linking the quantity of money to the value of the quantity of goods. Other classical contributors to the quantity theory include such writers as John Locke, David Hume, Richard Cantillon, David Ricardo, and John Wheatley. To these writers and early theorists, the common elements essential to the quantity theory are 1) constant proportionality between the quantity of money and price, 2) money-to-price causality, 3) neutrality of money, (4) independence of demand and supply of money, and 5) real causes and monetary causes of changes in absolute and relative price (Humphrey 1997; Patinkin 1995). Modern versions of the quantity theory are often associated with Knut Wicksell (1898, 1906) and Irving Fisher (1911). While Fisher was the first to express the quantity theory in its contemporary form, emphasizing the equiproportionality of money and prices, Wicksell focused on the real-balance effects and argued that short-run price fluctuations generate efforts by wealth-owners to take appropriate measures to stabilize their real balances. In other words, Wicksell maintains that both supply and demand of money play a role in determining the price level (Humphrey 1997, pp. 76-77)

Many economists think that Fisher, the Yale economist, is the author responsible for formulating the definitive version of the quantity theory. Fisher started out with the equation of exchange, which "...relates to all the purchases made by money in a certain community during a certain time." (Fisher 1922, p. 16). Therefore, "the equation of exchange is simply the sum

of the equations involved in all individual exchanges in a year." (Fisher 1922, p. 16). Hence, in Fisher's own words, $MV = \sum pQ$. Alternatively, if P is the weighted average of all the p's and T is the sum of all the Q's, then according Fisher, the above equation of exchange can be reformulated as $MV = PT$. This is same as the expression we use for our simulation purpose as seen above. Fisher left little doubt that the place to start the quantity theory is the equation of exchange, which he saw essentially as an identity. He summarized his exposé in three concise propositions, which he called theorems, in this way (Fisher, 1922, p. 26):

(1) If V and the Q's remain invariable while M varies in any ratio, the money side of the equation will vary in the same ratio and therefore its equal, the goods side, must vary in that same ratio also; consequently, either the p's will all vary in that ratio, or else some p's will vary more than in that ratio and others enough less to compensate and maintain the same average.

(2) If M and the Q's remain invariable while V varies in any ratio, the money side of the equation will vary in the same ratio, and therefore its equal, the goods side, must vary in that ratio also; consequently, the p's will all vary in the same ratio or else some will vary more and others enough less to compensate.

(3) If M and V remain variable, the money side and the goods side will remain invariable; consequently, if the Q's all vary in a given ratio, either the p's must all vary in the inverse ratio or else some of them will vary more and others enough less to compensate.

Succinctly, other terms being equal,

$$1)\ M \uparrow\downarrow\rightarrow P \uparrow\downarrow,\ 2)\ V \uparrow\downarrow\rightarrow P \uparrow\downarrow,\ \text{and}\ 3)\ Q \uparrow\downarrow\rightarrow P \uparrow\downarrow$$

According to Fisher, proposition (1) above "constitutes the quantity theory of money." In his words, "...the level of prices varies directly with the quantity of money in circulation provided the velocity of circulation of that money and the volume of trade...are not changed." (Fisher 1922, p. 14). One is not likely able to find a more forceful statement of the equation of exchange in the literature. Briefly, the quantity theory of money is the proposition that, with velocity constant, changes in the money supply are

reflected in a proportionate increase in nominal income. Finally, Fisher argued that the definition of money must be broadened to include demand deposits. He pointed out that even though the original formulation of the equation of exchange is correct, it is an error to leave consumer bank deposits out of the equation. So, if M' is the "total deposits subject to transfer by check and V' is the "average velocity of circulation," then a complete equation of exchange must read as $MV + M'V' = \sum pQ. = PT$

According to Hegeland (1969), Kemmerer (1907) was among the first writers to use a variation of the equation exchange for statistical work. Kemmerer's formulation was MR = NEP or P = MR/NE, where M refers to the quantity of money in circulation, R the number of time M is turned over in a period, N the quantity of the goods exchanged, E the number of times N is exchanged and P the average price of the goods. In that formulation, MR can be interpreted as the money supply and NE the good supply. Then, changes in the price can be attributed to changes in N, E, R and not just changes in M.

Milton Friedman is most closely associated with the "monetarist" school of thought. Although Friedman did not pretend to give an exact expression to the quantity theory, which he argues is a theory about demand for money rather a theory of output or price, he made a serious attempt to synthesize a rather loose oral tradition at the University of Chicago regarding monetary theory (The Chicago "school", as it is sometimes referred to, is associated with Henry Simmons, Lloyd Mints, Frank Knight, Jacob Viner, and, of course, Milton Friedman himself). To expose his ideas, however, Friedman relied on the classic equation of exchange but reformulated to make his point. Friedman started out with a demand for money equation, in which demand for money M is a function of the price level P, interest on bond rb, interest on equity re, the rate of change in prices, the ratio of non-human to human wealth w, money income Y, and a variable standing for tastes and preferences. Assuming the demand for money function is homogeneous of degree one, he then derived the equation in "the usual quantity theory form" as follows:

$$Y = v(r_b,\ r_e\ ,\ e,\ 1/P \cdot dP/dt,\ w,\ Y/P,\ u)\ .\ M$$

Thus, according to Friedman, demand for money is a function of real income and the cost of holding money. As discussed below, the above equation serves as a theoretical underpinning for the monetarist policy prescription on monetary policy.

SUBSTANTIVE ISSUES AND CONTENDING PERSPECTIVES

In the form of the equation of exchange, the quantity theory tells a very simple story. The monetary value of goods and services produced (pQ or Py) must be identically equal to the amount of money spent on them (MV) (Fisher also called the latter, "expenditure," 1991, p 24). This is evident from the results of the simulation. However, as a theory, the functional relationship between the terms is what makes the equation of exchange a theory. Consequently, theoretical and policy implications of the quantity theory need to be explored. The rest of this paper addresses two issues; one relates to the meaning of money and the other, the role of money on stability and growth.

What is Money?

As seen earlier, Fisher is one the earliest modern economist to define money to include demand deposits and checks. His emphasis is thus on the medium-of-exchange function of money.

Friedman's definition of money distinguishes between two approaches. The transaction approach stresses the medium-of-exchange function and the cash-balances approach focuses on the store-of-value function (Friedman 1971). According to the monetarist approach, money is considered as an exogenous variable over which the government has considerable control. This is the transaction approach to money. By changing credit availability through its tools of monetary policy, the government can effectively change the money supply. Changes in credit availability have a direct impact on economic activity through investment and consumption expenditures. But according to monetarists, such power is destabilizing, because it is powerful. Inability to diagnose correctly the source of macro instability and failure to

act at the proper time has tended to make discretionary monetary policy counterproductive.

Does Money Matter?

As mentioned earlier, the quantity theory of money posits that prices and the supply of money vary positively and proportionately, i.e., equiproportionality. What this means is that equiproportionaliy is present in both the equation of exchange as an identity and the equation of exchange as a quantity theory. Fisher based that conclusion on his macro studies in which he found that in the long run, changes in M does not affect V or T (or Q). He considers V stable (in the long run) and independent of the other variables in the equation. However, in transition, that is at certain time before the equation of exchange has a chance to re-establish itself, changes in M may affect V and T (Fisher 1911, pp. 158-60). Put differently, Fisher's "transition periods" are the times when the economy adjusts to prices changes induced by changes in money supply. Thus, while Fisher admits the possibility that the monetary variables can affect the real variable, he argued that temporarily the link between money and prices may be weak, but in the end, equiproportionaliy will reassert itself. Fisher was unequivocal about the neutrality of money:

> *...(except during transition periods) the volume of trade, like the velocity of circulation of money, is independent of the quantity of money. An inflation of the currency cannot increase the product of farms and factories, nor the speed of freight trains or ship. The streams of business depend on natural resources and technical conditions, not on the quantity of money.* (Italics mine).

How then do changes in money supply affect the real variables during the "transition period"? Again, Fisher's position is that the initial changes in prices provokes a chain reaction in the money and good markets, affecting velocity, interest rate, profits, and business activities. Fisher describes the cumulative process in a transitional sequence as follows. When monetary disturbance occurs, prices ("The price level is normally the one absolutely

passive element in the equation of exchange," Fisher 1911, p. 172) rise, which increases velocity, which leads to increase in profits, loans, and economic activities, i.e., the Q's. (Fisher 1911, p. 63).

In short, given his preoccupation with the purchasing power of money (the title of his classic 1911 book), as a forerunner of the contemporary monetarist school, Fisher's quantity theory can be thought of as a theory of prices, or be more precise, theory of long-run price behavior. The policy prescription that flows from the works of Fisher and other early monetarists is that the key to macro stability lies in keeping prices stable through control of the money supply.

A major difference between the early monetarists and the contemporary or later monetarists is the way changes in money supply affect prices and output. While the former sees the effect level of money supply on output through changes in the prices, velocity, interest rate, and profit, the latter describes the transmission mechanism in terms of the theory of demand for money. The monetarist theory of demand for money, as reflected in Friedman's work (Friedman 1971), posits that for wealth-holders, how much money they want to hold depends on their income, wealth, interest rates, rate of returns on financial assets, and rate of change in the prices of goods. Changes in the supply of money cause changes in prices, hence in wealth-holders' real balances, which in turn prompts them to adjustment their portfolio. To the extent that wealth-holders take action to realign their expenditures to reflect changes in their real balances, this adjustment endeavor affects real variables such as investment and consumption, which affects economic activities. In short, one may say that monetary changes affect production and output in the short run through real-balance adjustment effects. Friedman provides his statement of the quantity theory as follows:

> ...the empirical generalization that changes in the desired real balances (in the demand for money) tends to proceed slowly and gradually or to be the result of events set in train by prior changes in supply, whereas, in contrast, substantial changes in the supply of nominal balances can and frequently do occur independently of any changes in demand. The conclusion is that substantial changes in prices or nominal income are invariably the result of changes in the nominal supply of money (Friedman 1968).

Thus, the monetarist view about the quantity theory is that money does matter and that the quantity of money M influences economic activities and through which, real macro variables such as consumption, investment, and real and nominal income. In addition, like the early monetarist writers, Friedman posits that velocity is more stable than Keynes's investment multiplier. The later monetarists point to the high correlation between the money supply and nominal GDP as a proof that velocity is stable. Friedman's monetary research led him to conclude that money is a better predictor of income than investment. The research of Friedman and Schwartz and other monetarists shows that recessions have tended to follow strong deceleration in the money supply. Contrary to the Keynesian view that the spending of money is more important for economic stability and growth, the monetarist view keeping the supply of money honest, i.e., in line with changes in productivity, is the key to stabilization policy. Thus Friedman's policy prescription is to keep the growth of money supply stable and predictable.

On the other hand, Friedman warned against any tendency to equate his demand for money equation with a theory of income determination. In fact, he was quite explicit about that:

Suppose the supply of money in nominal units is regarded as fixed or more generally autonomously determined. Equation (13) [given above] then defines the condition under which this nominal stock of money will be the amount demanded. Even under these conditions, equation (13) alone is not sufficient to determine money income. In order to have a complete model for the determination of money income, it would be necessary to specify the determinants of the structure of interest rates, of real income, and the path of adjustment in the price level. (Friedman, 1956, p. 15).

The Keynesian Perspective

Kahn (1984) describes the formation of Keynes as an economist as "a struggle to escape from the stranglehold of the Quantity Theory [of Money.]". Keynes was initially attracted to the classical quantity theory because he saw it as providing a reasonable framework to tackle the problem

of short run economic instability. This situation clearly shows the influence of Knut Wicksell on Keynes'economic thought. Keynes himself was working on compiling price statistics to deal with the problem of inflation. In his early writing, Keynes went along with the Wicksellian thinking that the price level varies proportionately with the supply of money. For a long time, Keynes believes that monetary policy is an effective stabilization tool (Skidelsky 1995).

However, with the publication of his General Theory, Keynes no longer believes that in the equation of exchange, the level of output Q is an independent variable as the early monetarists had assumed. With that departure, Keynes and his followers argue that the quantity of money has a weak relation to output. Monetary is a largely ineffective stabilization policy because increases in the money supply are absorbed into cash balances, causing velocity to fall. So any variation in the money supply is offset by changes in velocity in the opposite direction, so as to leave aggregate demand unchanged. That being the case, the link between M and nominal income advocated by the monetarist would cease to exist. To Keynes, the strength of monetary policy is diluted by the existence of the liquidity trap and the fact that investment can be interest-inelastic. Keynes saw the link between the supply of money on the price level and real output to be a complex one. For example, in one of his class lectures, he argued that "ceteris paribus, the chain of causation is: increase in the volume of money -fall in the rate of interest-increase in the volume of investment
-increase in the volume of output-through diminishing returns in the short period and a rise in the wage units, a rise in prices." (Rymes 1989). (italics in the original).

Central to Keynes' theory on monetary policy is the importance of money as a store of value and his liquidity preference theory associated with that function of money. This is sharp contrast with the Wicksellian concept of money that stresses its medium-of-exchange function. The implication of Keynesian monetary analysis is clear: fiscal policy based on taxes and spending is the more effective tool to address instability problem regarding output and employment. In other words, the Keynesians believe that the

supply of money is less important than the spending of money because the latter affects aggregate demand and output directly.

CONCLUDING REMARKS

The outcome of this simulation exercise has been that the students seemed to enjoy a fresh change of venue and gain a better understanding of equation of exchange, a clearer idea about the quantity theory as a theory about money, price, and income. Although simplistic in its construct, the simulation seemed capable of making more accessible to many students some of the main ingredients of macroeconomics and the linkages between them. In addition, the students gain a deeper perspective of the various contending viewpoints and policy prescriptions. Needless to say, one can come up with variants of the design described here. As is often the case, any pedagogical device aimed at bringing the "real" world into the classroom is always a welcome learning experience for the students and faculty involved. Our experiment affirms this.

As an effective teaching tool thanks to its simplicity, or perhaps because of it, this exercise faces a number of limitations. In the first instance, the model underlying the simulation is one of comparative statics. This characteristic is clear as the instructor moves his "simulated economy" from one phase to the next. For example, as that economy doubles its output from 15 units (goods) to 30 units, the quantity of money being held constant (at $15), nominal income also doubles. Similarly, with a constant quantity of goods, when the quantity of money doubles, the price also doubles. The dynamic process of change in income, real and nominal, and changes in the price level cannot be demonstrated by the exercise. The students witness the change as an outcome and not as a process, so that what they actually see are like snapshots. Here, one hopes that the students use their imagination to visualize the successive phases of economic changes as the economy moves from one phase to the next. They have to fill in the frames between different scenes of a film script, so to speak.

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ECONOMICS IN THE INTEGRATED BUSINESS CURRICULUM: IN or OUT?

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ABSTRACT

We analyze the unique experiment of teaching junior level economics to business students at the University of Idaho within the framework of the Integrated Business Curriculum (IBC). Economics was originally directly embedded in the IBC program, but later became an independent course to be taught in conjunction with the IBC. We look at the costs and benefits of teaching economics within and outside of IBC. We use concepts and criteria borrowed from software engineering, to develop what we call The Three C's of Curriculum Development, Cohesion, Coupling and Cost.

JEL Classification: (Primary) A22, (Secondary) I21

INTRODUCTION

The idea of integrating a common body of business courses has gained wide acceptance within the academic and professional business communities. In recent years, the American Assembly of Collegiate Schools of Business (AACSB) has been actively promoting such integration, noting that without integration the traditional business education could become out of touch with the reality of the business world (Smith, 1995).

The general literature on various innovative teaching methods has grown dramatically as a response to demands for change and is far too large to list all here. (However, interested readers may also refer to Stover et al. (1997), Dangerfield and Bailey (1996), and Cluskey et al. (2001) on issues related to integrated undergraduate education.) We focus here on studies, which concentrate on devising methods in business schools to improve the managerial skills of the graduates (among others, see Pharr and Morris (1997), Byrne (1993), and Lataif (1992)). The

arguments about the improvement usually focus on adapting a system that has "cross-functional" integration or interdisciplinary and team-based approaches to business problems (Miller, 2000).

A common point in this literature is that business students should learn management skills in a team-based environment, not in the traditional textbook way. Many companies are dissatisfied with the education and research coming out of traditional business programs, and thus have turned more to in-house training (Leonard, 1992). Also, as Mintzberg (1992) points out, the graduates of business schools are parachuted into mid-level companies with authority over people who have vast knowledge in on-the-ground business and customer relations, thus creating a two-tier system. A boss has formal education, but not enough experience on one side, and an employee knows the customers, market conditions, and business environment, but has less formal education.

This in no way means that everybody has dropped the so-called traditional teaching models. As a matter of fact Jacobs (1991), Pharr et. al. (1998), Cotton (1982), St. Clair and Hough (1992) and Mason (1996) warn those who rush to integrative programs about problems created by the newly invented methods such as teacher knowledge, assessment, commitment from the faculty members and their institutions.

A few undergraduate business programs listened to the demands of the business world and attempted to develop new integrative programs. However, the scope and content of an integrative program varies from school to school, or even from year to year within the same school. No undergraduate program, however, is more integrated than that of the University of Idaho College of Business and Economics (UI CBE).

Furthermore, many business programs embarked on a curriculum development process to survive in the competitive educational market, and especially to improve employment prospects for their graduates. The College of Business and Economics at the University of Idaho is an example of an institution that has adopted the policy to review the curriculum constantly. Its Integrated Business Curriculum (IBC) is the result of these efforts.

One specific challenge for program designers is to incorporate the relevant disciplines of economics and accounting into the program. In this study, we consider the position of economics vis-à-vis the IBC at the UICBE. In the first format of the IBC, economics was a direct part of the program, spread throughout it. In the latter format, it is a separate course with close cooperation with the IBC.

Miller (2000) analyzes the costs and benefits of fully integrating economics into IBC as in the earlier format. Nevertheless, the later innovation in the structure of the program, which can be attributed partly to the academic aspirations but also to economic constraints, as well, necessitates a fresh look at the pluses and minuses of economics education within the integrated business curriculum framework.

In other words, in this analysis, we try to compare the cost and benefit of two alternative methods of economic education within the integrated business education framework. The first option is the full merger of the economics material within the integrated business curriculum, not necessarily as a distinctively identified module but rather as support material to all business issues being discussed in the modules. The second option is to take economics out of the integrated business curriculum and make it into a semi-independent course under a different title, but in close cooperation with the integrated business curriculum program.

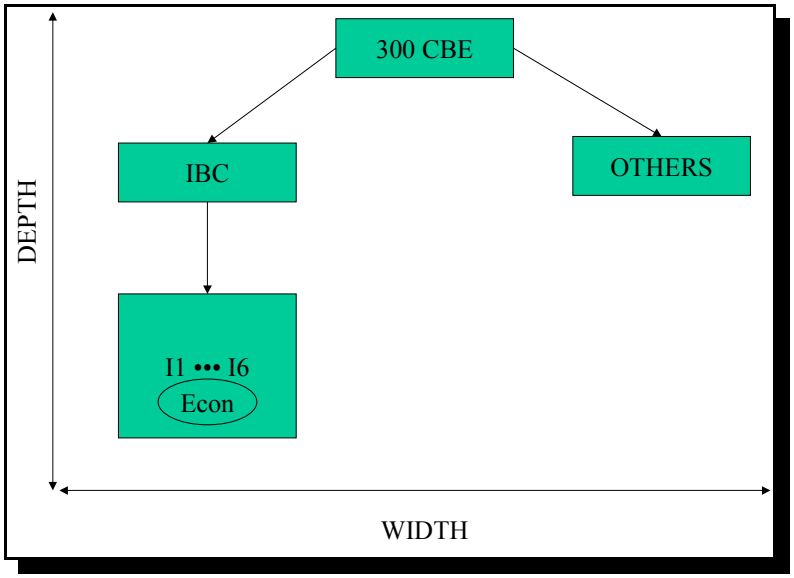
We will try to evaluate the costs and benefits of the two arrangements with the help of criteria borrowed from software engineering and economics.

ECONOMICS IN THE UNIVERSITY OF IDAHO IBC

Faculty in the IBC team-teach six cross functional, interdisciplinary junior-level business modules made up of the content previously found in the stand-alone courses, marketing, finance, production and operations management, information systems, human resource management, quantitative methods, and international business. The whole program is developed on an hour-by-hour basis for the entire year by the faculty team during the summer. It normally is spread over two consecutive semesters

Economics now has a special status in the program. Originally economics was fully integrated into IBC like the standard business disciplines. But in the most recent format, economics is taken out of the main body of IBC, delegating its content to a separate course to be taught in coordination with it. Accounting, too, has been recently incorporated into the system in a manner similar to that of economics.

Figure 1: The Structure of IBC with Integration of Economics

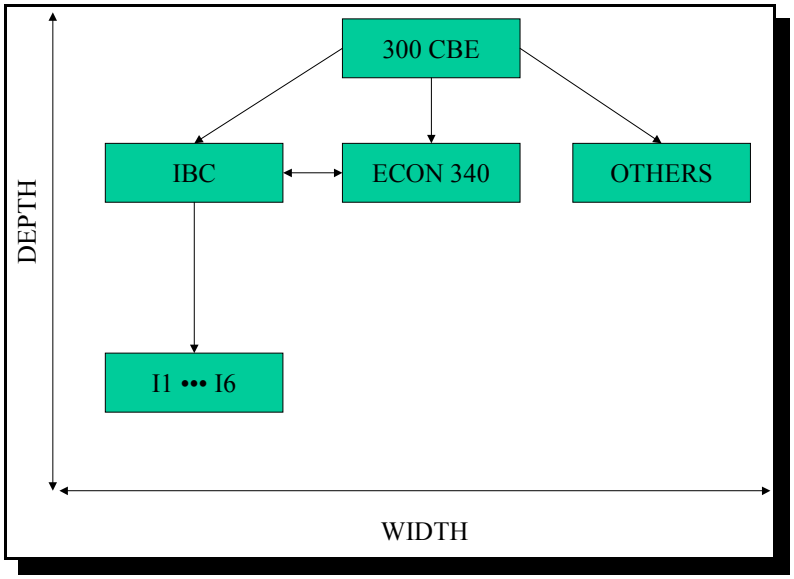


The 300 CBE refers to the junior level courses, which are composed of IBC modules and other courses (OTHERS). There are 6 IBC modules I1 through I6. Economics is spread throughout the IBC modules in this setup. Depth shows the vertical stratification of the junior level courses while Width indicates such an organizational structure in the horizontal sense.

Figures 1 and 2 represent the junior level course structure in the CBE with specific reference to economics. The figures represent the difference in breadth and depth of the junior-level program between the two versions of IBC. Note that the depth of the program remains the same in both versions, but that the program becomes wider in the new version. These diagrams facilitate our use of software engineering concepts in evaluating this curriculum change.

In software engineering, the courses shown at a lower level on the vertical axes of both figures are called "sub-ordinate." Likewise, the courses placed at a higher rank are called "superordinate." Thus, the original format, in which economics is spread among the modules of IBC, economics is subordinate to the main IBC modules, because they are the courses to be taught with a support from economics. The new classification puts economics at the same level with these les.

Figure 2: The Structure of IBC Without Integration of Economics



The notation remains as in the previous picture with the addition of Econ 340, Managerial Economics, as an independent course in the new setup.

Most of the economics content has been kept with the move to the new system, although certain minor adjustments have been made to the topic coverage in the new structure. Error! Reference source not found. shows the contents of the new economics course.

Table 1: Managerial Economics Contents		
Topic	Hours	Module
Introduction	1	
Free Riders and Team Production	1	Team Building
Game Theory and Team production	1	Team Building
Voting and Social Choice	1	Team Building
Price Discrimination	1	Business Systems-Business Operation Decision
Exchange Rate Determination	2	Business Systems
International Economics	2	Business Systems
Balance of Payments	2	Business Systems
Demand Estimation	2	Product Process Planning
Data Analysis and Graphs	1	Planning & Decision Making
Multivariate Linear Regression	5	Planning & Decision Making
Sources & Interpretation of Economic Forecasts	1	Planning & Decision Making
Business Cycles	1	Planning & Decision Making
Economics of Information	2	Management Firm Resource
Productivity and Cost	1	Management Firm Resource
Productivity and the Service Sector	1	Management Firm Resource
Pricing	1	Business Operation Decision
Auctions	2	Business Operation Decision
First Day	1	
Last Day Wrap-up	1	
Midterm	1	
Final Examination	0	
Total	30	

THE THREE Cs OF CURRICULUM EVALUATION

The biggest hurdle in analysis of curriculum change is surely the yardstick with which the cost-benefit analysis is carried out. Though we recognize the near-impossibility of creating a universally acceptable quantitative criterion, we employ a qualitative analysis, based on concepts borrowed from software engineering. These concepts suggest the characteristics of "good" software, and we believe they can apply to innovations in the education field as well. More specifically, we will make use of the software engineering concepts cohesion and coupling. By adding a third concept, namely cost, we have what we call the *Three Cs of Curriculum Evaluation.* To our knowledge, this is a novel method of interdisciplinary program evaluation.

In software engineering, Stevens et al (1974) were the first to introduce the notion of cohesion, an ordinal scale of seven levels that describes the degree to which the actions performed by a module contribute to a unified function. That is, "cohesion is a measure of one-ness of a module" (Rinker, 2002). Cohesion shows the functional strength of a module.

According to Stevens et al. (1974) and Yourdan and Constantine (1979) the idea of coupling was introduced about the same time as cohesion. Coupling is "a measure of interconnection among modules" (Rinker, 2002). In computer science jargon high cohesion and low coupling are desirable characteristics of good software. Nevertheless, empirical research has shown that most of the time the two concepts are inversely correlated for any software program. These concepts, cohesion and coupling, have found their places in standard computer science textbooks. (See for example, Friedman and Friedman (2000).) Cost, on the other hand, is the economic opportunity cost as explained further below.

In applying these criteria to the question at hand, we try to analyze "quality improvements" obtained as a result of a policy change, Q, from one mode of economics instruction to another. Q is assumed to be directly proportional to the variables, cohesion, coupling, and cost, to yield a relationship that can be expressed as

$$1. \qquad Q=f(\text{Cohesion, Coupling, Cost}) \tag{1}$$

where f stands for any functional form. The exact specification of f turns out to be immaterial here. The question, we have to analyze is the partial impact of the right hand side variables on the dependent variable.

Slightly drifting away from software engineering methods of evaluation, we concentrate on the cost and benefit of policy changes on the subjects affected from these changes. Thus, in the rest of the paper, we define the 3C concepts within the framework of economics, and carry out a cost-benefit analysis for several categories of individuals such as students, economics faculty, the UI CBE faculty, etc., who are directly or indirectly affected by the reorganization. The categories are based on the list identified by Miller (2000).

EVALUATION OF THE ECONOMICS/IBC CURRICULUM CHANGE

As in software engineering, we define cohesion as a measure of "one-ness" of the contents of the IBC program. In other words, if all the courses which are part of IBC serve one purpose only then is IBC highly cohesive. Any divergence from that phenomeonon contributes to dilution in the cohesiveness. The more cohesive a structure is, the more specialized it is in its job. Because economics is not a core business topic, and IBC is mainly a regrouping of the several business disciplines as mentioned above, taking economics out makes IBC more cohesive in this sense.

Coupling measures how each part within IBC connects to other parts. Although IBC becomes more cohesive with the exclusion of economics, it is a fact that all current modules of IBC need economics support in one way or another. Economics perhaps is the most common denominator of all modules. By taking economics out, it is more difficult to see the theoretical connection among topics considered within IBC. Thus, there is less coupling within IBC after the departure of economics. In fairness to software engineering, let us acknowledge that we are interpreting coupling in a totally different way here, which in a sense contradicts the measure of "good" software. We see more coupling to be better as opposed to worse as is the interpretation in software engineering.

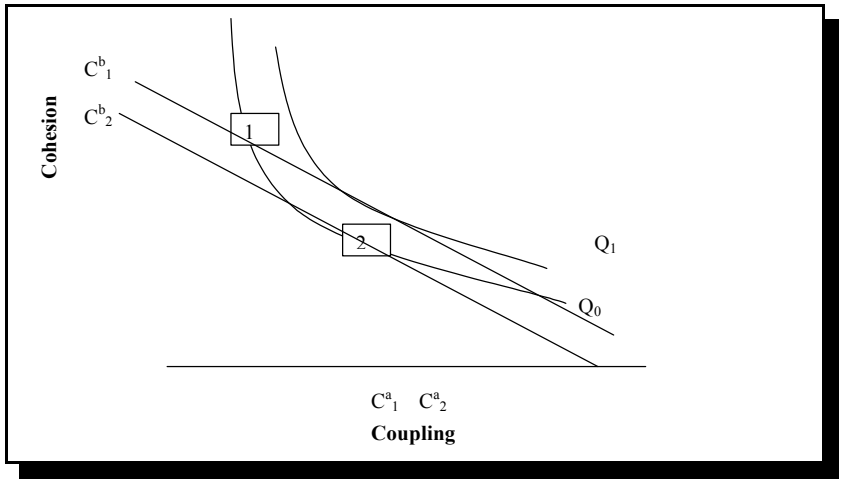
Cost is probably the most economically familiar concept of the Cs. We consider cost to be the opportunity cost of not having economics as part of IBC.

Our strategy is to look at the two scenarios, one with economics in IBC and other outside it, and consider the cohesion and coupling involved. We then relate this to the consideration of cost for the parties involved. This allows us to rewrite equation 1 for cost. Assume that for a given level of quality, Q0, the cost function can be expressed as

$$2. \qquad C=g(Cohesion, Coupling, Q0)$$

where g represents a functional form. Equation 2 is graphed in Figure 3. Graphically speaking, the cost of adopting coupling~cohesion combinations indicated by points 1 and 2 in the figure is given by the position of the isocost line running through each coupling~cohesion combination. The slope of the isocost line represents the subjective weights attached to each component. Needles to say, the cost weighting by students, faculty and administrators is an issue of conflict. (This may necessitate the consideration of yet another C, that is Conflict. Given the vast variety of users of a specific software program, this may very well apply to software engineering. We believe this is our give-back to Software Engineering!) This point is illustrated by the two sets of the isocost curves C^j_k where j=a, b and k=1, 2. Thus, the equilibrium point is obtained at the equality between the isocost and isoquant curves.

Figure 3: The Isoquant Isocost Map



Q_i refers to the levels of quality where Q_2 is higher quality than Q_1. The cost relativity is represented by the loci of the cost curves C^j_1 vs. C^j_2 where j=a and b. The rank of the cost schemes is $C^a_2 \geq C^a_1$ and $C^b_1 \geq C^b_2$.

We will next analyze the costs and benefits of the two alternative modes of teaching economics within the construction of IBC with the tools explained above.

ANALYSIS OF COSTS-BENEFITS OF ECONOMICS IN OR OUT OF IBC

Students

With economics out of IBC, the increased cohesiveness makes it easier for students to follow the material, because it is more closely connected. However, the relatively weaker coupling obtained in IBC following the departure of economics makes it more difficult for students to see the background of the discussions, and the links among business topics which are more often than not explainable with the help of the economic theory. The universal applicability of marginal analysis is just one example

Miller (2000) suggests that, the direct inclusion of economics into the IBC program was not questioned by students, who saw the economics in action. Student interest in economics topics within IBC was further apparent from the content of student presentations. The new format of IBC obviously makes that opportunity more difficult. In that sense, this is a disservice to students' learning experience. Even though most of the economics topics of the IBC program are carried over to the newly created IBC economics course, Managerial Economics, the new course is a one semester course, and the presentation of topics sometimes precedes, while sometimes comes quite later than the related IBC material.

From a students view point the opportunity cost of not having economics within IBC, but rather in the form of a separate course, means an additional class to register for, take exams in, etc. The testing in the separate course is unsurprisingly more detailed than the testing of economics concepts within the IBC program itself. Furthermore, even though it does not increase the upper level economics credit hour requirements, withdrawal of economics from IBC led to a 17 credit hour newly designed IBC plus a two credit hour managerial economics course in lieu of the previous 18 credit hour IBC program in total credit hours. The faculty made this choice, however, it increased required courses for the students.

IBC Economics Faculty

The economics faculty teaching the newly created IBC course, Managerial Economics, has the grand task of designing a more cohesive course out of the topics which were originally chosen to conveniently accommodate IBC needs. Topics ranging from microeconomics to macroeconomics, to international economics, to social choice theory, are difficult to justify teaching one after another unless a good connector is found. From experience in experimental versions of this course, we find that students most of the time seem to be wondering "why this topic now" unless a good explanation is provided. However, once the new course is developed and good connectors between topics are established, it seems to work more smoothly. We would advise that faculty make frequent references to IBC modules in justifying the content of such a course material. Nevertheless, as related IBC topics to be presented, it is still quite difficult to present a cohesive framework, especially in connection with the IBC material to which Managerial Economics is supposed to be a support.

Topics chosen from a wide scope of economics presented independently of IBC has low coupling. That is another challenge, which is in close proximity of the cohesion problem as identified above.

The biggest gain an IBC economics faculty gets from teaching outside of IBC can be stated in terms of the opportunity cost. The teaching load is much less in the newer format since economics faculty members are no longer involved with time-consuming student mentoring activities of IBC along with class attendance and faculty team meetings. The economics faculty members also gain full control of the tests and teaching style even though, the contents are not exclusively determined by him or her.

Non-IBC Economics Faculty and Economics Program

Of the 3Cs, cost seems to be the only relevant point of discussion for the non-IBC economics faculty. Miller (2000) states that although the involvement of economics faculty in IBC brought an extra burden on the economics faculty, which necessitated hiring temporary instructors to solve the teacher problem, it brought a better visibility of the economics field to the colleagues in the college.

College of Business and Economics Administration

Here, too, considering the cost side is the most relevant issue. The creation of managerial economics has extended the width of the junior level course offerings, as mentioned above while discussing Figure 1. This necessarily brings a heavier coordination task onto the shoulders of the college administrators, which is increased cost. Nevertheless, the original format would have required hiring more economics faulty to cover other economics classes since IBC has grown so much that assigning one economics faculty to each section was prohibitive in terms of cost.

CONCLUDING COMMENTS

In this paper, we analyzed the unique experiment of teaching junior level economics to business students at the University of Idaho within the framework of Integrated Business Curriculum (IBC). Economics was originally directly embedded in the IBC program, but later became an independent course to be taught in conjunction with the IBC. We looked at the costs and benefits of teaching economics within and outside of IBC. Such a policy change definitely affected several constituencies such as students, faculty and administrators. We developed what we call the Three C's of Curriculum Evaluation, that is, "Cohesion, Coupling and Cost," to analyze the impact of taking economics out of IBC on the affected parties. We benefited greatly from software engineering in computer science in developing the criteria. It is clear that these criteria can be applied to other educational policy consideration, as well. We hope such an analysis can help other schools better evaluate their curriculum change decisions.

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HIGH SCHOOL ECONOMIC EDUCATION IN EASTERN EUROPE: FINDINGS FROM FIVE NATIONS

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ABSTRACT

This paper reports a snapshot of the current state of high school economic education in five Eastern European nations. The findings of this paper indicate that the 20-item TEL that was developed and translated for use in this project is a reliable instrument for use in high school classrooms in five different countries. The findings of this paper also indicate that the National Council on Economic Education's in-service teacher training workshops and its efforts to have workshop participants develop effective teaching materials and techniques are beginning to have a positive influence on student test performance in the countries where they have been used most extensively.

INTRODUCTION

The study reported in this paper was initiated during a weeklong "Developing Skills in Evaluation Workshop" held at Indiana University in July 2000. The workshop was organized by the National Council on Economic Education (NCEE), and funded by the U.S. Department of Education in cooperation with the U.S. Information Agency. The workshop staff and five International Economics Education Research Fellows worked with 15 participants from eight Eastern European countries to improve their knowledge of techniques for assessment and research in economics education and to develop joint research projects.[1]

The workshop staff and the Research Fellows compiled a 20-item version of the third edition of the Test of Economic Literacy (TEL III, see Walstad &

Rebeck, 2001) for translation and field-testing in Eastern Europe. Participants in the 2000 workshop as well as international participants in two similar workshops held at Indiana University in 1998 and 1999 agreed to serve as coordinators in helping with the translation and administration of the 20-item TEL in their countries, and to send test results to Indiana University for coding into the data base used in this study. In addition to the test, a brief teacher questionnaire and a set of student background questions were also translated and administered as part of the 20-item TEL project.

This paper will describe the structure of the 20-item TEL and an overview of the sample of schools from which test results were obtained. This will be followed by a description of the types of high school economics courses offered in the participating countries and the participating teachers' background and training in economics. Student test performance across grade levels, by gender, and by item and content category in the participating nations will then be presented and compared with the performance of students participating in the U.S. norming of the TEL III.

STRUCTURE OF THE 20-ITEM TEL

The 20-item TEL is similar in structure to the 40-item TEL III in terms of content coverage, cognitive levels, and overall test reliability. The first five questions on the 20-item TEL involve fundamental economics concepts and examine the topics of scarcity, opportunity cost, specialization and productivity, incentives, and exchange. Questions 6-12 deal with microeconomics and examine the topics of competition, supply and demand (3 questions), monopoly, and market failures. Questions 13-16 deal with macroeconomics and examine the topics of Gross Domestic Product, potential output, aggregate demand, and inflation. Questions 17-20 deal with international economics and development and examine the topics of specialization and exchange, comparative advantage, exchange rates, and measuring a nation's standard of living.

With regard to the cognitive level of questions, two of the questions on the 20-item TEL (10%) are classified as "knowledge", five (25%) as "comprehension", and 13 (65%) as "application". These percentages compare with 15%, 30%, and 55% on TEL III Form A and 17.5%, 27.5% and 55% on TEL III Form B.

The 20-item TEL reliability coefficient of 0.81 obtained in this study is relatively high for such a short test. It compares with reliability coefficients of 0.89 for forms A and B of the 40-item TEL III.

All questions on the 20-item TEL have the four options arranged in a uniform short-to-long format, with each option being the correct choice an equal number of times. This format, which differs slightly from that in the TEL III, helps insure that choice of the correct option is based on economic knowledge and not on multiple choice test-taking "tips" such as the longest option is the correct choice a disproportionate number of times or that the correct option is most often hidden in one of the middle positions rather than placed in the first or last choice.

TYPES OF ECONOMICS COURSES TAUGHT IN THE PARTICIPATING COUNTRIES

Sixty different teachers administered the 20-item TEL in their courses. Table 1 presents the distribution of teachers by nation and by course grade level. Economics courses were taught at both the eleventh and twelfth grade levels in Albania. Four Albanian teachers taught at the eleventh grade level and 10 Albanian teachers taught at the twelfth grade level. Nine teachers taught economics courses only at the eleventh grade level in Croatia. Economics courses were taught at both the eleventh and twelfth grade levels in Latvia. Three Latvian teachers taught at both the eleventh and the twelfth grade level. One additional Latvian teacher taught at the eleventh grade level. Two additional Latvian teachers taught at the twelfth grade level. Sixteen Lithuanian teachers taught economics courses only at the twelfth grade level. Fifteen Romanian teachers taught economics courses only at the eleventh grade level.

In Albania a one-year course in "Applied Economics" is taught in either the eleventh grade in curricula emphasizing natural sciences or in the twelfth grade in curricula emphasizing social sciences. A Junior Achievement textbook translated and adapted by Albanians is the main material used in this course. Additionally, responses from teachers participating in the study who had attended the NCEE teacher-training workshop indicated frequent use of NCEE materials. Test results were obtained from 14 eleventh and twelfth grade teachers in 11 schools in seven different cities. Six of the teachers were from three schools in Tirana, and eight teachers were from eight schools in six cities outside the nation's capital. Three teachers sent in results from two classes, and one teacher sent in results from three classes.

The economics education curriculum in Croatia is currently undergoing changes. At present, the topics taught in secondary "schools of economics" include bookkeeping and accounting, business communications, marketing, financial

transactions, statistics, and commercial law in addition to what would be considered "economics" topics in the U.S. In addition, other secondary schools cover topics in "politics and economics". Included in this study are student test results from teachers whose questionnaires indicated they were teaching eleventh grade courses in what would be called "economics" courses in this country. Test results were obtained from nine eleventh grade economics teachers in six schools in four different cities. Four of the teachers were from three schools in Zagreb, and five teachers were from three schools in three cities outside the nation's capital.

In Latvia, a 105-hour "Fundamentals of Business Economy" course for eleventh or twelfth grade students became mandatory beginning in the 1999-2000 school year. Translated Junior Achievement and NCEE materials, along with texts and curriculum guides produced by Latvian economists are used to teach the course. NCEE programs have been very successful in training Latvian economists to develop their own materials. Test results were received from six eleventh and twelfth grade teachers in six schools in five different cities. Two of the teachers were from different schools in Riga, and four teachers were from four schools in four cities outside the nation's capital. Three teachers sent in test results for both eleventh and twelfth grade classes.

A yearlong, twelfth-grade economics course is taught in Lithuania. All of the participating teachers in Lithuania are graduates of NCEE workshops. The instructors use Junior Achievement and NCEE materials to teach the course. Test results were received from 16 twelfth grade teachers from 16 different schools in 13 different cities, all outside the nation's capital of Vilnius.

In Romania, the average school year is 36 weeks long, and high school economics is usually taught in a yearlong eleventh grade course. In regular (grammar) high schools, students learn economics two hours a week. In "economics" high schools students start learning economics at the tenth grade for one hour a week, and continue learning economics at the eleventh grade for two hours a week. With regard to the materials used in these courses, currently five alternative textbooks have been approved for use in high school classes. Among the co-authors there are five graduates of NCEE programs. Student test results were received from 15 eleventh grade teachers in 14 schools in 12 different cities. Only one teacher was from a school in Bucharest, all of the others were in schools in cities outside the nation's capital.

In summary, despite some differences within and between countries, the high school economics courses in this study are sufficiently comparable to those taught in the U.S. to make some preliminary comparisons of student performance

on the questions on the 20-item TEL meaningful. The translated teacher questionnaires used in our project asked participating teachers to examine the 20-item TEL, and instructed: "If any of the questions on this test deal with a concept NOT covered in the course you teach, please indicate the question number(s) in the space below." Twelve of the Albanian teachers indicated that question number 15 dealing with aggregate demand was not covered in their courses, and one Latvian teacher indicated that questions 17-20 dealing with international economics and development were not covered. Other than these responses, there were no a priori indications that questions on the 20-item TEL were not appropriate for assessing student performance in the high school economics courses tested in this project.

Table 1: Total Teachers by Nation and Grade Level

	Albania	Croatia	Latvia*	Lithuania	Romania
Total Teachers	14	9	6	16	15
Teachers in Grade 11	4	9	4	0	15
Teachers in Grade 12	10	0	5	16	0

* 3 teachers in Latvia taught at both the eleventh and twelfth grade levels

TEACHER BACKGROUND.

Tables 2, 3, and 4 present the teaching experience and economics background of the sample of teachers participating in this study. Table 2 shows that the average number of years of general teaching experience of these high school teachers is about 17 years, with the lowest average (11.94 years) found for the 9 Croatian teachers and the highest average (21.13) found for the 15 Romanian teachers. The average number of years teaching economics ranged from 7.37 in Lithuania to 18.93 in Romania, with an overall mean of 10.65 years.

Table 2: Teaching Experience, General and Economics

Nation	Years Teaching Experience				Years Teaching Economics			
	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.
Albania (n=14)	13.71	10.25	1	28	9.07	8.73	1	27
Croatia (n=9)	11.94	11.27	2.5	33	8.17	8.70	0	25
Latvia (n=6)	15.50	6.83	7	26	7.50	1.76	5	10
Lithuania (n=16)	19.44	8.45	6	35	7.37	2.63	4	15
Romania (n=15)*	21.13	7.60	3	35	18.93	6.24	3	25
Total (n=60)	17.01	9.42	1	35	10.65	7.77	0	27

* The number of years teaching economics response from one Romania teacher was missing.

Table 3 describes the varying backgrounds in economics of the sample of teachers in our study. Croatia and Latvia had the highest percentage of teachers reporting that they majored in economics in college, and Lithuania had the highest percentage reporting that they took no economics courses in college. All of the Lithuanian teachers, however, reported attending in-service workshops in economics, as did all Latvian teachers. Twenty of the 60 teachers reported teaching an in-service workshop, with the highest percentage being in Latvia and Romania. All of the Latvian teachers and three-fourths of the Lithuanian teachers possessed a graduate (masters or doctorate) degree.

With regard to attending in-service workshops in economics, several teachers reported attending more than one such workshop. Table 4 shows that 73% of the teachers in our sample attended a workshop taught directly by the NCEE, and 57% attended a workshop taught by Junior Achievement. Thirty-eight percent of the teachers attended a workshop taught by a teacher trained by the NCEE, with Romania having the most teachers attending this type of workshop. Only six teachers (17%) reported not attending any type of in-service workshop in economics.

Table 3: Teacher Background in Economics

Nation	College Course Work In Economics			Attended Workshop		Taught Workshop		Graduate Degree	
	Majored	Some Courses	No Courses	Yes	No	Yes	No	Yes	No
Albania (n=14)	2	9	3	10	4	0	14	0	13
Croatia (n=9)	8	0	1	8	1	2	7	1	8
Latvia (n=6)	3	3	0	6	0	5	1	6	0
Lithuania (n=16)	3	1	11	16	0	5	11	12	4
Romania (n=15)	3	12	0	14	1	8	7	1	14
Total (n=60)	19	25	15	54	6	20	40	20	39

Note: Sums might not equal sample size due to missing data.

Table 4: Type of Workshop Attended

Nation	NCEE	J.A.	NCEE Trainer	Non-government Organization	Post-Diploma Institute	None
Albania (n=14)	6	6	2	1	0	4
Croatia (n=9)	3	1	3	6	0	1
Latvia (n=6)	5	6	5	1	2	0
Lithuania (n=16)	16	16	4	2	0	0
Romania (n=15)	14	5	9	4	3	1
Total (n=60)	44	34	23	14	5	6
	(73%)	(57%)	(38%)	(23%)	(10%)	(17%)

STUDENT PLANS FOR THE FUTURE

Table 5 shows the responses to the survey question regarding students' plans after high school graduation. Overall, 90% of the students who responded to this question indicated that they planned to "pursue further education" after graduating from high school. This ranged from a low of 81.5% in Croatia to a high of 97.0% in Lithuania. All of these percentages are significantly higher than those of U.S. students in the TEL III norming sample who had plans to "attend college". Rebeck and Walstad (2001, p.16) reported that the percentage of U.S. students who planned to attend college was 71.3% in basic economics courses and 82.2% in AP/Honors U.S. economics courses.

Table 5: Student Plans After High School

Nation	Percentage of Students			
	Further Education	No Plans	Get Job	Military
Albania (n=594)	82.2	12.5	3.2	2.2
Croatia (n=178)	81.5	11.8	4.5	2.2
Latvia (n=232)	94.0	4.3	1.7	0.0
Lithuania (n=397)	97.0	1.5	0.5	1.0
Romania (n=400)	96.8	1.3	1.8	0.3
Total (n=1,801)	90.1	6.4	2.2	1.2

STUDENT PERFORMANCE

Table 6 reports the average scores achieved on the 20-item TEL across the five nations by grade level and by student gender. The highest score after completing an eleventh grade economics course was found in Romania with an average score of 15.83 points. The lowest average score at the eleventh grade level was found in Albania, with a score of 11.07. At the twelfth grade level, the highest average score of 16.01 was found in Lithuania, and the lowest average score of 9.32 was found in Albania.

Table 6: Overall Scores Sorted by Grade and Gender for each Nation *				
Nation	Grade		Gender**	
	11	12	Male	Female
Albania	11.07	9.32	9.63	10.07
	(3.09) N=208	(3.50) N=391	(3.79) N=211	(3.27) N=381
Croatia	11.11	---	10.94	11.39
	(3.03) N=178		(2.90) N=109	(3.23) N=69
Latvia	13.32	13.39	13.16	13.47
	(2.79) N=103	(2.49) N=135	(2.80) N=83	(2.52) N=155
Lithuania	---	16.01	15.64	16.41
		(3.51) N=400	(3.92) N=208	(2.93) N=186
Romania	15.83	---	16.32	15.56
	(3.47) N=400		(3.48) N=146	(3.45) N=250
Total	13.48	12.80	13.15	13.12
	(3.91)	(4.58)	(4.51)	(4.11)
N	889	926	757	1,041
* Standard deviations are in parentheses.** Gender data was missing for some observations.				

At first glance, the fact that the average score for twelfth grade students (9.32) is significantly lower than the average for eleventh grade students (11.07) in Albania may be somewhat puzzling -- particularly since the average scores of the eleventh grade students (13.32) and the twelfth grade students (13.39) are virtually identical in Latvia. The Albanian result may be explained by the fact that different

types of students (those studying natural sciences) take economics in the eleventh grade than in the twelfth grade (those studying social sciences) in Albania. Another factor might be that all four of the eleventh grade courses were in schools located in the capital city of Tirana, whereas only two of the 10 twelfth grade courses were in schools located in the capital city.

Another point of interest in Table 6 is the fact that, unlike in the U.S., the average economics test score for females is higher than that of males in four of the five countries shown. Only in Romania is the average score for males higher than for females and, overall, the scores are virtually identical-13.15 for males and 13.12 for females. This result differs from several studies in the U.S. that reported higher scores for males than females on multiple-choice tests in economics (see, for example, Walstad and Robson, 1997). An interesting question to answer in future research would be why are there international differences in test performance between males and females?

Table 7 shows the distribution of item-percent-correct scores on each question and on four broad content categories. Included in this table are the scores achieved by the regular and AP/honors economics samples used in the norming of TEL III in the U.S. as well as the scores for each of the Eastern European nations and for all five Eastern European nations combined. The item-percent-correct data for each individual country broken down by teacher and grade level is available at http://facultyweb.anderson.edu/~ktsaunders/byteacher.xls.

Table 7: Item Percent Correct

Item	TELII I	United States		Eastern Europe					
	Item	Regular	AP/Honors	Albania	Croatia	Latvia	Lithuania	Romania	Total
1	1A	0.60	0.77	0.46	0.67	0.93	0.78	0.82	0.69
2	4A	0.62	0.78	0.65	0.62	0.93	0.90	0.90	0.79
3	6A	0.60	0.73	0.63	0.72	0.66	0.92	0.84	0.75
4	12A	0.56	0.67	0.38	0.30	0.04	0.79	0.58	0.46
5	13A	0.66	0.75	0.61	0.67	0.92	0.87	0.74	0.74
6	15	0.70	0.77	0.70	0.74	0.79	0.91	0.83	0.79

Table 7: Item Percent Correct

Item	TELII I	United States		Eastern Europe					
	Item	Regular	AP/Honors	Albania	Croatia	Latvia	Lithuania	Romania	Total
7	16A	0.64	0.75	0.48	0.59	0.76	0.75	0.86	0.67
8	17A	0.71	0.81	0.45	0.70	0.68	0.48	0.67	0.63
9	19A	0.74	0.82	0.51	0.53	0.83	0.76	0.73	0.66
10	20	0.69	0.79	0.75	0.72	0.83	0.80	0.85	0.79
11	21A	0.62	0.68	0.31	0.30	0.66	0.73	0.90	0.58
12	22	0.51	0.71	0.16	0.18	0.38	0.63	0.79	0.43
13	25	0.55	0.70	0.65	0.69	0.95	0.96	0.91	0.82
14	26A	0.59	0.70	0.46	0.44	0.21	0.64	0.81	0.54
15*	27B	0.31	0.63	0.35	0.52	0.28	0.59	0.67	0.48
16	29A	0.63	0.74	0.72	0.79	0.89	0.90	0.92	0.83
17	35	0.68	0.81	0.51	0.56	0.56	0.81	0.81	0.65
18	36A	0.53	0.68	0.32	0.39	0.85	0.87	0.69	0.60
19	39A	0.40	0.48	0.33	0.38	0.35	0.80	0.73	0.53
20	40A	0.52	0.59	0.51	0.59	0.83	0.85	0.82	0.70
Fundamental: 1-5		0.61	0.74	0.54	0.60	0.70	0.85	0.77	0.69
Micro: 6-12		0.66	0.76	0.48	0.54	0.71	0.76	0.80	0.65
Macro: 13-16		0.52	0.69	0.55	0.61	0.58	0.77	0.83	0.67
International: 17-20		0.53	0.64	0.42	0.48	0.65	0.83	0.76	0.62
Overall Averaage		0.59	0.72	0.50	0.56	0.66	0.80	0.79	0.66
N		2,124	495	599	178	238	400	400	1,815

* Item 15 is from form B of the TEL, with sample sizes 2,718 and 293 for basic and advanced U.S. students, respectively.

The overall average percent correct for Latvia (66%), Lithuania (80%), and Romania (79%) exceed the overall average for regular economics students in the U.S. (59%), and the averages for Lithuania and Romania also exceed the average for AP/Honors students in the U.S. (72%). This superior performance might be due to the higher percentage of students who plan to pursue further education in the Lithuanian and Romanian courses, the high percentage of teachers who have attended NCEE workshops in these two countries, or the greater length of the Eastern European courses compared to the U.S. courses, which are typically only one semester long. Whatever the reason, the data in Table 7 indicate that a lot of economics is being learned by the students tested in this study.

Totaled across all five nations, the overall average of 66% on all 20 questions for the Eastern European students completing either an eleventh grade or a twelfth grade economics course is 7% higher than the average for U.S. students completing a regular economics course and 6% lower than the average for U.S. students completing an AP/Honors course. The higher percentage correct for the Eastern European students compared to U.S. students in regular economics courses was greatest on the four macro questions (15%) and the four international questions (9%). It is interesting to note that both regular and AP/Honors students in the U.S. performed better on the micro questions relative to the macro questions; whereas, this is not the case in four of the five Eastern European countries (Albania, Croatia, Lithuania, and Romania). An interesting question for future research might try and answer why there are international differences in relative test performance on microeconomic questions compared to macroeconomic questions?

The data in Table 7 also indicate that in some cases the overall mean percent correct score for all 20 items may have been influenced by unusual performance on some individual questions. Question 4 dealing with the incentive effects of a decline in real interest rates, for example, was answered correctly by only 4% of the 238 Latvian students, and none of the students in one Romanian course got this question right. The Albanian teachers' concern with lack of coverage on aggregate demand in their curriculum was noted above. The data in Table 7 indicate that 35% of their students got question 15 right. This question, however, proved to be even more difficult for U.S. students (31%) and Latvian students (28%). Latvian students also had difficulty with question 14 dealing with an economy's potential output (21%). Question 12 dealing with the most efficient approach to controlling pollution proved to be particularly difficult for students in Albania (16%) and Croatia (18%) as did question 11 dealing with the cause of high wages in a market economy (31% in Albania and 30% in Croatia).

Questions on which the performance of students in all five Eastern European countries equaled or exceeded that of U.S. students in regular economics courses were number 2 (opportunity cost), 3 (specialization), 6 (competition), 10 (equilibrium adjustment),13 (GDP), and 16 (inflation).

In addition to having the largest percentage of students who plan to pursue further education after high school, the three countries showing the highest 20-item TEL scores in Table 7 are the three with the largest percentage of teachers who have attended NCEE workshops, and whose coordinators reported the most activity in developing new materials for economics courses in their countries. this is encouraging evidence of the effectiveness of these programs

FACTORS INFLUENCING STUDENT PERFORMANCE

We do not have a way to adequately deal with the fact that the five countries in our study have different curricula and use different materials in their courses. Nor do we assume that the courses and students tested are a completely random sample. Nevertheless, for purposes of exploratory investigation of the factors influencing student performance we have run an OLS regression with all of our data.

To control for the currently unknown national differences in curriculum and materials that may have influenced student scores, dummy variables were specified for Croatia, Latvia, Lithuania, and Romania with an omitted variable for Albania suppressed in the intercept. Then we included student and teacher variables that might be expected to influence student test performance. Missing data in some cases reduced the number of students included in our regression to 1,716. The variable descriptions, mean values, and regression results are reported in Table 8.

After controlling for other factors, the lack of a significant difference in scores between males and females found in Table 6 remained. As noted, this result differs from the common finding in the U.S. that males outperform females on multiple-choice tests in economics, and may be worth further exploration. Other than student gender, significant differences were found for other characteristics: students planning to further their education after high school scored 1.74 points higher than those without such plans, and the higher scores achieved by eleventh grade students found in Table 6 remained significant after controlling for other factors. The estimated coefficients were significantly different from zero at the 1% level.

Table 8: Multivariate Analysis with Overall Score as the Dependent Variable				
Independent Variables		Mean	Coef.	p-val.
	Constant		9.46	---
Student				
	MALE: Gender dummy variable (1=male)	13.17	-0.08	0.61
	COLLPLAN: Plans further education after high school (1=yes)	0.42	1.74	0.00**
	GRADE12: Grade 12 dummy variable (1=Grade 12)	0.52	-0.84	0.00**
Teacher				
	TCHEXPER: Years of teaching experience	17.27	-0.16	0.00**
	TCHEXPER^2: Years of teaching experience squared	378.78	0.004	0.00**
	NCEEWRKS: Attended a NCEE workshop (1=yes)	0.75	0.95	0.00**
	ECMAJOR: Majored in economics in college (1 = yes)	0.25	0.89	0.00**
	GRADDEG: Has earned a graduate degree (1=yes)	0.34	0.87	0.01**
Other				
	CAPITAL: Dummy variable for located in nation's capital (1=yes)	0.25	0.55	0.01*
	CROATIA: Nation dummy variable (1=Croatia)	0.10	-0.20	0.58
	LATVIA: Nation dummy variable (1=Latvia)	0.14	1.77	0.00**
	LITHUANIA: Nation dummy variable (1=Lithuania)	0.22	5.00	0.00**
	ROMANIA: Nation dummy variable (1=Romania)	0.23	4.80	0.00**
	N	1,716		
	Adj. R-squared	0.43		

* significant at the 5% level.
** significant at the 1% level.

As might be expected, having a teacher who attended an NCEE workshop, majored in economics in college, or who had a graduate degree were positively and significantly associated with student test performance. After controlling for these factors, however, years of teaching experience was found to be negatively associated with student performance at a diminishing rate. A possible explanation for this

finding is that, rather than teaching experience being harmful, younger teachers in this sample are more likely to have studied the western economic concepts found on the 20-item TEL.

After controlling for student and teacher factors that varied across the national samples, significant differences in student test scores remained. Students in Latvia, Lithuania and Romania scored higher, on average, than did students in Croatia and Albania (the omitted country). Students attending schools in their nation's capital city outperformed students attending schools outside their nation's capital by about one-half point.

CONCLUSION

The findings of this paper indicate that the 20-item TEL that was developed and translated for use in this project is a reliable instrument for use in high school classrooms in five different countries. The findings of this paper also indicate that the NCEE's in-service teacher training workshops and its efforts to have workshop participants develop effective teaching materials and techniques are beginning to have a positive influence on student test performance in the countries where they have been used most extensively.

There are several interesting areas for future research. Why are there international differences in relative test performance on microeconomic questions compared to macroeconomic questions? Why are there international differences in test performance between males and females? Is it possible to employ more sophisticated analytical techniques to identify factors that affect student performance in a multivariate setting?

ENDNOTES

[1] Ilia Kristo (Albania), Efka Heder (Croatia), Veronika Bikse (Latvia), Danute Poskiene (Lithuania), Maria and Paul Lacatus (Romania) were instrumental in arranging for the translation and gathering the data in the five Eastern European countries participating in this study.

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ECONOMICS ARTICLES

WHAT ECONOMISTS DO: TRENDS IN ECONOMIC RESEARCH

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ABSTRACT

This paper integrates and extends the literature on research trends in economics. Differences in the research interests of graduate students and senior scholars are examined, as are dynamic changes in research agendas over time. Significant and persistent differences in the topical distributions of books and dissertations in economics are found; but even so, regression results suggest that graduate students are influenced by the distribution of current research across fields as well as employment opportunities when selecting thesis topics. Economists appear to be influenced by external events in selecting research subjects, and exhibit a life-cycle pattern in which they move from narrower specialties to broader, more historical subjects over time.

INTRODUCTION

Like the scholarship in every academic profession, economic research defines the boundaries of the discipline. In Jacob Viner's famous phrase, "Economics is what economists do" (as quoted by Robbins (1981), Hansen (1991), and Heck and Zaleski (1991)). Of course, as Lionel Robbins (1981, p. 1) pointed out, Viner's quip "only shifts the question one stage further: What is it that they do? What is the object of their investigations?" This, clearly, is a positive question, inviting empirical examination. It is rather surprising, therefore, that historians of thought have paid so little attention to the subject matter of economic research, while other aspects of the professional literature have been widely investigated. Kenneth Button (1981, p. 36) observed more than two decades ago, "A major new interest has grown amongst academic economists in recent years, the study of the professional literature in economics." While this has included numerous citation rankings of individuals, departments, and journals, scarcely any of the work has investigated the topical content of the literature. Indeed, given the general

consensus that economics is, as Robbins (1935, p.16) put it, the study of the allocation of "scarce means which have alternative uses", it is ironic that economists should largely neglect to study the allocation of their own research effort among alternative fields of specialization. This point is made forcefully in Henry Villard's (1966) discussion of Bronfenbrenner's (1966) study. Villard also notes (p. 555) that "what we teach is directly related to what we research", which reinforces the notion that 'what economists do' is well captured by an examination of economic research. The value of such work is suggested by Heck and Zaleski (1991, p. 27), who note that "Knowledge of research emphasis and topical trends in the literature serves a range of researcher needs, from providing a sense of where future research is likely headed to simply satisfying a general curiosity."

Due to its brevity, the existing literature can be summarized succinctly. Stigler (1965) documented changes in the distribution of articles across fields in five leading journals for six decades up to 1953. Bronfenbrenner (1966) undertook a broader examination of articles through 1963 and a more careful study of doctoral dissertations by field from 1960 through 1965. Coats (1971) then replicated these studies using a group of five premier journals similar to Stigler's set. (Stigler (1965), Coats (1971) and Laband and Wells (1998) all examined the *American Economic Review,* the *Quarterly Journal of Economics*, and the *Journal of Political Economy*. Stigler also included the *Review of Economics and Statistics* and *Econometrica*, whereas Coats included *Economic Journal* and *Economica*.) Two decades later, Heck and Zaleski (1991) documented trends in journal articles by field from 1969 to 1989, just prior to the reclassification system adopted by the *American Economic Association* (AEA) in 1991. Diamond and Haurin (1995) considered changes in the relative importance of fields from 1927 to 1988 by examining self-reported classifications of AEA members rather than publication listings. They then estimated the relationship between self-reported classifications and the availability of jobs by field to determine whether demand affects field choice. Most recently, Laband and Wells (1998) studied topical coverage in 3 major journals through 1995.

The present paper integrates and extends this literature in several ways. First, Bronfenbrenner's comparison between the research interests of neophyte and experienced scholars is replicated and updated using a more consistent methodology. Recent data on job openings and book and dissertation distributions are then used to replicate and extend the Diamond-Haurin analysis of field choice, using both supply and demand factors. Next, an intertemporal comparison of research distributions serves to update earlier observations regarding long run trends

in economic research. Finally, I investigate differences in the research agendas and publication forums of junior and senior scholars to draw some tentative life-cycle conclusions.

NEOPHYTE AND EXPERT SCHOLARSHIP: 1960-1970

The first comparison of interest is between the research undertaken by neophyte economists (i.e., the doctoral dissertations of graduate students) and that of experienced scholars. Martin Bronfenbrenner offered such a comparison in the 1960s using journal articles, but the classification systems for dissertations and articles differed (15 categories for dissertations versus 23 for articles), as did Bronfenbrenner's methodology. As Bronfenbrenner (1966, p. 544) explained, "Rather than counting articles, I have economized time by 'measuring' them in column-centimeters, at the cost of overstressing the longer-winded titles," whereas for dissertations he "merely counted titles" (p. 546). His review of the evidence led him to the tentative conclusion (p. 546) that "The dissertation topics appear generally less theoretical, more commonly 'applied' or 'descriptive,' than the published essays."

That evaluation is now reconsidered by comparing the distribution of American doctoral dissertations across specializations from 1960 through 1965 with the distribution of English-language economics books published during the 1954-70 period. Books were chosen rather than journal articles for several reasons. First, by their very nature, books and dissertations are more comparable (in terms of length and depth) than articles. Second, the classification systems in use at the time for dissertations and books were essentially equivalent to each other, but were unlike the system for articles; moreover, articles are often classified in multiple categories, unlike books and dissertations. Finally, the contrast between neophytes and mature scholars may be most clearly drawn by comparing dissertations with books, which tend to be authored and edited by experienced researchers; although they sometimes author articles, graduate students rarely publish books while completing their dissertations. Indeed, as Hartley, et al. (2001) show, books are rarely written within the first few years after graduation. (A well-known exception is Robert Heilbroner, whose book, *The Worldly Philosophers*, predates his dissertation.) At the same time, however, the distinction between books and journals is not as severe as it may seem; refereed annual publications for example, have traditionally been classified as books rather than as journals, and this practice continues to the present. Despite their similarities to journals, refereed annuals such as *Research in the History of*

Economic Thought and Methodology and Research in Political Economy are classified as books. (See Table 5 below for a formal comparison of book and journal distributions by field.)

The distribution of books was calculated from the *Cumulative Bibliography of Economics Books*, *volume 1, 1954-62* and *Economics Selections, An International Bibliography, Cumulative Bibliography Series I and II*, *1963-1970*. These indices provide a fairly comprehensive data set; as the publishers (Gordon & Breach, 1974) note in the preface to the latter, "Coverage… encompasses all publications in the economics area amounting to 60 pages or more. Publications are ordered as notice of their appearance is circulated in the Library of Congress proof-sheets or index cards. Consequently, virtually all publications in the English language are covered." Combining the 1954-62 and 1963-70 periods results in a single 1954-70 period centered around the comparison period for dissertations. The 1960-65 distribution of dissertations is a weighted average of the percentages reported by Bronfenbrenner; the aggregate number of economics dissertations for each year were obtained from the Association of Research Libraries (1967). To make the dissertation and book classifications strictly comparable, dissertations in general economics and economic theory were combined into a single category.

The distributions are presented in Table 1. In contrast to Bronfenbrenner's finding, Table 1 suggests that dissertations were not substantially less theoretical than contemporaneously published books. Indeed, the difference between proportions in the general economics, theory, thought, and methodology category is not statistically significant at a five percent level. Similarly, only small differences of approximately one and one-half percentage points or less are observable in business cycles, public finance, and labor economics. In contrast, the major differences are that established economists devoted more than twice as much attention to economic history and growth, statistical methods, and economic systems as graduate students, paid less than half as much attention to money and banking, business finance, and business administration, and roughly half as much attention to agriculture as their students. Thus, the differences in topical coverage appear to be more notable than differences in the level of empiricism. To determine whether these differences in topical coverage have persisted into more recent years, the comparison is now replicated for the 1991-1995 period.

Table 1: Distributions of Dissertations and Books in Economics*		
Field	American Dissertations 1960-65	English-Language Books 1954-70
1) General Econ, Theory, Thought & Methodology	7.8982	8.1140
2) History & Growth	11.0840	27.2001
3) Stat/Quant Methods	1.9848	5.1229
4) Economic Systems	1.2851	2.8979
5) Business Cycles	1.4993	1.4056
6) Money & Banking	8.6211	4.2968
7) Public Finance	5.6492	4.9297
8) International	7.6156	9.3132
9) Business Finance	6.2382	1.6721
10) Business Administration	11.2450	3.8905
11) Industrial Organization	10.8954	8.0474
12) Agriculture & Geography	13.7583	7.3479
13) Labor	8.9768	10.3324
14) Welfare & Education	3.3404	5.4294
*All figures in percentages; figures may not sum due to rounding.		

NEOPHYTE AND EXPERT SCHOLARSHIP: 1990-1995

Beginning in 1991, the *Journal of Economic Literature* (*JEL*) revised its long-standing classification scheme for economic research. The ten broad categories and 166 subfields in use at the end of the 1980s were reclassified into 19 major fields and 118 subfields. The major differences were the separation of microeconomics from macroeconomics and monetary economics, and the discontinuation of the distinction between theory and empirical research.

Using the new A-R *JEL* classifications, Table 2 documents the distribution of American doctoral dissertations across economic fields from 1991 through 1995. The nineteenth field, Other Special Topics (Z), is omitted from this analysis; none of the doctoral dissertations, less than one percent of the books, and less than one-half of one percent of the job openings have been classified in this category. The five fields showing the greatest persistent interest among doctoral students

during this period were international economics, financial economics, agriculture and natural resources, economic development, and the combined macroeconomics and monetary economics.

Table 2: Distribution of Doctoral Dissertations, Books, and Job Openings*

Field	Dissertations 1991-95	Books 1991-95	Jobs 1991-95
A) General	0.1418	3.9966	2.7775
B) Method/Thought	0.6480	5.5134	0.7077
C) Math/Quant	5.0020	2.9614	10.3406
D) Microeconomics	8.0194	4.7671	9.4029
E) Macro/Monetary	9.6598	5.2125	12.1008
F) International	13.4467	11.0991	10.9244
G) Financial	10.3281	3.5031	6.8908
H) Public Economics	4.0300	3.8401	5.5020
I) Health/Welfare	3.9895	3.2864	4.6793
J) Labor/Demography	9.0117	7.5479	6.0946
K) Law & Economics	0.7898	1.0593	1.7337
L) Industrial Organization	7.4322	6.5246	9.3145
M) Business Administration	1.8631	3.1540	2.1583
N) Economic History	1.7213	8.5590	1.2030
O) Growth/Technology	9.9433	12.6038	6.2185
P) Economic Systems	1.3568	6.4283	1.4684
Q) Agriculture/Resources	10.1863	6.6089	6.0327
R) Urban/Regional	2.4301	2.8049	2.4502

*All figures in percentages; figures may not sum due to rounding.

The distribution of economics books by field for the 1991-95 period was similarly calculated from the *JEL* and is also documented in Table 2. Unfortunately, given the discontinuation of the distinction between theory and application, no comparison can be made on this basis with the current data; differences in topical coverage can, however, be observed. As in the 1960s, there were again similarities between the proportions of dissertations and books in public economics, labor, and

health, education and welfare, along with urban and regional economics. But in contrast to the dissertations, only small percentages of recent books addressed agriculture and natural resources, macroeconomics and monetary economics, and financial economics. On the other hand, authors and editors of books again paid far greater attention to economic history, methodology and history of thought, and economic systems. A Chi-square test reveals a statistically significant difference between the distributions of books and dissertations at the one percent level.

In short, the analysis reveals a basic consistency from the 1960s to the early 1990s in the contrast between neophyte and established scholars. In each period, experienced economists paid relatively greater attention to economic history and economic systems, roughly equal attention to public finance, welfare, and labor, and less attention to agriculture, money and banking, and finance than graduate students. The greatest inconsistency between the periods was the attention paid to quantitative methods. In the early 1960s, while this field was still in its infancy, it was naturally the province of experienced scholars; by the early 1990s, graduate students showed greater interest than faculty in this specialization.

SUPPLY AND DEMAND IN FIELD CHOICE

The contrast between the dissertation and book distributions at any point in time, of course, reflects the fact that dissertations and books are not drawn from the same population of authors. Certainly, part of this difference may be due to the need of graduate students to choose fields in which employment is likely to be available. Nonetheless, we might anticipate some correlation between the two distributions if Ph.D. students are influenced in their choice of field either by the interests of their faculty or by the availability of current information and professional research. The effect of direct faculty influence appears to be limited, however; Hansen's (1991, p. 1079) study found that in choosing thesis subjects "the influence of faculty advisors proved to be surprisingly weak. Relatively few of the respondents credited their faculty advisors with the inspiration for their thesis topics."

The potential effect of currently available knowledge is consistent with the notion that field choice is affected by supply factors. As Diamond and Haurin (1995, p. 104) explain, "A subfield becomes important because the development of tools of analysis or data has reached the point where the time is ripe for advance in the subfield." In their statistical analysis of self-reported classifications of new economists between 1974 and 1988 however, only demand, represented by job openings for economists, was included as an explanatory variable, and the tests

revealed relatively little explanatory power (8 to 20 percent). Thus, while finding that field choice is significantly affected by employment opportunities, the authors invited replication along the following lines. "In the future, we hope that the robustness of the results reported here will be tested in various ways. ...[One] test of the robustness of our results would be to see if similar trends were reflected in the subfield distribution of dissertations listed annually by the American Economic Association.... In the future, we also hope to continue to seek good measures of the supply and demand for particular subfields" (Diamond & Haurin, 1995, p. 120). Thus, as a means of replicating and extending the Diamond-Haurin study, I measure field choice using doctoral dissertations from 1991 through 1995 as the dependent variable and use the annual distributions of books to measure the supply of recent information in the field. Following Diamond and Haurin, I use recent data on job openings by field (as collected each May in the *American Economic Review*) to measure demand; those data are summarized in the last column of Table 2. While the data set is newer, the sample size is approximately two-thirds as large as the Diamond-Haurin sample: the 18 categories observed over the five year period 1991-1995 provide 90 observations of each variable.
The ordinary least-squares regression yields

$$DISSERTATION\% = -0.0177 + 0.795\,JOB\% + 0.523\,BOOK\%$$
$$\qquad\qquad (-3.16) \qquad (12.16) \qquad\quad (6.59)$$

$$R^2 = .730, \text{ adjusted } R^2 = .724, \text{ DW} = 1.96$$

where Student's t statistics are given in parentheses. Each of the independent variables is significant at the one percent level, indicating that both supply and demand factors affect field choice. Supply appears to weigh somewhat less heavily; every percentage point increase in books published in a field increases the dissertations written in that field by half a percentage point, while a percentage point increase in employment opportunities raises the proportion of dissertations in the field by some eight-tenths of a percentage point. The latter effect is approximately twice the magnitude of that reported by Diamond and Haurin, and the expanded model explains substantially more of the variation in field choice. On the whole, the results are consistent with the Diamond-Haurin findings, and the estimates appear quite robust; additional replications using lag structures and aggregated distributions yielded surprisingly similar results. (There might, for example, be some delay between the availability of published literature and the completion of the

dissertation; such reformulations of the model made no substantial difference in the test results.) Thus, while dissertations and books are not drawn from the same populations of authors, there does appear to be a correlation between the supply of current research in a specialization and the proportion of doctoral candidates choosing that field for dissertation work.

CHANGES IN RESEARCH AGENDAS SINCE 1960

Stigler (1965), Bronfenbrenner (1966), Coats (1971), and Laband and Wells (1998) all found it useful to inspect the distribution of economic literature for short and long run trends among fields of interest. This section expands that work by examining recent intertemporal changes in dissertation and book distributions.

To make the intertemporal comparisons, it is necessary to reclassify research from the earlier and later periods without causing severe damage to the integrity of the original classifications. Fortunately, the 14-category classification scheme used in the early 1960s and the current 18-category *JEL* system have more in common with each other than either has with the 10-category system which prevailed in the interim. Indeed, the most questionable category for reclassification is perhaps the new *Law and Economics,* which only amounts to one percent of all current research. For present purposes, this topic is included with health, education and welfare, as suggested by both the *JEL* and the University of Pittsburgh's *Economic Books*. (In March of 1991, both *Economic Books* and the *JEL* published cross-reference guides indicating that the new *Law and Economics* category most nearly fit with the earlier welfare category.)

Table 3 presents the reclassified distributions of doctoral dissertations for 1960-65 and 1991-95. The numbers in parentheses below each field refer to the field codes in Table 1, and the letters refer to the field codes from Table 2. Surprisingly, there is remarkable stability in most of the fields over these three decades. Predictably, the most significant increases have been in statistical and quantitative methods, international economics, and finance, while the most notable declines have been in business administration and industrial organization. Although Stigler (1965) cautioned against attributing changes in research interests to changes in the economic environment, the injunction is probably less applicable to graduate students than established scholars. Indeed, the increasing globalization of the economy and the revolutionary financial innovations of the past few decades, combined with increasingly sophisticated computer facilities are almost certainly correlated with the increasing interest of doctoral students in these three areas. It is

also interesting to note that a dramatic decline in history and development in the early 1960s that Bronfenbrenner observed was not sustained into the early 1990s, principally because dissertations in economic development and technological change increased faster than theses in economic history declined.

Table 3: Distributions of Doctoral Dissertations, 1960-65 and 1991-95*

Field	1960-65	1991-95
General Econ, Thought & Method (1; A, B, D)	7.8982	8.8092
History & Growth (2; N, O)	11.0840	11.6646
Quantitative Methods (3; C)	1.9848	5.0020
Economic Systems (4; P)	1.2851	1.3568
Macro, Monetary & Fiscal (5, 6; E)	10.1204	9.6598
Public Finance (7; H)	5.6492	4.0300
International (8; F)	7.6156	13.4467
Finance (9; G)	6.2382	10.3281
Business Administration (10; M)	11.2450	1.8631
Industrial Organization (11; L)	10.8954	7.4322
Agriculture, Resources, Geography (12; Q, R)	13.7583	12.6164
Labor (13; J)	8.9768	9.0117
Welfare, Education & Law (14; I, K)	3.3404	4.7793

*All figures in percentages; figures may not sum due to rounding.

A similar reclassification of English-language economics books is presented in Table 4 for the periods 1954-62, 1963-70 and 1991-95. The professional research shows far less stability across subject matter than the dissertations; only macroeconomics (monetary and fiscal policy) and business administration reveal relatively consistent levels of interest. Theory and methodology increased substantially over the period, continuing a pattern observed by Coats in the earlier journal literature; other upward trends are apparent in economic systems, finance, and agriculture, resources and economic geography. The declining share of research devoted to labor economics continues an earlier trend observed by Coats, as does the decline in industrial organization. Stigler's injunction notwithstanding, these

findings appear to reinforce the conclusion Heck and Zaleski (1991, p. 32) drew from their inspection of journal articles: "economists' research interests have tended to shift as society's economic problems change." The declining interest in labor economics, for example, is clearly contemporaneous with the decreasing unionization of the workforce both in North America and Europe. But the decline in statistical and quantitative methods is a rather surprising reversal of the earlier trend documented by Stigler, Bronfenbrenner, and Coats; similarly, the decrease in the proportion of research devoted to history and development reverses an earlier trend noted by Coats. Finally, the table indicates cycles of interest, of the type described by Bronfenbrenner as "parabolic trends" in the areas of public finance, international economics, and welfare. Despite this pattern, however, the relative importance of welfare as a subject of professional interest has remained about equal to that of public finance and somewhat greater than either business finance or business administration, providing evidence in favor of Bronfenbrenner's (1966, p. 549) hypothesis "that some economic aspects of the poverty problem will prove substantially more than fads."

The intertemporal changes in the field distribution of scholarly work described above could have been caused by successive cohorts of new economists entering the profession with different research interests, or alternatively, by shifts in the research interests of established economists, or, of course, a combination of both. (Differential productivity changes across fields represent another possible explanation, but there is no *a priori* reason to believe that productivity differed in this manner.) Diamond and Haurin (1995) documented intertemporal changes in the distribution of young economists, whom they define as those having received doctorates within the previous dozen years or so; using those data, it is possible to evaluate the two potential explanations of research changes. (Diamond and Haurin drew a distinction between the majority of young economists and an elite minority; the data used here refer to the former.) In particular, the shares of research devoted to general economics (including thought and methodology) and economic systems increased despite declining proportions of young economists entering these areas. In the late 1950s and early 1960s, approximately 19 percent of new economists classified themselves in these fields, but over time the proportion fell to approximately 11 percent. Thus, the increased output can be attributed to movements of more senior economists into these fields. At the other extreme, the falling research shares in quantitative methods (including econometrics), industrial organization, labor economics, and monetary and fiscal policy (including public

finance) have occurred despite increasing influxes of young economists to these fields; this suggests an exodus of senior scholars away from these areas.

Table 4: Distributions of Books, 1954-62, 1963-70, and 1991-95*

Field	1954-62	1963-70	1991-95
General Econ, Thought & Method (1; A, B, D)	7.4950	8.6518	14.2771
History & Growth (2; N, O)	26.1823	28.0842	21.1628
Quantitative Methods (3; C)	5.7180	4.6060	2.9614
Economic Systems (4; P)	2.4219	3.3113	6.4283
Macro, Monetary & Fiscal (5, 6; E)	6.9934	4.5811	5.2125
Public Finance (7; H)	3.3391	6.3115	3.8401
International (8; F)	11.0203	7.8302	11.0991
Finance (9; G)	1.5047	1.8175	3.5031
Business Administration (10; M)	3.1814	4.5064	3.1540
Industrial Organization (11; L)	8.6558	7.5190	6.5246
Agri, Resources, Geog (12; Q, R)	6.8788	7.7555	9.4138
Labor (13; J)	12.3961	8.5398	7.5479
Welfare, Education & Law (14; I, K)	4.2132	6.4857	4.3457

*All figures in percentages; figures may not sum due to rounding.

Unfortunately, the twenty years omitted from Table 4 are problematic; the broad ten-category classification system that prevailed in the 1970s and 1980s is highly incompatible with either the earlier or later systems. During this interim period, for example, economic history was neither a separate category (as in the current system) nor combined with development (as in the earlier system), but was instead combined with general economics, theory, thought, methodology, and systems; similarly, economic geography was moved from agriculture to welfare economics, and business cycles and forecasting, previously an independent category, was combined with statistical methods before being recombined with macroeconomics in the current system. Thus, unless one is willing to construct even broader, less meaningful categories, no detailed comparison can be made between these two decades and the earlier or later periods. Yet an examination of the

research distribution in these years is instructive in its own right, and several comparisons of interest can be made within the period.

Table 5: Distributions of New Economists, Books, and Articles, 1969-89*

Field	New Economists 1969-88	Books 1971-89	Articles 1969-89
General Econ, History, Systems	12.0-13.6	17.7	17.0
Growth	6.5-8.7	14.3	10.0
Stat/Quant	10.9-12.3	7.5	6.0
Money/Fiscal	16.9-18.6	6.4	14.0
International	8.4-10.9	10.6	9.0
Business Admin	5.2-5.7	11.4	5.0
Industrial Org	9.2-12.3	7.7	10.0
Agriculture	6.4-7.2	7.3	8.0
Labor	10.6-11.2	8.5	11.0
Welfare	4.2-8.2	8.7	10.0

*All figures in percentages; figures may not

Table 5 presents the distribution of economics books over the 1971-1989 period, along with the distribution of journal articles for 1969-1989 and ranges for the proportions of new economists in each field during 1969-1988. The distribution of books was calculated from cumulative bibliographies of *Economics Selections* edited by Maurice Ballabon (1979 and 1982) and from individual issues of the University of Pittsburgh's quarterly *Economic Books: Current Selections.* The distribution of journal articles is taken from Heck and Zaleski (1991), and the data on new economists are taken from Diamond and Haurin (1995). (It should be noted that *Economic Books* continued a policy of annotating all economics books in the English language through 1987; beginning in 1988, the coverage was changed to a "comprehensive sample." Note also that the figures from Heck and Zaleski (1991) are remarkably consistent with those of Laband and Wells (1998), who examined fewer journals over more years.)

The distributions clearly suggest that young economists were relatively underrepresented in economic development and the combined history, systems, and general economics field, while being somewhat overrepresented in quantitative

methods and monetary and fiscal policy. As might be expected, these differences between younger and more experienced economists are largely consistent with those obtained above in the comparisons between graduate students and established economists in general, particularly for the most recent years. Moreover, despite a general similarity between the distributions of books and articles, there were notable differences in the areas of economic growth, monetary and fiscal policy, and business administration. It is especially evident in these fields that the distribution of young economists is more closely related to the distribution of articles than books, which suggests that younger professionals are more likely to utilize journals as a forum for their research.

CONCLUSION

Because this study draws inferences regarding static differences between populations of researchers as well as dynamic changes in research agendas over time, a brief summary may be useful. The data reveal notable differences in the subject matter selected by graduate students and established economists, and most of these differences appear to have persisted for at least thirty years. Compared with their faculty, graduate students appear less interested in economic systems, history and development, and more interested in financial and monetary economics; in recent years, they have also shown greater interest in quantitative methods. Nonetheless, graduate students do appear to take the available supply of economic research as well as the availability of employment opportunities into account when selecting dissertation topics. A similar pattern of differences appears in the research interests of junior and senior economists; in recent years at least, younger economists have been less interested in general economics, economic systems, history, and development, and more attracted to quantitative methods and monetary economics than their senior colleagues. Younger economists also appear to have had a greater propensity to publish their research in professional journals than books.

Over the past three decades, the research interests of successive cohorts of graduate students in economics have remained fairly stable, with the changes that did occur corresponding broadly with changes in the economic environment. Over the past four decades, senior economists have increasingly left labor, industrial organization, and quantitative methods to their younger colleagues, and paid increasing attention to economic systems and general economics, including the history of economic thought and methodology.

Roughly speaking, the results suggest that the research interests of economists, especially those of graduate students, do respond to changes in the external environment. Moreover, there appears to be a life cycle pattern in which economists tend to move toward broader, more historical, and more fundamental questions as they advance in their careers. The evidence also appears to suggest that the differences between junior and senior economists have widened in recent years, as successive cohorts of young economists have increasingly avoided the subjects which have been increasingly favored by senior researchers.

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INFORMATION TRANSFERS FROM DIVERSE CORPORATE EVENTS: METHODOLOGICAL ISSUES AND FINDINGS

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ABSTRACT

This paper presents results from research pertaining to the industry-wide transfer of information from a diverse set of corporate events. Early studies in this area date back to the late 1970s and early 1980s, but the literature indicates that interest in this area of research became more widespread in the 1990s, and the subject remains a fruitful area of study even today. This paper organizes into six categories the results of the bulk of the intra-industry studies in finance. More importantly, though, it discusses several methodological issues involved in conducting such research. Finally, it highlights areas of conflicting evidence that are therefore potential candidates for further research.

INTRODUCTION

Following the development of the Capital Asset Pricing Model (CAPM) in the 1960s and 1970s, applied research in finance trained much attention through the 1980s on the use of "event study methodology" to assess the information content of various corporate events, such as stock splits and equity offerings. For the most part, this research focused on documenting the equity valuation implications for the firm directly affected by the event of interest. A few studies in this decade, however, sought to widen the scope of enquiry into the information content of firm-specific events by attempting to measure the effects of such events on the stock prices of rival firms. Beginning in the early 1990s, interest in this "intra-industry" perspective gained momentum, and, the sustained stream of research seen since then indicates that interest has not yet ebbed; the study of industry-wide information transfers remains a fruitful area of research.

The current paper has three objectives: First, it seeks to present the results pertaining to the diverse events that have been studied from the intra-industry perspective with the view of impressing upon the reader the fact that many events have valuation effects that are more far-reaching than traditionally understood. Second, the survey seeks to stimulate new ideas for further empirical work in the area of information transfer. Finally, for the benefit of such research, it highlights numerous methodological issues involved in conducting intra-industry studies.

A BASIS FOR EXPECTING INTRA-INDUSTRY EFFECTS

As noted above, since the early 1990s, researchers have devoted considerable attention to the measurement of a possible "ripple effect" stemming from firm-related events that manifests itself in contemporaneous abnormal changes in stock prices of other firms within the same industry. In general, a development at an individual firm could have implications for its competitors in the same resource and product markets because the event may (1) reflect changes in the profitability of the industry as a whole, or (2) suggest competitive shifts within the industry.

Thus, research dealing with intra-industry effects is grounded in the idea that firms within an industry are likely to compete in the same resource and product markets. As such, their values will be affected similarly by a set of common factors, or differentially by a set of firm-specific factors. That is, if an event at one firm (the "originating" firm) is perceived by the market to have been occasioned by an industry-wide factor (such as a decline in market demand), the valuation effects of that event would be in the same direction for the originating and rival firms. On the hand, the firms being placed in a competitive setting, if the market ascribes the event to a firm-specific factor (such as a management problem or law suit), the valuation effect of the event would be of an opposite sign for the originating firm and its competitors (see, for example, Szewczyk (1992)). As will be seen below, a diverse set of events appears to possess industry-wide implications.

EARNINGS RELEASES AND FORECASTS

The early studies in the area of intra-industry information transfers focused on earnings announcements and forecasts, and even precede the steady stream of studies beginning in the 1990s. For instance, Firth's (1976) investigation of the industry-wide impact of earnings announcements in the United Kingdom between 1973 and 1974 constitutes one of the earliest inquiries into the existence of

intra-industry information transfers. The study, which included announcements from four industry groupings (Breweries, Food Retailers, Shipping, and Banks), found that during the ten trading days prior to the announcement, the sample of securities behaved in a manner predicted by the market model, with residuals being randomly distributed around zero and having no cumulative impact. On the announcement day, however, similar-type firms experienced an average excess of 2.1% or -3.7% in their share prices depending on whether the announcement bore "positive" or "negative" news. The residuals for 94% to 98% of the sample firms showed the same sign on that day. In particular, the residuals of competing firms ranged from 50% to 80% of announcing company residuals, and were in the same direction as those of the announcing firms. Firth concluded that the stock market used firm-level annual earnings results to reassess share prices of rival companies, and that virtually the entire price adjustment occurred on the announcement day.

Foster (1982), whose sample included announcements in the Wall Street Journal between 1963 and 1978, similarly found strong evidence of an information transfer between the firm releasing earnings information and other firms in its industry. Employing three alternative definitions of an industry, namely the 4-digit Standard Industrial Classification (SIC), the Homogeneous Line of Business, and the Dominant Firm industry definitions, the author found that the magnitude of impact was stronger for companies having a larger proportion of their revenues in the same line of business as the announcing firm; roughly, these firms are among the less diversified entities within an SIC code. For a sample of Australian firms, Clinch and Sinclair (1987) found results similar to Foster over the period January 1977 to December 1981; earnings releases had a homogeneous impact on the announcing and rival firms. Further, the magnitude of stock price effects diminished for successive earnings announcements within the same industry.

In his attempt to examine the determinants of the industry-wide effects of earnings reports, Bannister (1994) incorporated the correlation between the earnings signals of announcing and rival firms, the information content of the announcer's signal (measured by the announcement period abnormal return), and the level of uncertainty for the rival firms prior to the earnings announcement (measured by the size of the firm and the standard deviation of the rival's distribution of information signals). While the strongest association between these factors and the abnormal returns to rival firms was observed for fourth quarter announcements that represented bad news for the competitors, the market reacted to bad news whenever it occurred. Good news, on the other hand, elicited a stock price response only in

the fourth quarter, presumably because accounting numbers in this quarter were fully audited.

In contrast to the studies mentioned above, Baginski (1987) examined the intra-industry information transfers associated with earnings forecasts made by management. The final sample consisted of 57 forecasts announced in the Wall Street Journal between 1978 and 1983. A grouping of similar firms was achieved through a cluster analysis of firms within the same 4-digit SIC code. The clustering was performed on the basis of the estimates from a firm's single-index market model and financial leverage. The results indicated that rival firms experienced positive (negative) abnormal returns when the forecasts for the announcing firm indicated positive (negative) changes in earnings. These findings are consistent with the existence of intra-industry information transfers from management's earnings forecasts.

The existing literature on the announcement effects of earnings releases and forecasts clearly suggests that investors use the information contained in these reports to evaluate the shares of other firms in the same industry. Typically, the stock prices of the announcing firms and their rivals are observed to change in the same direction.

CORPORATE BANKRUPTCY ANNOUNCEMENTS

Much attention has traditionally been paid to the possibility of a contagion effect from bankruptcies within the banking industry. Recently, however, some researchers have demonstrated the occurrence of this phenomenon among industrial and other non-banking firms as well. Lang and Stulz (1992) studied the industry-wide stock price effects from bankruptcy announcements by industrial firms between January 1970 and December 1989. In order to increase the probability of detecting an industry-wide effect, the study restricted its attention to bankruptcies of large firms. Consistent with the majority of intra-industry studies, the authors defined industry rivals as those with the same primary 4-digit SIC code in COMPUSTAT (a database compile by S&P which contains comprehensive accounting and some market data for the firm level). Also, the event date was identified as the day on which the report of a Chapter 11 filing appeared in the *Wall Street Journal*.

The 59 bankrupt firms in the sample experienced significantly negative abnormal returns over the four days prior to the announcement date, and a loss of 18.93% in shareholder wealth on the filing day. These bankruptcies initiated a

dominant contagion effect for the corresponding industries; the portfolios of industry rivals experienced significantly negative abnormal returns over the 11 days surrounding the event date. Thus, it appears that the average bankruptcy was caused by industry-wide shocks rather than by a firm succumbing to competition. However, a closer analysis of the abnormal returns to rivals indicated a heterogeneous effect across industries, and a study of the relationship between the abnormal returns and industry characteristics revealed that the contagion effect was particular strong in highly levered industries. In industries characterized by a high degree of concentration and low leverage, on the other hand, a competitive effect prevailed, with rival firms profiting from the distress of the bankrupt firm.

In a similar study of industry-wide effects, Cheng and McDonald (1996) examined bankruptcy announcement effects in the airline and railroad industries, which possess vastly different market structures. The sample included 7 airline and 5 railroad bankruptcy announcements over the period 1962 and 1991 that appeared in the Wall Street Journal. Employing the event study methodology, the authors found that the surviving airlines experienced an average abnormal return of 1.89% on the day preceding the announcement, but the surviving railroads suffered a significantly negative average abnormal return (of -0.89%) on Day 0. The difference in the timing of market reaction for the two industries may arise from the fact that the railroad bankruptcies pertain to the early part of the sample period, when the electronic news media was not in wide use.

The authors ascribed the positive abnormal returns for rival airlines to the existence of barriers to entry (into city-pair markets) and hence market power. In such an industry, the bankruptcy of a firm would increase the market power of the surviving firms, whose stock prices will consequently be bid up by investors. The negative abnormal returns to surviving railroads, on the other hand, can be explained by an immobility of assets, which makes it difficult for one railroad to service the regions covered by a failing industry member. Furthermore, the successful operation of the business requires cooperation among two or more railroads. Thus, the railroad industry is characterized by interdependencies, which imply disruptions in operation for surviving companies when a member firm goes bankrupt.

The studies by Lang and Stulz (1992) and Cheng and McDonald (1996) suggest that industry characteristics can play a significant role in determining the nature of the valuation effects events have on rival firms. Asness and Smirlock (1991), who examined the effects of a Real Estate Investment Trust (REIT) bankruptcy, emphasized the importance of discriminating across firm characteristics when investigating intra-industry information transfers. An REIT must, at its

inception, define the type of assets to be purchased and the maximum leverage to be assumed. By thus lending themselves to differentiation by portfolio composition (i.e., as Equity, Financial, and Residual REITs), these institutions allow an investigation of how firms within the industry might differ in their reaction to a given announcement.

The authors studied the impact of the Residential Resources Mortgage Investment Corporation (RES RES) bankruptcy announcement on a sample of 35 REITs: 18 Equity, 8 Financial, and 9 Residual investment trusts. RES RES belonged to the last category of trusts. An analysis of the 121 day period surrounding the event revealed that the bankruptcy announcement decreased the value and increased the perceived riskiness of REITs; there was a negative stock price effect on the announcement day, and a positive change in systematic risk following the event. In particular, the study showed that these effects were limited to Residual REITs; when studied separately, the Equity and Financial trusts showed no abnormal returns during the event window, nor did they experience any statistically significant change in systematic risk.

Among the Residual REITs, the authors found that the magnitude of the abnormal return varied cross-sectionally by leverage, indicating that the market discriminates among industry members in assessing intra-industry effects of information arrival. The main conclusion offered by this study was that treating rival firms as a homogeneous sample in the examination of information transfers can provide misleading results.

From a methodological viewpoint, it would be useful here to mention the most recent study on the intra-industry effects of bankruptcy announcements. Haensly et al. (2001) replicate the stratification methodology adopted by the Lang and Stulz (1992) study mentioned earlier, but use a sample from a single legal regime. They find that the effects of bankruptcy announcements on competitors are ambiguous, and results are very sensitive to the debt screen employed in sample selection. A study of the ripple effects of bankruptcies appears, therefore, to be a potential subject for further research.

CAPITAL STRUCTURE ADJUSTMENTS

Change in capital structure is another area in which the results of different intra-industry studies disagree. Michael Hertzel (1991) first investigated the stock price effects on rival firms due to stock repurchase tender offers made within the industry. Citing theoretical models that demonstrate strategic changes in a firm's

capital structure can have implications for industry counterparts, he argued that information about the repurchasing firm could cause the market to reassess earnings prospects for rival firms. However, for a sample of 134 offer announcements over the period 1970 to 1984, the author found no significant valuation effects for non-announcing firms, which indicates that the information content of repurchase announcements pertains mainly to the firm making the offer. These results parallel those found by Slovin et al. (1992), who compared the intra-industry effects of seasoned equity issues made by banks and industrials. While no industry-wide valuation effects could be observed for common stock issues by industrial firms, a significantly negative impact on rivals was seen within the banking industry. The authors ascribed these findings to the information structure of bank operations, which in their view limits the dissemination of information necessary for the assessment of individual bank value and riskiness.

In contrast to these studies, Szewczyk (1992) reported significantly negative abnormal returns for the rivals of industrial firms announcing equity and debt issues. The sample included announcements between 1970 and 1983 for which a date could be identified in the Wall Street Journal Index. In all, 128 common stock, 54 convertible debt, and 302 straight debt offerings were employed in the study. Significantly negative abnormal returns were observed for both announcing rival firms in the case of equity and convertible debt offerings. For the issue of straight debt, however, a significant (negative) effect was seen only for the industry rivals. These findings indicate that the market draws inferences about industry prospects from announcements of equity and debt offerings.

Unlike Hertzel (1991) and Slovin et al. (1992), Akhigbe and Madura (1999) focused exclusively on the ripple effects of bank stock repurchases, since on account of capital requirements and other regulatory constraints, events at banks are likely to constitute a special case. And in contrast to the two earlier studies, these authors did find that repurchases of stock by banks have a significantly positive effect on both the repurchasing banks and their industry rivals.

Erwin and Miller (1998), on the other hand, find that while the announcement of open market repurchases has a positive effect on the announcing firm, it has a negative effect on rival firms. Thus, these authors discover a net "competitive" rather than a net "contagion" effect from stock repurchase announcements. Further, they find that this competitive effect is stronger in those industries where competition is less and in which the degree of similarity between the announcing firm and its rivals is lower.

DIVIDEND CHANGES, INITIATIONS AND OMISSIONS

Firth (1996) studied the existence of ripple effects from dividend adjustments. He hypothesized that dividend changes by one firm could possess valuation implications for other firms in the same industry since management may revise dividends to signal changes in future earnings and cash flows from: (1) anticipated industry-wide changes, or (2) perceived shifts in competition or market share within the industry. Thus, performance and operating strategy linkages among firms may cause investors to apply information releases of one company to its competitors.

The study included a total of 543 dividend increases and 106 dividend cuts between 1980 and 1991, and measured the impact of these changes on "rival firms" defined as those sharing the 4-digit SIC code of the dividend change firm. The author employed standard event study methodology to assess the market reaction to dividend changes; abnormal returns were calculated as the difference between actual and expected returns, with the latter being generated by estimating the market model using daily returns on the CRSP equally-weighted market index. Firth found that non-announcers on average were re-valued in the same direction as the announcing firm, though by a smaller magnitude. Thus, dividend increases (decreases) by one firm constituted good news (bad news) for that firm as well as for the other members in its industry. This observation is consistent with dividend revisions being based on perceived changes in industry-wide factors rather then anticipated alterations in market share. In addition, Firth tested whether the dividend "surprise" (the abnormal return of the announcing firm) was related to any changes in earnings forecasts of non-reporting firms. He found the unexpected revisions in analysts' earnings forecasts of non-reporting firms to be directly related to the abnormal stock returns of the dividend change announcer. Overall, these results led Firth to conclude that dividend changes by one firm carried informational value for other firms in the same industry.

Laux et al. (1998) studied the intra-industry effects of large dividend revisions, and found a heterogeneous effect on rivals; rivals that are unlikely to be threatened by competitive realignments experience a revaluation in the same direction as the announcing firm, while those likely to be affected by such realignment do not experience statistically significant stock price effects. Finally, Howe and Shen (1998) showed that dividend initiations are purely form-specific events, while Caton et al.(2003) documented the possibility of ripple effects from dividend omissions.

In an effort to test the hypothesis that horizontal mergers have collusive, anticompetitive effects, Eckbo (1983) measured the stock price effects of merger proposal announcements for merging firms and their horizontal rivals. The collusion hypothesis suggests that a horizontal merger should have a positive valuation effect on the rival firms, since the costs of monitoring any existing collusive agreement will decline with a reduction in the number of independent producers in the industry. Further, rivals outside the collusive agreement should also earn positive abnormal returns since they can free-ride on higher product prices. The sample included a total of 259 merger proposals over the period 1963 to 1978. Horizontal rivals were identified on the basis of the 4-digit SIC code, and abnormal returns around the Wall Street Journal announcement date were calculated using the market model. Even though for a large subset of events rivals experienced positive stock price effects, the behavior of abnormal returns over the merger proposal and subsequent antitrust complaint announcements did not support the collusion hypothesis. Instead, the overall results were consistent with the argument that rivals enjoy positive abnormal returns at the merger proposal announcement because of the potential increase in productive efficiency; the author suggests, for instance, that the announcement can reveal information which allows rivals to imitate the technological innovation prompting the acquisition.

Mitchell and Mulherin (1996) obtained similar results in their test of the proposition that industry fundamentals contribute to takeover and restructuring activity. For the period 1982 to 1989, the authors found distinct patterns in the rate and clustering of these activities across 51 industries. A link between industry shocks and takeover activity implies that the announcement of a takeover at one firm should elicit a positive stock price response from other members of the industry. For 607 announcements of takeover or restructuring activity, significantly positive abnormal returns were observed for rival firms in the event month. As in the case of Eckbo (1983), the authors did not interpret these spillover effects as evidence of anticipated market power. Since industry fundamentals appeared to drive the takeover and restructuring activity, the more benign explanation for the positive abnormal returns could be offered, that investors anticipated ongoing industry-wide restructuring activity.

A significantly positive valuation effect on rival firms was also observed for the 128 going-private transactions between 1980 and 1988 studied by Slovin et al. (1991). In contrast to the case of mergers and takeovers, however, this impact on

rivals could not be attributed to operating synergy or market power because going-private transactions do not involve a consolidation of firms. Instead, the authors suggested that buyout bids revealed information about future cash flows in the industry.

In another study, Slovin et al. (1995) compared the information content of three mechanisms of restructuring: (1) equity carve-outs, which are public offerings of subsidiary equity; (2) spin-offs, which distribute subsidiary equity to the owners of the parent firm through pro rata stock dividends; and (3) asset sell-offs, which are sales of subsidiaries to third parties. The objective of this study was to identify the sources of gain to the parent firm conducting such restructuring activity by focusing on the contemporaneous valuation effects on industry rivals. These rivals were defined as firms belonging to the same 4-digit SIC code as the announcing firm. For a sample period 1980 through 1991, the authors found that equity carve-outs were associated with significantly negative abnormal returns to other industry members. This observation is consistent with two views: that the equity carve-out signals over-valued industry assets, or that it reflects an improved competitive position for the restructured parent. An analysis of equity betas for rivals revealed no shifts round the event dates, suggesting that the observed stock price effects were not an outcome of changes in industry systematic risk.

In contrast to equity carve-outs, spin-off announcements elicited a positive stock price response from industry rivals, indicating that these events constitute a favorable signal about industry value. In particular, managers of the parent company believe the unit to be undervalued, and are therefore unwilling to issue equity in the subsidiary as a method of restructuring. This action therefore constitutes favorable information for rivals if the unit has industry-common elements. Asset sell-offs, the third method of restructuring, did not have any intra-industry valuation effects.

More recently, Akhigbe and Madura (1999; 2001) have examined the industry-wide effects of bank acquisition announcements and insurance company mergers. In the first study, they found that bank acquisition announcements caused, on average, a significantly positive revaluation in the equity of rival firms, though the impact was conditioned by firm-specific characteristics. In the second study, they once again found a positive effect of insurance company merger announcements, on both the announcing firm and on industry rivals, lending credence to the idea that mergers act as signals to the market in the face of information asymmetry.

The final section below provides a brief account of miscellaneous studies which further support the view that a variety of developments at one firm can have important implications for other industry members. These studies consider such events as strikes, bond rating changes, stock splits, layoffs, and announcements of R&D expenditures.

OTHER EVIDENCE OF INTRA-INDUSTRY EFFECTS

The work by Kramer and Vasconcellos (1996) belongs to the class of studies that examines the linkages between non-financial resource markets and stockholder wealth. The authors extended the inquiry into the economic effects of strike activity by measuring the industry-wide stock price impact of strikes. The study included manufacturing firms operating in highly concentrated industries which experienced a strike by 1,000 or more workers between January 1982 and July 1990. The authors limited their definition of industry rivals to a maximum of the top four competitors. The final sample consisted of 21 strikes across 9 industries, and 41 non-struck competitors. Standard event study methodology indicated that the struck firm suffered a statistically insignificant decline in market value over the 30 trading days prior to the strike, but experienced a post-strike increase in value in the post-strike period. These results suggest that concessions made by labor exceeded the quid pro quo costs (such as profit sharing and layoff protection).

The gains to non-struck competitors in the pre-strike period were also not statistically significant. However, over the month following the strike, like the struck firms, these rivals experienced positive abnormal returns, suggesting that investors expected the competitors to secure similar concessions from labor. During the strike period, the struck firms suffered a decline in market value of 1.9%, but these losses were not captured as gains by rivals; the latter earned abnormal returns not statistically different from zero. The authors attributed this absence of spillover during the strike period to the struck firm's ability to stockpile inventory, shift production to other facilities, and subcontract production.

Zantout and Tsetsekos (1994) investigated the nature of information conveyed by the announcement of increases in R&D expenditures. Such an announcement could indicate to investors that the announcing firm will possess a strategic advantage over the competition from being the first to innovate. Alternatively, market participants may anticipate that rivals will benefit from technology spillovers. The authors conducted an event study to test these

hypotheses. Rivals were defined as those operating in the same 4-digit SIC code and which were of the same size (in terms of sale) as the announcing firm. For 114 announcements made by 71 firms between June 1979 and December 1990, the authors found that the announcing firms experienced positive abnormal returns while their rivals suffered negative abnormal returns at the announcement of the planned increase in expenditures. These findings support the hypothesis that first movers enjoy an innovation-induced competitive advantage.

In their study of stock split announcements, Tawatnuntachai and D'Mello (2002) found that the event had a generally positive valuation effect on rival firms, and that this effect is associated with changes in earnings levels (but not changes in earnings volatility) for the rival firms. With regard to corporate downsizing, Sun and Tang (1998) found a negative effect of such announcements on both originating and rival firms. Finally, Akhigbe et al. (1997) found that bond rating downgrades were associated with negative stock price effects for both the re-rated firm and a subset of industry counterparts that were more closely related to the re-rated firm. Thus, the activity of rating agencies such as Moody's and S&P appear to have implications not only for the firm for which they supply the reclassified rating, but also for other firms in the same industry.

CONCLUSION

A review of the finance literature indicates a sustained interest among academicians in the possibility of industry-wide effects from a diverse set of corporate events. Traditionally considered to be firm-specific, such events as capital structure changes, dividend adjustments, stock splits, and rating reclassifications now are known to have the potential to convey industry-wide information to capital markets. The existing research on intra-industry information effects sheds light on numerous economic and regulatory issues. For instance, the emerging evidence on the far-reaching effects of re-rating activity should be of considerable value to the current debate on the regulation of credit rating agencies and the legally sanctioned barriers to entry in the rating industry.

The evidence provided in this paper also suggests that there is some ambiguity with regard to the spillover effects of some events; for instance, existing studies do not agree on the industry-wide implications of bankruptcy announcements and capital structure adjustments. The potential for research still exists in these and additional areas. Arguably, one of the more challenging areas of study in the intra-industry information arena is the identification of "rational" and

"irrational" contagion; that is, in the instances where rivals are found to be affected in the same direction as the originating firm, there is an evident need to be able to ascertain whether or not the market was justified in generalizing the information provided by the event from the firm to the industry as a whole.

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WAGES AND VOLUNTARY LABOR TURNOVER: COMPARING IT WORKERS WITH OTHER PROFESSIONALS

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ABSTRACT

There is a body of literature suggesting that a new labor contract between employer and employee is emerging which places less value on loyalty and long term employment relationships. Some have argued that the use of computing technology contributes to this by making skills more common and transferable across organizations, thereby encouraging organizations to hire away the skilled workers of their competitors. Concern about voluntary job change specifically among IT professionals was heightened during the IT boom of the late 1990s.

This study examines monthly employment, wage, and job change data from 1998 through the beginning of 2001. IT professionals were compared to other technical and managerial workers. In addition, IT workers employed in the computer services industry (the sector which includes software companies and IT consulting firms) were examined as a distinct subgroup of IT workers. IT professionals who changed jobs were found to have gained a small wage premium, while other professional workers did not benefit from job change. In addition, voluntary job change rates were found to be high for IT professionals in the computer services industry, while IT professionals in other industries were no more likely to change jobs than other professional workers.

INTRODUCTION

During the late 1990's, U.S. IT employers expressed substantial concern over what they perceived to be a substantial shortage of skilled IT workers with rapidly escalating wage rates and high rates of voluntary job change among IT

workers with critical skills. Not surprisingly, many IT workers and groups representing them expressed a very different view of the nature and magnitude of this problem. They argued that employers were using the perceived shortage of IT workers to justify visa exemptions to bring in foreign workers at wages that undercut those required to hire and retain experienced U.S. workers. They cited the lack of evidence of rapid wage increases or unusually rapid employment growth across the IT profession, arguing that rapid employment growth was occurring only at the highest skill levels (Bernstein & Hamm, 1998).

The performance of the IT labor market during this period of market stress is important since it is likely that similar pressures will occur in future periods of strong economic growth. Perhaps more importantly, IT wage and turnover behavior during this period are of interest for what they can tell us about the nature of the employment relationship in the IT profession and perhaps for what they can tell us about changes in the employment relationship across all professional occupations. The academic literature provides a number of potential explanations of and prescriptions for dealing with the high job turnover rates of IT workers. Theories range from those that focus on unique aspects of the IT worker and IT jobs to those that suggest that the changing IT job market simply reflects changes, and perhaps represents the vanguard of changes, that are impacting employment relationships across all industries and occupations. In addition, the economic theory of human capital suggests the nature of a worker's skill set (as determined by such things as formal education and formal and informal on-the-job training) is a key factor determining the likelihood of job turnover.

In this study, we will examine alternative theories postulated to explain IT job turnover and determine the extent to which these theories are competing or reinforcing in terms of expected labor market behavior of IT workers. Then, using data from the US Current Population Survey (CPS), we will evaluate the degree to which the alternative theories are supported by US labor market data.

HUMAN CAPITAL THEORY AND TRADITIONAL ECONOMIC THEORY

In a broad sense, wage structures and labor turnover can be explained by the theory of human capital as developed by Becker (1962). According to human capital theory, investments in skill acquisition come at a cost since time that could have been used in production is sacrificed to acquire the skills. A return on this

investment is generated in succeeding periods since the acquired skills enhance the productivity of the worker. Individuals can increase their productivity not only through their investments in formal education, but also by learning work skills while they are actually on the job through formal training programs or informal instruction by supervisors or coworkers (Mincer, 1962).

Becker (1962) divides on-the-job training into general training and specific training. General training increases a worker's prospective productivity in a large number of firms. For example, training in the use a word processing package or conflict resolution skills would be expected to have equal value to a broad set of firms. Competition for the services of a worker with these general skills forces the current employer to pay the full value of the skills to the workers or lose her/him to a competing employer. Therefore, the employer presumably cannot afford to pay for such training. The employee reaps all of the returns to general training and must, in a competitive labor market, bear all of the costs of such training. If the skills developed are general, the model of on-the-job training is not fundamentally different than that for a worker deciding whether to bear the costs of formal education in anticipation of higher future earnings after completing their formal education.

Specific training increases the worker's productivity only at the firm that provides the training. For example, one may learn the operating procedures and business rules of a particular firm or learn how use or maintain specialized information systems developed by the firm. The enhanced productivity from this type of knowledge is only achieved if the worker remains with her current firm. For all other firms, her productivity (and therefore her value) has not increased. Once specific training has occurred, the employee has incentive to remain with the firm as long as they receive at least some of the benefits of their improved productivity and the employer will gain from retaining the employee as long as they pay no more than the full value of the employee's improved productivity. Since the worker is now more valuable to their current firm than to competing firms, the worker is less likely to seek a job with another firm and the employer is more likely to make efforts to retain the worker. Specific training requires that the employee and employer to strike a mutually beneficial bargain to share costs and returns of training, which enhances job security for the employee and reduces voluntary turnover for the employer.

When applying human capital theory to information systems (IS) professionals and other high tech workers, it is important to note that specific skills as defined by Becker are far different than specialized skills. Highly specialized

skills in mechanical engineering, JavaScript programming, or even in the implementation of a specific ERP software package are likely to be of value to a substantial number of firms constituting a competitive labor market. Thus, such skills are general in Becker's terminology. To avoid confusion, we will henceforth use the term "generally-valued" for Becker's general skills and firm-specific for his specific skills.

TRANSFORMATION OF WORK AND "THE NEW LABOR CONTRACT"

Increased global competition and rapid changes in technology of the 1980's and 1990's set the stage for dramatic changes in the nature of work and the structure of organizations. To accommodate these changes, many researchers believe that a new employment relationship between employers and employees has emerged and that IT is in the forefront of this emergence. Sommers (1995) remarks: "Employees are now loyal first to their individual careers, second to their peers, and third to their company".

Under the old labor contract, the expectation was that good work and loyalty on the part of employees would be appreciated and rewarded with good pay and job security by the employer. However, Chilton and Orlando (1996) argue That this system has "created high cost labor systems with insufficient incentives for producing high quality goods." Rapidly changing needs of business for employees with specialized skills shifts employees' focus away from job security to employment security. Hall and Moss (1998) suggest a new "Protean Career Contract" is emerging in which -"The career is managed by the person, not the organization". Development is self-directed, continuous, and often found in work challenges. The organization is expected to provide challenging assignments, developmental relationships, information, and training opportunities.

A recent content analysis of articles specifically examining the New Employment Relationship in the human relations literature (Roehling, et. al., 2000) identified the requirement for employers "to provide training, education, and skill development opportunities" and for the employee to "assume responsibility for developing and maintaining skills" as the most common characteristics of this new relationship. Thus firms are demanding, and in need of, cutting-edge skills and employees need maintenance of employability through continual training opportunities.

In applying these concepts to IT worker retention, Cappelli (2000) states: "a market-driven retention strategy begins with the assumption that long-term, across-the-board employee loyalty is neither possible nor desirable." Echoing these ideas, Stokes (2000) suggests that neither the employee nor employer desires a career length commitment, so that reward and incentive structures should be built around the desired length, such as, keeping workers through the completion of a project.

The studies cited above suggest that loyalty, job security, and the expectation of long-term employment with the same firm are less important under the new labor contract. Employers are not expected to offer continued employment across a career and employees are not expected to forego short-term wage gains from alternative offers in exchange for a long-term commitment to the firm. At the same time, the new contract requires employers to provide employees access to new skills and requires employees to remain employable by taking the initiative to maintain current skills.

Has computer technology played a special role in the emergence of the New labor contract? Zuboff (1992) argues that computer technology, in addition to automating certain functions, serves to "informate" business enterprises. That is, computer systems make it easier to acquire information about an organization. They formalize and expose data about company operation and policies and procedures. This changes the nature of relationships within an organization, and also makes it easier for those outside the firm to gain an understanding of its systems. If this is the case, computerization is in effect increasing the proportion of generally-valued skills as compared to firm-specific skills.

McConnell (1996) contends that the impact of computers is pervasive across occupation and industry lines - "moving many organizations from a pyramid shape structure to a flatter structure." Quinn, Anderson, and Fenkelstein (1996) argue the ability to leverage information and intellect is leading to new organizational structures which are centered on intellectual skill sets. They argue that "leveraging intellect" by hiring the best people, stimulating them to internalize the information knowledge, skills, and attitudes needed for success, creating systematic organizational structures to capture, focus, and leverage intellect, and demanding and rewarding performance is the key to success. Workers in such a firm will stay because the intellect-nurturing climate helps them increase their value, so they are less likely to be lured away by offers from other firms.

If changes in IT are an important factor in the emergence of new organizational relationships, we would expect the IT labor market to be on the

leading edge of this change. The reduction of loyalty under the new labor contract and the increased proportion of generally-valued skills in computer-based systems suggest that IT workers would have higher turnover rates than other professions.

TRAINING, AND THE NEW LABOR CONTRACT

Empirical studies of training suggest that differences in schooling, work, and occupational choice decisions can be explained by unobserved variations in skill level with more able individuals investing more in both formal education and on-the-job training settings because their expected return for skill acquisition is greater (Keane & Wolpin, 1997) and the likelihood of receiving training increases with the education level of the worker (Neal, 1997; Royalty, 1996).

Recent training studies imply that access to training opportunities is often viewed as a form of fringe benefit that firms can use to attract and retain higher quality workers. A survey of US firms (Barron, Berger & Black, 1997) found that there was no evidence that starting salaries were lower when workers received greater on-the-job training, although on-the-job training did cause subsequent increases in wages and productivity. In addition, large firms are much more likely than smaller firms to provide formal on-the-job training than smaller firms and firms offering more numerous and generous benefits to their employees are more likely to provide training (Frazis, Herz & Harrigan, 1995. The incidence of training is also likely to be higher in firms where employee turnover is low (Frazis et.al., 1998) and which use high-performance work systems (such as just-in-time or MRP) (Lynch & Black, 1998).

Traditional human capital theory holds that the employer can only afford to offer training that builds firm specific skill. However, if workers view training opportunities as a significant form of fringe benefit, employers offering strong training opportunities can select the most able workers out of a pool of candidates and pay them the same wage that firms offering less training must pay to less able workers remaining in the candidate pool. This allows employers to in effect recoup training costs by getting a greater stock of ability at the same cost.

Viewing training as a cost of attracting and retaining quality workers is very consistent with the concepts of the new labor contract. The lessening of loyalty under the new labor contract is perhaps, in part, explained by the fact that firms are forced to provide access to training that is not specific to the firm, but enhances the worker's value in the competitive labor market (generally-valued training). Although

human capital theory indicates that firms are not willing to pay the costs of providing generally-valued training, firms may pay the direct costs of such training, in return for obtaining and retaining higher quality workers at a given cost.

LABOR MARKET CHARACTERISTICS OF IT WORKERS

A number of studies of the IT field over the past 20 years have attempted to explain job satisfaction and job turnover in terms of the unique characteristics of IT workers and the job characteristics they desire. The motivating factors identified for IT workers are similar to those described for workers in general under the new labor contract.

Couger, Zawacki, and Oppermann (1979) studied motivational levels of MIS managers and other managers. They found stronger growth needs scores and lower social needs scores for MIS managers. A later study (Zawacki, 1992) confirmed these results and suggested than managers must recognize this need for growth and new challenges to motivate IT workers. With respect to more specific aspects of job motivation, Couger (1988) identified the top motivating factors for analysts and programmers as: the work itself, opportunity for achievement, opportunity for advancement, pay and benefits, recognition, and increased responsibility. Job security, working conditions, company policies, and interpersonal relations were ranked lower. Smits, McLean, and Tanner (1993) found that the desire for interesting and challenging work and task variety and autonomy are key motivational factors for high achieving IS professionals and a recent survey IS professionals in the Midwest (Mak & Sockel, 2001) found that the employees' assessments of career development prospects with their current firm had a substantial impact on retention.

It is worth noting that there is a distinction between worker satisfaction with the work environment and worker turnover intentions. Guimaraes and Igbaria (1992) found that job satisfaction was the primary factor for IT workers to feel organizational commitment. However, they found that job satisfaction had no direct effect on turnover intentions.

Stokes (2000) comments that reasons workers stay or leave an organization "vary as much as these professionals' skills and personalities and organizations' cultures and IT functions". He argues for the use of employability training and notes that: "Successful firms accept the marketability of employability". While it may be beneficial to use training as part of a retention strategy, Sheehan (2000) contends

that organizations tend to use training for reward purposes rather than as a discipline-driven, reskilling strategy.

Several of the studies reviewed above suggest that employers wishing to minimize voluntary turnover of IT workers should ensure that jobs are varied and challenging and that they involve the opportunity for acquisition of new skills. The new labor contract literature also suggests that those characteristics are important for obtaining high-quality professional workers, but is less clear on retention. Workers who are provided good access to skill improvement opportunities may have higher job satisfaction, but this may not translate into higher retention.

Shortages of workers with specialized skills may force employers of IT workers to provide training in these areas even though these skills are immediately valuable to other competing firms. Firms must balance training costs and an increased risk of losing trained workers against the increase in the ability level of the workers they attract and the enhanced productivity of the workers during their employment with the firm. The choice may become one of: fail to provide training and retain a set of less qualified workers for a longer period of time, or provide training and retain more able and skilled workers for a shorter period of time.

IMPACT ON EXPECTED VOLUNTARY LABOR TURNOVER

The alternative theories described above offer differing expectations with respect to voluntary labor turnover of IT workers. Under the new labor contract with its lessened emphasis on loyalty, it would be expected that voluntary turnover would be increasing across the board. However, if IT workers are on the leading edge of this trend, we would expect their voluntary turnover rates to be higher than those of other professions that are less affected by the new economy. Human capital theory reaches the same conclusion. Job skills that are more generally-valued have a more competitive labor market and thus there is less room for employers and employees to strike a mutually beneficial bargain for the employee's labor. Labor turnover would be expected to be higher the more generally-valued a worker's set of skills. If IT makes the internal workings of a business more transparent, it makes skills more generally-valued and IT workers, on the leading edge of that transformation would be expected to have a higher proportion of generally-valued skills, and thus higher rates of voluntary turnover.

On the other hand, the literature on job motivation of IT workers suggests that they are likely to be better satisfied and thus (probably) less likely to move to

another job to the extent that their current job gives them access to the opportunity to learn new skills and the ability to perform interesting and fulfilling work. Thus, workers would generally be less likely to voluntarily leave jobs with more access to learning new skills.

TURNOVER AND WAGE RATE

Also of interest in this study is the impact of voluntary job turnover on the wage of employees. Other things being equal, an employee would voluntarily change jobs only if he or she received a wage premium for doing so. Labor market analyses that have measured wages longitudinally (so that a worker's current wage may be compared to a former wage level for that same employee) have found the expected positive wage effect for a voluntary job change (Keith & McWilliams, 1999; Tomkins & Twomey 2000). However, cross sectional studies that compare the wage levels of workers who have changed jobs with the wages of comparable workers (equalizing for effects of age, sex, race, education level, and total work experience) who have not changed jobs have often concluded that job-changers tend to have lower wages. Light and McGarry (1998), for example, observed a negative impact of job change on wage in a purely cross sectional study based on data from the NLSY. They postulated that jobs could be viewed as "experience goods" where workers will change jobs if the experience of the job is less favorable than expected.

Some researchers have suggested that cross sectional results showing lower wages for job-changers than for job-stayers are due to adverse selection in the "used worker" market (job-changers). Current employers are better informed about the abilities of their employees and thus are able to concentrate their retention efforts on their better workers. Thus there is adverse selection in the market for "used" workers (Acemoglu & Pirchke, 1998; Greenwald, 1986; Waldman, 1984). Workers who quit one job to move to another are likely to be those workers who were passed over for promotion or whose previous employer was unwilling to match an alternative offer. Quitters may increase their salary, but still make less on average than those who do not change jobs.

Countering these adverse selection effects, aspects of the new labor contract seem to imply a measure of positive selection. The emphasis on the employee's responsibility to maintain employability suggests that companies believe that they have numbers of current employees whom they would not be willing to hire on the open market. Presumably, this set of employees would not have access to voluntary

job change and only those employees maintaining a current skill set would be able to find alternative job offers.

Another factor contributing to positive selection among voluntary job changers is "poaching." A study of French workers (Hocquet, 2000) found that workers with trained in certain types of skills by their former employers earned a substantial wage premium if they left that employer and went immediately to another employer in the same sector. This suggests that workers are receiving training that produces skills that are valued by competing firms. To cite just a couple of examples from the IT field, United Health Care reported losing "about half" of 600 new IT hires in 1997-98 to other employers (McGee & Davey, 1998) and a Gartner group study (Bittman, 1998) suggested that "Services providers like IBM, EDS and CSAA grow their NT know-how by stealing talent away from their end users with a minimum 35 (pay) percent increase."

The specificity of skill needs in IT is also an important factor that may contribute to poaching behavior. Moore and Burke (2002) suggest that, "At any given time within the IT profession some skill-sets are more marketable than others. In today's environment, skills associated with say, network and database management (such as in Oracle database administration) and with enterprise resource planning (ERP) systems (such as those in people-soft and SAP) are in demand." The sets of highly demand skills also tend to change rapidly. As Memishi (2000) notes "workers proficient in Novell were in huge demand about five years ago and today that's not a problem. There are multiple skill sets and so if something new comes down the pike and people aren't trained in that application, that's when there's a shortage."

Overall, theoretical models and past empirical results do not provide a clear-cut prediction as to the effects of job change on the wage level. Some evidence suggests that in purely cross sectional studies (as will be the case for our analysis) wage rates of job changers have tended to fall below those of job-stayers. However, the new labor contract research suggests that this is changing and that positive selection factors, including incentives for poaching those workers with the most highly desired skill-sets, may begin to outweigh the adverse selection factors leading to higher wages among voluntary job-changers.

CPS SURVEY DATA

The empirical component of this study is based upon data from the Current Population Survey (CPS which is household based. If a person changes their residence, they drop from the survey and the new occupant of that residence is surveyed. Thus, only job changes not involving changes in residence are included in this study. Workers can be in the survey for 8 months. However, they are asked questions about their wages only in months 4 and 8 in the survey. The data set used here is based upon data for the 4th and/or 8th months in the survey plus data measuring voluntary job change over the prior 3 months - workers who reported changing employers in any one of the 3 previous months were coded as job changers. Individuals are included in our survey data only if they were surveyed throughout months 1 through 4 or throughout months 5 through 8. The data set used in this analysis covers a three year period (April 1998 through March 2001). It is restricted to individuals 25 years of age and above, working full time, and reporting weekly earnings of at least $150. This allows us to focus the analysis on full-time paid employment of workers who have completed their initial formal education.

Most of the variables used are standard demographic and economic measurements. The wage variable used is an average weekly wage estimate compiled by the CPS by converting wage values reported over differing time periods (hourly, monthly, annually, etcetera) to a weekly bases (and, if necessary constructing values) using a standard procedure (US BLS, 2000). This wage is top-coded at $2881.61, or approximately $150,000 per year. Following Autor, Katz and Kreuger (1998), top coded wages are reported as 1.5 times the top code value or $4322.42 per week to adjust for truncation bias. In the analyses that follow, less than two percent of any of the groups studied had top coded values.

Comparison of IT workers with workers in other professions is the major focus of this study. The detailed occupation code of workers was used to separate IT workers (codes 64 and 229) from other business and technical professionals. Professional workers and technicians in all other non health care related fields were identified as the base group of other comparable professional workers.

Data identifying the industry in which a worker is employed are also of interest. Industry code 732 Computer and Data Processing Services is the industry category that includes software and computer consulting services companies. Arguably, firms in this industry tend to provide their employees with more access to new technology and provide workers with greater professional growth opportunities than companies that are not in computer related industries.

Comparison of IT workers in this IT related industry with IT workers in less IT focused industries allows us to determine whether this industry has distinct wage and turnover behavior.

EMPIRICAL RESULTS

Descriptive statistics for a number of qualitatively measured demographic characteristics that might be expected to impact wage and voluntary labor turnover rates are presented in Table 1.

The education level of IT workers appears to be somewhat higher than that of other technical occupations and management related occupations. Distribution of employment across industries shows that just over one-third of IT workers are employed specifically in the Computer services industry, which constitutes only a very minor component of employment in the other occupation categories. IT workers tend to be more concentrated in large cities than workers in the other two categories. Finally, female workers are much more prevalent in the management related occupations than in the IT and other technical occupation groups, whereas, Black and Hispanic workers are about equally represented across the three occupation categories, but are underrepresented across all of these occupation groups relative to their prevalence in the general population.

Age is measured in individual years in the CPS data set. Table 2 shows the distribution of employment by age grouped in 5-year age ranges and compared across occupation groups. Clearly the proportion of workers in the age groups up to age 40 is substantially higher in IT related occupations, than in the other occupational categories.

Table 3 presents summary data showing the average weekly wage for workers at each age range across the occupation groups. The data suggest that young workers in IT related professions experience a substantial wage premium compared with the other occupation groups. However, this premium shrinks substantially with age.

We have not yet presented data about the rates of voluntary job change. Since these rates are one of the principal targets of our analysis, we present the job change data in Table 4 along with results of a statistical test of whether the proportions are equal across occupation groups.

Table 1: Distribution of Demographic Variables

	IT Related Occupations		Other Technical Occupations		Management Related Occupations	
	Count	Percentage	Count	Percentage	Count	Percentage
EDUCATION LEVEL						
High School or <	401	6.90%	1701	14.33%	2200	17.75%
Some College	818	14.07%	1945	16.39%	2356	19.00%
Associates Degree	656	11.28%	1665	14.03%	1288	10.39%
Bachelors Degree	2873	49.42%	4612	38.86%	5116	41.27%
Masters or Higher	1066	18.34%	1946	16.40%	1437	11.59%
INDUSTRY						
Manufacturing	1142	19.64%	5260	44.32%	2108	17.00%
Trans., Util. & Fin.	1109	19.07%	1810	15.25%	3438	27.73%
W & Retail Trade	360	6.19%	392	3.30%	1303	10.51%
Computer Services	1941	33.38%	363	3.06%	186	1.50%
Other Serv & Govt.	1262	21.71%	4044	34.07%	5362	43.25%
CITY SIZE						
Small (<500,000)	1256	21.60%	3860	32.52%	3939	31.77%
Medium (500,000-5,000,000)	2294	39.46%	4508	37.98%	4598	37.09%
Large (>500,000)	2264	38.94%	3501	29.50%	3860	31.14%
FEMALE AND MINORITY STATUS						
Female	1692	29.10%	2670	22.50%	7251	58.49%
Black	369	6.35%	622	5.24%	1037	8.36%
Hispanic	182	3.13%	538	4.53%	537	4.33%
TOTAL COUNT	5814		11869		12397	

Table 2: Age Distribution of IS and Other Professional Workers			
Age Range	IT Related Occupations	Other Technical Occupations	Management Related Occupations
25 - 29	16.37%	12.55%	13.65%
30 - 34	19.49%	14.65%	14.90%
35 - 39	19.80%	17.75%	15.86%
40 - 44	16.05%	18.24%	16.83%
45 - 49	13.50%	14.79%	14.99%
50 - 54	9.24%	11.64%	12.79%
55 - 59	4.16%	7.03%	7.43%
60 or Over	1.39%	3.34%	3.56%

Table 3: Average Weekly Wage of Workers by Age and Type of Profession			
Age Range	IT Related Occupations	Other Technical Occupations	Management Related Occupations
25 - 29	$926	$783	$765
30 - 34	$1,059	$909	$873
35 - 39	$1,189	$1,001	$985
40 - 44	$1,177	$1,063	$1,002
45 - 49	$1,181	$1,059	$1,006
50 - 54	$1,158	$1,080	$1,003
55 - 59	$1,201	$1,166	$1,047
60 or Over	$1,090	$1,054	$973

Table 4: Three Month Job Change Rate IS VS OTHER OCCUPATIONS			
Value	IS Related Professions	Other Technical Professions	Management Professions
No Job Change	5427	11254	11716
Job Change	387	615	681
Percent Changing Jobs	6.66%	5.18%	5.49%
Test for = Proportions (Z-Value)		-3.98**	3.11**
** Signifacant at .05 level.			

Table 4 shows that the 3 month rate of voluntary job change is between 1 and 1.5 percent higher for IT related occupations than that for other technical workers and for management professions and these differences are statistically significant (based upon separate comparisons of IT worker to each of the other occupation groups).

In Table 5 similar statistics are presented with a breakdown of the turnover rate of workers in the computer services industry versus all other industries, as well as a breakdown of IT versus other professional occupations.

It is clear that job turnover in the computer services industry is much higher than the average across other industries for both IT workers and other professional workers. It appears that all of the difference in job change rates found in Table 4 is due to the strong prevalence of IT workers in the computer services industry. Within industry comparisons showed no significant difference in the rate of job change. IT professionals working in the computer services industry experienced a job change rate of 9.22 percent over the three month observation period, but employees from other professions working in the computer services industry experienced an even higher, 10.20 percent, job change rate. In all other industries, IT professionals experienced a job change rate of 5.37 percent compared to 5.23 percent for other professions.

Table 6 presents regression results for determinants of the rate of job change. Job change is a dichotomous variable. A worker either changed jobs over the prior 3 months (1) or did not change jobs in the prior 3 months (0). For a number of reasons, standard linear regression is not appropriate when using a dichotomous

dependent variable. Most prominently, the error term cannot be normally distributed.

Table 5: Three Month Job Change Rate Computer Service Industry VS All Other Industries (In IT and Other Occupations)

Information Technology Occupations		
Value	Computer Services Industry	All Other Industries
No Job Change	1762	3665
Job Change	179	208
Percent Changing Jobs	9.22%	5.37%
Test for = Proportions (Z-Value)		-5.56**
Other Technical and Management Occupations		
Value	Computer Services Industry	All Other Industries
No Job Change	493	22477
Job Change	56	1240
Percent Changing Jobs	10.20%	5.23%
Test for = Proportions (Z-Value)		-5.12**

** Significant at .05 level.

The logit function is a commonly used method that produces maximum likelihood estimates for equations with dichotomous dependent variables (Green, 1997). The Logit function essentially makes the log of the odds ratio (the ratio of the probabilities of the two outcomes of a dichotomous variable) the dependent variable and performs a "standard" linear regression on this transformed value. In our case the odds ratio is the probability of changing jobs divided by the probability of not changing jobs. This is illustrated in the following equation where ln is the natural logarithm, pjc is the probability of changing jobs, a is an intercept term X is a vector of independent variables, B is a vector of coefficients on those variables and e is the error term.

$$\ln(p_{jc}/(1- p_{jc})) = \mathbf{a} + \mathbf{B}X + e$$

Taking the antilog of the equation above yields:

$$p_{jc}/(1- p_{jc}) = \exp\mathbf{a} \times \exp\mathbf{B} \times \exp X \times \exp e$$

The B coefficients above can be interpreted as percentage changes in the odds-ratio of the dependent variable, and this interpretation is appropriate for the coefficients of Table 6.

Data for all of our occupational categories were pooled into a single group for this analysis with occupation and industry groupings being treated as independent variables. The likelihood ratio test for this model shows it to be statistically significant. Individual parameter estimates and their standard errors are also shown.

Age, and the square of age are the only continuous variables in this model. They are statistically significant with opposite signs. These coefficients suggest that the odds of a worker changing jobs initially increase at a decreasing rate with age and eventually begin to decrease with age.

The remaining coefficients in Table 6 are based upon sets of dummy variables. In each category there is a base group and a set of coefficients reflecting how a worker's probability of job change is affected by belonging to some other demographic group. The base group is white male workers in non-IT related technical professions who live in cities between 500,000 and 5 million in population and work in the services and government industry sector (but not the computer services industry). The results suggest that college graduates are less likely than workers at other education levels, both higher and lower, to change jobs. Workers in manufacturing industries are significantly less likely to change jobs and workers in the computer services industry are substantially more likely to change jobs than workers in other industries, which is consistent with the base proportions in Table 5 Not surprisingly workers in small cities are less likely to change jobs (without relocation) and workers in large cities are more likely to do so. The race and sex of workers does not appear to have a significant impact on their job change characteristics. Finally, consistent with the Table 3 results, the worker's occupation category does not significantly impact the rate of job change when the impact of working in the computer services industry is treated as a separate factor. Together the results of tables 4 through 6 suggest that the higher rates of voluntary job change for workers in IT occupations are almost entirely due to the high incidence of job

change in the computer services industry where over a third of IT professionals work.

Some of the results of Table 6 seem at first counter intuitive and are inconsistent with past studies of voluntary job change. However, it must be remembered that only job changes not involving relocation are included in our sample. With respect to age, younger workers may change jobs more frequently overall (the expected result) but a higher proportion of their moves may involve relocation. Rates of job change have generally been found to decline with increases in the education level, but the markets for workers with advanced degrees may be too small to allow them to easily change jobs without relocation.

Table 7 summarizes linear regression results examining the determinants of wage rates. In this case separate results for IT occupations, other technical professions, and management related professions are shown. Values for the log of weekly wage were found to be approximately normally distributed, while untransformed wage values were not. Thus, the log of weekly wage was used as the dependent variable in this analysis.

Table 6: Determinants of Job change Rates
(Logistic Regression Results)

		Chi-Square	DF	Pr > ChiSq
	Likelihood Ratio Test	163.0729	17	<.0001
	Parameter	Estimate	Std. Error	
	Intercept	0.6320	0.4549	
	Age	0.0787	0.0215**	
	Age Squared	-0.00075	0.00026**	
Education Level (Bach. Degree Base)				
	High School or <	0.0152	0.0416	
	Some College	0.0792	0.0364 **	
	Associate Degree	0.0795	0.0413*	
	Masters Degree or >	0.0639	0.0376*	

Table 6: Determinants of Job change Rates
(Logistic Regression Results)

		Chi-Square	DF	Pr > ChiSq
Industry (Services Base)				
	Manufacturing	-0.1275	0.0351 **	
	Trans. Utilities & Finance	-0.0066	0.0348	
	Wholesale and Retail Trade	0.0437	0.05130	
	Computer Sevices Industry	0.2416	0.0469 **	
City Size (Medium Size Base)				
	Small (< 500,000)	-0.1029	0.0328 **	
	Large City (> 5,000,000)	0.0486	0.0293 *	
Race and Sex (White and Male Base)				
	Female	0.0160	0.0281	
	Black	0.0063	0.0493	
	Hispanic	0.0116	0.0599	
Occupation (Non IT Technical Base)				
	Information Technology	-0.0156	0.0385	
	Management	-0.00585	0.0315	

** Significant at .05 level
* Significant at .10 level

In standard linear regressions with a dependent variable that is measured in log form, coefficients can be interpreted as percentage impacts on the dependent variable in non-log form. Thus, for instance, the -.15896 coefficient for female workers in IT occupations means that, other things being equal average weekly wages of female workers are about 16 percent less than those of their male counterparts.

The regression model is statistically significant for each occupation group. Adjusted R-Square values are modest suggesting, not surprisingly, that there are

many factors influencing individual wage rates which are outside the scope of the broad set of demographic factors available for this study.

The age and age squared coefficients are similar across the occupation groups and reflect a pattern of wage rates increasing at a decreasing rate in younger age levels and decreasing in absolute terms for older workers. The somewhat larger magnitudes (in an absolute sense) of these coefficients among workers in IT occupations means that wages are expected to rise more rapidly with age initially, but that this rate of growth will also drop off more rapidly as age increases.

The month variable is an index that begins with a value of 1 in April of 1998 and increases by one for each month thereafter. It is designed to capture the general time trend of wages. This rate is about 0.4 percent per month or 4.8 percent per year for workers in IT occupations. The rate for management occupations is almost identical to the rate for IT, while that of other technical occupations is slightly, but not significantly lower.

The Education level parameters suggest that the wage premiums for increased education are systematically (and in many cases significantly) lower for IT occupations than for the other technical and management occupations. This may suggest that formal education is less important, relative to subsequent on-the-job and nonacademic training and experience among IT professionals.

Industry differences are less pronounced for IT workers than for the other occupations. However, it should be noted that the services and government sector (the base sector in this analysis) includes the computer services industry that has a large number of highly paid IT workers. This industry will be examined in detail in Table 8 below. City size has consistent effects across the occupation groups - workers in small cities on average earn less while workers in large cities earn more. The wage penalty for living in a small city is somewhat smaller for non-IT technical occupations. The wages of women and minorities are systematically lower across all of the occupational categories. The wage differential for female IT workers is significantly smaller than that for the other two occupation categories, while the wage rate differential for Blacks is a bit larger than that for management related professions. Finally, the job change parameter shows that workers who had changed jobs in the previous three months earned slightly less than those not changing jobs among both management and non-IT professional occupations. Neither of these coefficients was statistically significant. For IT related occupations, on the other hand, job changers on average earned just over 5 percent more than those who had not changed jobs and this difference was statistically significant.

The results indicate that workers in IT occupations could expect a premium for changing jobs that was not present in other occupations. At the same time, the rate of increase in wages over time was not significantly greater for IT occupations. Together these results show a substantial incentive for job change among workers in IT occupations. Perhaps positive selection factors, including poaching effects, were on balance more important than adverse selection factors among job changers in IT occupations. This would account for the combination of a wage premium for job changers with very little increase in the overall wage trend.

Table 7: Determinants of Log Wage Rate Across Occupations

	Info. Systems Occupations		Other Technical Occupations		Management Occupations	
Observations	5813		11783		12386	
Adj. R-Square	0.1833		0.2799		0.2822	
Variable	Parameter Estimate	Std. Error	Parameter Estimate	Std. Error	Parameter Estimate	Std. Error
Intercept	5.43964	0.10453**	5.61670	0.0625**	5.62659	0.06829**
Age	0.06788	0.00522**	0.05227	0.00332**	0.05131	0.00328**
Age Squared	-0.00073	0.00006**	-0.00051	0.00004**	-0.00053	0.00004**
Month	0.00397	0.00054**	0.00333	0.00039**	0.00395	0.00038**
Education Level (Bach. Degree Base)						
H S or <	-0.27048	0.02237**	-0.37738	0.01215**	-0.30675	0.01134**
Some Col	-0.19804	0.01660**	-0.25708	0.01147**	-0.24375	0.01097**
Asso Deg	-0.16726	0.01820**	-0.26005	0.01211**	-0.25583	0.01351**
MSDeg >	0.07959	0.01515**	0.11004	0.01142**	0.15588	0.01286**
Industry (Services Base)						
Mfg	-0.00159	0.01451	0.07786	0.00875**	0.05393	0.01100**
T. U. & F	-0.01323	0.01463	0.10698	0.01178**	0.04671	0.00934**
W/R Trade	-0.00879	0.02328	-0.02975	0.02212	-0.06161	0.01328**

Table 7: Determinants of Log Wage Rate Across Occupations

	Info. Systems Occupations		Other Technical Occupations		Management Occupations	
Observations	5813		11783		12386	
Adj. R-Square	0.1833		0.2799		0.2822	
Variable	Parameter Estimate	Std. Error	Parameter Estimate	Std. Error	Parameter Estimate	Std. Error
City Size (Medium Base)						
Small	-0.13145	0.01478**	-0.08511	0.00927**	-0.12754	0.00935**
Large	0.08849	0.01246**	0.08529	0.00951**	0.11648	0.00941**
Race and Sex (White and Male Base)						
Female	-0.15896	0.01214**	-0.24555	0.00960**	-0.23889	0.00811**
Black	-0.17494	0.02270**	-0.16250	0.01748**	-0.13547	0.01413**
Hispanic	-0.07429	0.03167**	-0.07187	0.01867**	-0.07267	0.01844**
Job Change	0.05381	0.02206**	-0.01617	0.01741	-0.02448	0.01688

In Table 8, we further break down the data, for workers in IT occupations only, to see if the wage determinants in the computer services industry differ from those for other industries. Results suggests that wages of workers in the computer services industry tend to rise more rapidly with age initially, but to fall of more quickly at older ages. With respect to the effect of job change on wage, job changers in the computer services industry gained a premium of 5.8 percent while IT workers in other industries gained about 3.7 percent. However, the job change coefficient was not significantly different from zero for either group. The time trend of wages for workers in the computer services industry is a bit stronger than that for IT workers in other industries (5.6 percent versus 4 percent). Differences across the remaining demographic groupings provide few systematic patterns. Overall, the results in Table 8 suggest that factors affecting wage rates of IT professionals in the computer services industry do not differ substantially from the factors affecting IT professional's wages in other industries.

Table 8: Determinants of Log Wage Rate of Workers in it Occupations
(Computer Services Industry Vs All Other Industries)

	All Other Industries		Computer Services Industry	
Observations	3872		1940	
Adjusted R-Square	0.2009		0.155	
	Parameter Est.	Std. Error	Parameter Est.	Std. Error
Intercept	5.42152	0.12238**	5.29579	0.19433**
Age	0.06399	0.00607**	0.07688	0.00976**
Age Squared	-0.00068	0.00007**	-0.00082	0.00012**
Job Change	0.03688	0.02819	0.05861	0.03563
Month	0.00336	0.00062**	0.00475	0.00104**
Education Level (Bach. Degree Base)				
High School or <	-0.23423	0.02446**	-0.34835	0.04863**
Some College	-0.19243	0.01887**	-0.18578	0.03257**
Associate Degree	-0.14452	0.02055**	-0.20132	0.03613**
MS Degree or >	0.10454	0.01808**	0.04312	0.02689
Industry (Services Base)				
Manufacturing	0.08097	0.01633**		
Trans. Util. & Fin.	0.07108	0.01642**		
W & R Trade	0.07563	0.02377**		
City Size (Medium Size Base)				
Small (< 500,000)	-0.10100	0.01649**	-0.15897	0.03092**
Large (>5,000,000)	0.10261	0.01470**	0.05502	0.02270**
Race and Sex (White and Male Base)				
Female	-0.15457	0.01379**	-0.13975	0.02411**
Black	-0.16580	0.02616**	-0.16004	0.04320**
Hispanic	-0.05514	0.03596	-0.12964	0.06222**

** Significant at .05 level * Significant at .10 level.

CONCLUSIONS

This paper has examined alternative theories of the impact of training and skills on the structure of wages and voluntary job change. Human capital theory suggests that firms can only afford to pay for firm-specific training. However, the dynamics of the IT market suggest that firms are often forced to pay the direct costs of specialized training that has a very competitive market. The new labor contract model suggests that firms should view such training as a cost of attracting more able employees. By providing frequent opportunities for performance appraisal and salary adjustments, the firm can recoup a sufficient return on this enhanced ability to recoup its training costs, although job change rates are expected to be higher overall due to the highly competitive skill sets developed.

Job satisfaction surveys within the IT industry have found that IT workers are generally more satisfied with their jobs when they have access to learning new skills. However, this greater job satisfaction may not translate into longer retention, if the skills learned have a highly competitive market.

Generally, the empirical results presented here support the concepts of the new labor contract and suggest that IT workers, or at least IT workers in the computer services industry, may be on the leading edge of the movement to this form of relationship between employees and employers. The higher rate of voluntary job change among computer service industry workers and the positive returns to job change among IT workers (suggesting a predominance of positive selection factors among job changers) are both compatible with new labor contract ideas that: neither workers nor employers desire career length relationships and that the employer is expected to provide opportunities for training and skill development.

The nature of available data has imposed major limitations on the hypotheses that could be developed and the conclusions that could be drawn in this study. The ideal data set for the analyses presented here should: follow workers if they relocate due to job change, provide estimates of the wage before and after job changes, track cumulative job changes over a longer period of time, and provide data about specific skills developed and training provided on the job. The costs of developing such an ideal data set at large scale may be prohibitive, but it should be possible to test the impact of some of these elements through survey research and the use of other predefined data sources.

It is also important to examine the responsiveness of the high-tech labor market across the business cycle. This study covered a time period that was predominantly part of an economic boom. If the new labor contract is rooted in

changes that are making skills more generally-valued and less firm specific, firms will have less incentive to retain skilled workers through economic downturns, since the ability to share in the returns of a firm-specifically trained workers skills during good times provides incentives for employers to retain them during recessions.

Finally, this paper and the literature it reviews suggest that the process of skill development in the new economy is important area for future research. If skills are indeed becoming more generally-valued, who will pay for them and how will they be provide? Will firms be less willing to bear the costs of obtaining these skills (as economic theory suggests)? If the individual must bear all, or nearly all, of the costs of acquiring skills will there be substantial under-investment in these skills? What is the role of the higher education community in the provision of these skills and the re-skilling of workers as technology advances? All of these are important questions that need to be addressed as we work to understand the implications of the changes in work relationships implied by the new labor contract.

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