

# Ph.D. Program Learning and Job Demands: How Close Is the Match?

By WENDY A. STOCK AND W. LEE HANSEN\*

The types of knowledge, skills, and proficiencies that should be imparted to students in graduate economics programs are a matter of long-standing controversy. A 1953 American Economic Association (AEA) report cataloged major shortcomings in graduate economic education and recommended changes to enhance the quality and effectiveness of economics Ph.D. programs (Howard R. Bowen, 1953). By the 1980's, the perception grew that economics Ph.D. programs devoted excessive attention to theoretical work at the expense of real-world application (Wassily Leontief, 1982). This development triggered David Colander and Arjo Klammer (1987) to conduct an independent study based on interviews with graduate students at elite Ph.D. programs. Their study reinforced the views of many, including leaders in the AEA, the National Science Foundation, and several private foundations, that something was amiss. In 1988, the AEA established the Commission on Graduate Education in Economics (COGEE) to undertake a thorough study of graduate training. The Commission's major concern, based on extensive surveys and interviews of graduate students, faculty, and employers, was that graduate education in economics had removed itself from real-world economic problems (Anne O. Krueger et al., 1991).

The COGEE study is distinguished by its attempt to determine the emphasis given to cultivating a set of economic proficiencies in graduate school and the importance of an array of skills for success in graduate school and later on

the job (Hansen, 1991). The proficiencies included in the COGEE study were: *providing rigorous training in economic theory*, *providing training in econometrics and measurement*, *applying theory to real-world problems*, *using economic theory in empirical applications*, and *conducting independent economic research*. For this study, we added three proficiencies to the COGEE list: *understanding economic institutions and history* and *understanding the history of economic ideas*, to capture concerns about curriculum changes that eliminated or scaled back training in these two fields, and *developing teaching skills*, to reflect recent emphasis on improving the quality of instruction (William E. Becker, 2003).

The skills included in the COGEE study were: *critical judgment* (analyzing ideas, reviewing literature, formulating pertinent comments), *analytics* (understanding and solving problems, making and analyzing logical arguments), *application* (seeing practical implications of abstract ideas, analyzing real-world policies and processes), *mathematics* (constructing and analyzing proofs, manipulating mathematical abstractions), *computation* (effectively and quickly finding and manipulating relevant data, estimating economic relationships using statistical software), *communication* (speaking and writing effectively, quickly understanding spoken and written ideas of others, explaining ideas clearly), and *creativity* (conceiving interesting questions, finding new means of analysis). We added *instruction* (being an effective classroom teacher) to the skills list for the same reason mentioned above.

\* Stock: Department of Agricultural Economics and Economics, Montana State University, Bozeman, MT 59717-2920; Hansen: Department of Economics, University of Wisconsin, Madison, WI 53706-1393. We are grateful to Pat Fisher and Tyler Kruzich for research assistance and to the Ford Foundation for financial support. John Siegfried, T. Aldrich Finegan, Ronald Ehrenberg, Daniel Hamermesh, Maresi Nerad, Barbara Wolfe, William Becker, and Richard Alston provided useful comments. We also owe many thanks to the graduates who completed the surveys.

## I. Data

The data for this study come from two sources. One is a survey of new Ph.D. economists who earned their degrees from U.S. economics Ph.D. programs between 1 July 2001 and 30 June 2002. This survey is similar to that

conducted by John J. Siegfried and Stock (1999) for their analysis of the labor market for new Ph.D. economists from the class of 1996–1997. Because Siegfried and Stock describe the 2001–2002 survey elsewhere in this volume (Siegfried and Stock, 2004), its details are not repeated here. Graduate responses from the class of 2001–2002 number 398 and represent 47 percent of the cohort (Siegfried and Stock, 2004).

Data also come from a 2003 resurvey of respondents to Siegfried and Stock's original survey of the economics Ph.D. class of 1996–1997 (5.5–6.5 years post-graduation) to obtain information about their employment and their perceptions regarding the match between the training they received while earning their Ph.D.'s and the skills they use in their jobs. The survey was sent to 433 of the original 511 respondents (77 lacked an accurate address, and one graduate had died). We received 321 completed surveys, yielding a response rate of 63 percent of the original survey respondents. Because of difficulty obtaining valid addresses for graduates living overseas and for those in non-academic positions in the United States, the resurvey respondents are more likely to be U.S. citizens and slightly more likely to be academics than were the original survey respondents. Sixty-one percent of the resurvey respondents are U.S. citizens, compared to 52 percent of the original survey respondents (the one-tailed-test  $p$  value for this difference is less than 0.01); 62 percent of the resurvey respondents are academics, compared to 57 percent of the original respondents ( $p$  value = 0.11). As a result, we report some responses separately by employment sector and recommend caution when applying our results to non-U.S. citizens.

## II. Results

1. *Proficiencies.*—Table 1 presents a summary of the two cohorts' responses regarding the emphasis placed on various economic proficiencies by the programs where they earned their Ph.D.'s. Respondents were asked to rate the emphasis placed on each proficiency by their Ph.D. program based on a 1–3 scale (1 = too little emphasis; 2 = about right; 3 = too much emphasis). The percentages of respondents who reported either "too much" or "too

TABLE 1—EXTENT OF PH.D. PROGRAM EMPHASIS ON ECONOMIC PROFICIENCIES

Proficiency	Too much <sup>a</sup>	Too little <sup>a</sup>	Mean <sup>b</sup>
<i>1996–1997 Cohort (N = 316)</i>			
Economic theory	14	8	2.1
Econometrics and measurement	5	27	1.8
Applying theory to real world	1	61	1.4
Using theory in empirical applications	2	43	1.6
Understanding institutions and history	3	56	1.5
History of economic ideas	4	54	1.5
Conducting independent research	5	28	1.8
Developing teaching skills	3	44	1.6
<i>2001–2002 Cohort (N = 385)</i>			
Economic theory	8	13	2.0
Econometrics and measurement	2	28	1.7
Applying theory to real world	2	51	1.5
Using theory in empirical applications	1	37	1.6
Understanding institutions and history	5	51	1.5
History of economic ideas	6	53	1.5
Conducting independent research	4	26	1.8
Developing teaching skills	5	33	1.7

*Notes:* The 1996–1997 cohort results are based on survey mailed in March 2003; 2001–2002 cohort results are based on survey mailed in January 2003. The sample size varies by row but is close to the maximum reported. The  $N$  reported here is smaller than the number of returned surveys (321 and 398, respectively for the 1996–1997 and 2001–2002 cohorts) because these questions were asked only of employed graduates.

<sup>a</sup> The percentage of respondents indicating that their Ph.D. program placed too much (too little) emphasis on the proficiency. The percentage indicating that the emphasis was "about right" is omitted.

<sup>b</sup> Mean emphasis value (3 = too much, 2 = about right, 1 = too little).

little" emphasis on each proficiency are reported, along with the mean response. Unless noted otherwise, we discuss below only results that were consistent between the two cohorts of graduates; part 4 of this section presents differences in responses among the two cohorts.

Only small percentages of graduates report too much emphasis by their Ph.D. programs on any of the proficiencies on our list. Indeed, for most of the proficiencies, the majority of respondents indicate that the emphasis was "about right." However, at least half of the respondents report too little emphasis on *applying economic theory to real-world problems*, on *understanding economic institutions and history*, and on *understanding the history of economic ideas*. Substantial fractions also report too little emphasis on *using economic theory in empirical applications* and on *developing teaching skills*.

2. *Skills*.—We asked the graduates to use a 1–5 scale (5 = very important; 1 = not very important) to rate the importance of various skills for success in their Ph.D. programs and for success in their jobs. We also asked them to specify which single skill was “most” and which was “least” important for success. Table 2 reports the mean response along with the percentage rating each skill as “most” and “least” important for success in graduate school and on the job.

The largest percentage of respondents (41–42 percent of each cohort) listed *analytics* as the skill most important for success in their Ph.D. programs. *Instruction* dominates as least important, with 70–72 percent of respondents choosing being an effective classroom teacher as the skill least important for success in graduate school. As for the importance of the skills in graduates’ jobs, the largest fraction of graduates (roughly one-fifth) listed *communication* as the skill most important for success in their jobs. *Mathematics* and *instruction* were the skills most often chosen as the least important for success in respondents’ jobs.

As a simple way to gauge the match between which skills graduates think were important for their success in graduate school and which they think are important for their success on the job, the last column of Table 2 reports the sample means of the differences in the graduates’ ratings of the importance of each skill on the job minus their ratings of that skill’s importance in school. For both of the cohorts and all of the skills, the differences are statistically different from zero at the 0.10 level or better (two-tailed tests using heteroscedasticity-robust standard errors). Differences in graduates’ ratings of the importance of *application*, *communication*, and *instruction* are positive and large, implying that graduates view these skills as much more important for their success on the job than for their success in graduate school. On the other hand, the differences in graduates’ ratings of *mathematics* are negative and large, implying that graduates perceive *mathematics* as much more important for their success in graduate school than it is for success in their jobs.

3. *Differences by Employment Sector*.—Because the skills used on the job are likely to differ by job type and because academics were

TABLE 2—IMPORTANCE OF ECONOMISTS’ SKILLS FOR SUCCESS IN PH.D. PROGRAM AND IN CURRENT JOB

Skill	Importance in Ph.D. program			
	Most <sup>a</sup>	Least <sup>a</sup>	Mean <sup>b</sup>	
<i>1996–1997 Cohort</i>				
Critical judgment	10	2	4.2	
Analytics	42	0	4.6	
Application	3	11	3.1	
Mathematics	19	1	4.5	
Computation	12	4	3.9	
Communication	2	7	3.4	
Creativity	12	4	3.8	
Instruction	0	70	2.1	
<i>2001–2002 Cohort</i>				
Critical judgment	12	1	4.4	
Analytics	41	0	4.7	
Application	3	7	3.4	
Mathematics	16	3	4.4	
Computation	7	4	4.0	
Communication	3	8	3.5	
Creativity	19	6	3.9	
Instruction	0	72	2.2	
Skill	Importance in current job			Difference <sup>c</sup>
	Most <sup>a</sup>	Least <sup>a</sup>	Mean <sup>b</sup>	
<i>1996–1997 Cohort</i>				
Critical judgment	13	3	4.4	0.14*
Analytics	17	2	4.4	−0.15**
Application	19	4	4.4	1.28**
Mathematics	2	48	2.8	−1.70**
Computation	6	10	3.7	−0.23**
Communication	21	0	4.6	1.28**
Creativity	11	4	4.1	0.35**
Instruction	12	29	3.3	1.15**
<i>2001–2002 Cohort</i>				
Critical judgment	9	2	4.2	−0.10 <sup>†</sup>
Analytics	13	2	4.2	−0.46**
Application	16	3	4.3	0.88**
Mathematics	1	39	3.0	−1.34**
Computation	9	13	3.8	−0.25**
Communication	19	0	4.6	1.05**
Creativity	18	3	4.1	0.15*
Instruction	16	38	3.2	1.00**

Notes: The 1996–1997 cohort results are based on survey mailed in March 2003; 2001–2002 cohort results are based on survey mailed in January 2003. The sample size varies by row (see notes to Table 1).

<sup>a</sup> The percentage of the cohort listing skill as most (least) important for success.

<sup>b</sup> Mean importance value (5 = very important; 1 = not very important).

<sup>c</sup> Difference between mean importance on the job and its importance in the Ph.D. program with results of two-tailed tests using heteroscedasticity-robust standard errors.

<sup>†</sup> Statistically different from zero at the 10-percent level.

\* Statistically different from zero at the 5-percent level.

\*\* Statistically different from zero at the 1-percent level.

more likely to respond to the surveys, we grouped graduates into four employment sectors: academic jobs, business/industry jobs, government/international organization/research organization (G/IO/RO) jobs, and other jobs. For the 2001–2002 cohort, 62 percent of employed respondents were in academe, 26 percent in G/IO/RO, and 11 percent in business/industry. For the 1996–1997 cohort, the percentages were 62, 25, and 13, respectively.

We examined differences among the sectors by estimating a set of ordered probit regressions of the scale responses to the proficiency and skill questions on a set of employment-sector dummy variables. To estimate the degree of perceived skill match among the sectors, we also estimated a set of ordered probit regressions of the difference in the scale rating of each skill's importance for success on the job minus its importance for success in graduate school on the employment sector dummies.<sup>1</sup> All results reported below are significant at the 0.05 level or better (two-tailed tests).

Among the 2001–2002 cohort, those employed in academe (the benchmark) have a higher probability of reporting too little emphasis on *applying economic theory to real-world problems* than do those in business/industry. Those in business/industry and those in G/IO/RO have a higher probability of reporting too little emphasis on *using economic theory in empirical applications* than do academics. Among the 1996–1997 cohort, those in academe have a higher probability of reporting too little emphasis on *understanding economic institutions and history* and on *understanding the history of economic ideas* than do those in business/industry. Academics in that cohort also have a higher probability of reporting too little emphasis on *conducting independent economic research* and on *developing teaching skills* than do those in G/IO/RO.

Responses to the skills questions also differ among the employment sectors. Those working in the business/industry and G/IO/RO sectors perceive that *application* is more important and

*mathematics*, *creativity*, and *instruction* are less important for their success on the job than do academics. Although graduates in all sectors report that *application* skills are significantly more important in their jobs than they were in graduate school, nonacademics have a higher probability of reporting a larger gap than do those in academe. Similarly, though graduates in all sectors report that *mathematics* is less important for success on the job than it was for success in graduate school, nonacademics report a larger gap. The gap in the importance of *creativity* is larger for academics than for those in G/IO/RO. Not surprisingly, the importance of *instruction* is significantly higher on the job than in graduate school for academics, but not for nonacademics.

**4. Differences Among Cohorts.**—Since one might believe that the earlier cohort has learned more about which skills and proficiencies matter most, we tested for statistically significant differences in the responses among the cohorts by estimating a set of ordered probit regressions of the scale responses to the proficiency and skill questions on a dummy variable denoting the 1996–1997 cohort. To estimate the degree of perceived skill match among the cohorts, we also estimated a set of ordered probit regressions of the difference in the scale rating of each skill's importance for success on the job minus its importance for success in graduate school on the 1996–1997 cohort dummy. Results reported below are significant at the 0.01 level or better (two-tailed tests). For the proficiency question, most differences among the cohorts were insignificant, with the exception that the 1996–1997 cohort had a higher probability of reporting too much emphasis on *economic theory* and a higher probability of reporting too little emphasis on *applying economic theory to real-world problems* and *developing teaching skills* than the 2001–2002 cohort.

For the skills questions, respondents in the earlier cohort perceive *application* as less important for success in graduate school and *analytics* as more important for success on the job than those in the later cohort. Both cohorts of graduates perceive that *application* and *communication* are more important, and *mathematics* less important, for success on the job than in school, but the 1996–1997 cohort had a higher

<sup>1</sup> When testing for differences among the employment sectors and among the cohorts, ordered logit and ordinary least-squares estimates generated qualitatively similar conclusions. All tests were conducted using White (heteroscedasticity-robust) standard errors.



probability of reporting a larger gap than the 2001–2002 cohort. Both cohorts perceive that *analytics* is less important for success on the job than in school, but the gap here is larger for 2001–2002 cohort. Finally, graduates in the 1996–1997 cohort perceive *critical judgment* as more important for success in their jobs than it was for their success in graduate school, while the opposite is the case for the 2001–2002 cohort.

### III. Summary

First-year economics Ph.D. students are justified in wondering about the future value of the skills and proficiencies emphasized in their graduate courses and about whether there are close linkages between what is important for success in graduate school and what is important for success on the job. Although most of our survey respondents report that the emphasis given in their Ph.D. programs to many economic proficiencies was “about right,” many graduates wanted more than their Ph.D. programs delivered.

At least half of our survey respondents report too little emphasis by their Ph.D. programs on *applying economic theory to real-world problems*, on *understanding economic institutions and history*, and on *understanding the history of economic ideas*. In addition, graduates report that skill in *application*, *communication*, and *instruction* are much more important for success in their jobs than for success in graduate school, while the opposite is true for *mathematics*.

As with the COGEE report, our results do not imply that sweeping changes are needed in economics Ph.D. programs. Indeed, Siegfried and Stock (1999, 2004) report that new economics Ph.D.’s land good jobs that pay well and that, among recent graduates, 86 percent agree that had they known at matriculation what they knew after graduation, they still would have pursued a Ph.D. in economics. In addition, our comparison between the two cohorts of graduates reveals that gaps between the importance of *application* and *communication* and the unimportance of *mathematics* for success on the job versus their importance for success in graduate school are smaller among more recent graduates than among their counterparts five years earlier.

Although this could be a signal that changes are taking place in Ph.D. programs, it is more likely a reflection of the additional years of post-graduation job experience among the 1996–1997 graduates.

Nonetheless, changes made at the margin by Ph.D. program faculty to increase emphasis on *applying economic theory to real-world problems*, on *understanding economic institutions and history*, and on *understanding the history of economic ideas*, and to improve graduates’ skills in *application* and *communication* (and *instruction* for those pursuing academic careers), could reduce some of the perceived mismatch between what Ph.D. economists learn in graduate school and what they do in their jobs. Such marginal changes may also keep some potentially strong applied economists from pursuing alternate graduate degrees in interdisciplinary, business, or public-policy Ph.D. programs. As Colander (1998 p. 606) notes, keeping the training of these potential economists within traditional economics Ph.D. programs may prove to be a worthwhile endeavor in the long run, since by not doing so, economics Ph.D. programs are limiting their potential for future growth.

### REFERENCES

- Becker, William E.** “Undergraduate Choice: Sexy or Non-Sexy.” *Southern Economic Journal*, July 2003, 70(1), pp. 219–23.
- Bowen, Howard R.** “Graduate Education in Economics.” *American Economic Review*, September 1953 (Supplement), 43(4), part 2, pp. 1–223.
- Colander, David.** “The Sounds of Silence: The Profession’s Response to the COGEE Report.” *American Journal of Agricultural Economics*, August 1998, 80(3), pp. 600–07.
- Colander, David and Klammer, Arjo.** “The Making of an Economist.” *Journal of Economic Perspectives*, Fall 1987, 1(2), pp. 95–111.
- Hansen, W. Lee.** “Education and Training of Economics Doctorates: Major Findings of the American Economic Association’s Commission on Graduate Education in Economics.” *Journal of Economic Literature*, September 1991, 29(3), pp. 1054–87.
- Krueger, Anne O.; et al.** “Report of the Commission on Graduate Education in Economics.”

- Journal of Economic Literature*, September 1991, 29(3), pp. 1035–53.
- Leontief, Wassily.** “Academic Economics.” *Science*, 9 July 1982, 217(4555), pp. 104–07.
- Siegfried, John J. and Stock, Wendy A.** “The Labor Market for New Ph.D. Economists.” *Journal of Economic Perspectives*, Summer 1999, 13(3), pp. 115–34.
- . “The Market for New Ph.D. Economists in 2002.” *American Economic Review*, May 2004 (*Papers and Proceedings*), 94(2), pp. 272–85.

**This article has been cited by:**

1. Wendy A. Stock, John J. Siegfried. 2014. Fifteen Years of Research on Graduate Education in Economics: What Have we Learned?. *The Journal of Economic Education* **45**, 287-303. [[CrossRef](#)]
2. KimMarie McGoldrick, Gail Hoyt, David Colander. 2010. The Professional Development of Graduate Students for Teaching Activities: The Students' Perspective. *The Journal of Economic Education* **41**, 194-201. [[CrossRef](#)]
3. David Colander. 2008. The Making of a Global European Economist. *Kyklos* **61**, 215-236. [[CrossRef](#)]
4. Susan Athey, Lawrence F. Katz, Alan B. Krueger, Steven Levitt, James Poterba. 2007. What Does Performance in Graduate School Predict? Graduate Economics Education and Student Outcomes. *American Economic Review* **97**:2, 512-518. [[Citation](#)] [[View PDF article](#)] [[PDF with links](#)]
5. Mike Reay. 2007. Academic Knowledge and Expert Authority in American Economics. *Sociological Perspectives* **50**:10.1525/sop.2007.50.issue-1, 101-129. [[CrossRef](#)]
6. David Colander. 2005. The Making of an Economist Redux. *Journal of Economic Perspectives* **19**:1, 175-198. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]