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MYRA STROBER, Section Editor

The Dissemination of Research Agendas among Young Economists

Arthur M. Diamond, Jr., and Donald R. Haurin

The central question we addressed was whether the research agendas of Ph.D. economists who graduate from elite schools differ from those of Ph.D. economists who graduate from lower-ranked institutions.¹ Drawing on literature from the history of economic thought and the sociology of science, we formulated competing hypotheses about the structure of the economics profession in the United States. These contending hypotheses suggest that three kinds of relationships between changes in the distribution of the elite students and the nonelite among the subfields of economics might be observed. The possibilities are that the changes occur independently, that the changes occur simultaneously, or that the changes in the elite's distribution lead the changes in the rank-and-file's distribution. Although unsupported by any theoretical rationale, a fourth logical possibility is that the rank-and-file's distribution leads changes in the elite's distribution.

THEORIES OF THE RELATION BETWEEN THE ELITE AND THE RANK-AND-FILE

The key issue we investigated was the extent to which the elite and the rank-and-file pursue the same research agenda. One view supposes that the labor market differs for the elite and the rank-and-file. If the new economists from the elite

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schools are sought by research universities that mainly value an economist's contribution to advancing the frontier of knowledge (Diamond 1984, 1986a, 1986b), while the new economists from the rank-and-file schools are sought by teaching universities, businesses, and governments that value an economist's contribution to the noneconomist's understanding of practical policy issues, then one would expect the subfield distributions of new Ph.D.s to differ between these groups. George Stigler (1965) provided partial support for this view when he discusses the extent to which the direction of economic research is influenced by current policy disputes. His basic position is that the economist who contributes to the advance of economic science is much more influenced by issues internal to the profession than by issues that are of current public interest (p. 22). Changes in the subfield distribution among the elite would then reflect changes in areas that are ripe for advance (Medawar 1967), whereas changes in the subfield distribution among the rank-and-file would reflect changes in areas that are important in current policy disputes. If current topical research is performed mainly by the rank-and-file and if frontier-extending research is performed mainly by the elite, then this view would suggest the hypothesis that changes in the distribution of subfields of the elite should be independent of changes in the distribution of subfields of the rank-and-file.

A second view of the workings of science is based on Kuhn's (1970) distinction between normal and extraordinary science. According to this view, in both stages we would expect the elite scientists to lead the rank-and-file. In the normal stage, characterized by puzzle solving, the elite scientists would lead either because, through ability or control of scientific resources, they are more successful at solving puzzles or else because, through their "gate keeping" activities, they define what puzzles will be recognized as important and what will count as a solution (see, e.g., Crane 1965, 1970, 1972; Mulkay 1976, 452; Mulkay 1980, 35-42).² Ph.D. candidates at both elite and rank-and-file schools are sensitive to funding opportunities and the probability of publishing articles based on their dissertation research. In comparison with students at rank-and-file schools, students at elite schools receive word sooner on what topics (and hence subfields) are apt to be important in the future. Thus in a period of normal science, the changes in the distribution of subfields of the elite would lead changes in the distribution of subfields of the rank-and-file.

The elite would a fortiori lead the rank-and-file in the periods of extraordinary science that Kuhn suggests result when the accumulation of anomalies leads to a scientific revolution. To the extent that graduates of the elite schools have greater ability and greater control over research resources, we would expect them to lead the rank-and-file in (1) the identification of a stage as one of crisis and (2) the development of an alternative paradigm.³

The final view of the relationship between the elite and the rank-and-file is that the changes in subfields occur simultaneously, a result of both groups receiving and reading market signals at the same time. No transmission mechanism between universities is required for this result; rather, changes in the subfield choices of new Ph.D.s are dominated by accessible and easily observed external factors.

We next describe the econometric model that we used, a model that relates changes in the subfield distribution of new Ph.D. economists graduating from elite institutions to changes in the rank-and-file's distribution. Using post-World War II data, we analyzed the relationship between changes in subfield choice of the elite and the rank-and-file.

THE ECONOMETRIC MODEL

The general relationships that we wished to test for were straightforward, and the vector autoregressive (VAR) approach we used is well known (Sims 1980). The variables of interest were the percentages of the reported codes for each cohort in each of the 14 aggregated subfields. (Each economist reported two subfield codes, so this is not identical to the percentages of economists in each subfield.) We studied the distribution among 14 subfields for the years spanning 1942 to 1988 and allowed four years for transmission of information from the elite to the rank-and-file (or vice versa).

Let E_t^i be the percentage of elite school Ph.D.s in subfield i in year t ; R_t^i was similarly defined for rank-and-file Ph.D.s. In our case, the VAR technique was represented by two sets of regressions:

$$E_t^i = \sum_{j=1}^4 a_{1j}^i E_{t-j}^i + \sum_{j=1}^4 a_{2j}^i R_{t-j}^i + u_{1t} \quad (1)$$

$$R_t^i = \sum_{j=1}^4 a_{3j}^i R_{t-j}^i + \sum_{j=1}^4 a_{4j}^i E_{t-j}^i + u_{2t}. \quad (2)$$

Because the stochastic errors in the set of 14 E_t^i regressions may be correlated, we estimated the system using the seemingly unrelated regressions technique. A similar method was applied to the system of rank-and-file equations.

Hypothesis testing in this framework is based on whether the inclusion of a set of right-hand side variables improves the accuracy of the prediction of the dependent variable. The following four outcomes are possible:

1. $a_2 = 0$ and $a_4 = 0$; the subfield choices by elite and rank-and-file Ph.D.s are independent
2. $a_2 \neq 0$ and $a_4 \neq 0$; the subfield choices by elite and rank-and-file Ph.D.s are mutually causal
3. $a_2 \neq 0$ and $a_4 = 0$; choices by rank-and-file Ph.D.s predict subsequent choices by the elite
4. $a_2 = 0$ and $a_4 \neq 0$; choices by Ph.D.s from elite institutions predict subsequent choices by rank-and-file Ph.D.s.

THE DATA: VARIATIONS IN THE NUMBER OF NEW ECONOMISTS IN THE SUBFIELDS OF ECONOMICS

Some information on the areas of specialization of economists can be found in the American Economic Association (AEA) directories. Other methods of identifying subfield specialization are possible for some groups of economists. For

instance, subfield codes of published articles could be used for the minority of Ph.D. economists who are active in publishing research. The directories, however, appear to be the only source of subfield data for a wider and more representative sample of Ph.D. economists.

For the current research, Ph.D. economists listed in the AEA directories for 1956, 1969, 1981, and 1989 were categorized into three groups: an elite, a middle group, and the rank-and-file. Data on the number of members and the response rates for the various directories can be found in Diamond and Haurin (1991a). A cohort consisted of all economists who received their Ph.D.s in a particular year. We used only data from each directory of the most recent 10 to 15 years of Ph.D.s (i.e., cohorts 1981–1988 from the 1989 directory, cohorts 1969–1980 from the 1981 directory, cohorts 1956–1968 from the 1969 directory, and cohorts 1942–1955 from the 1956 directory).⁴ We operationally defined elite economists as those who received their Ph.D.s from 3 of the most distinguished economics departments in the country. Chicago, Harvard, and Yale were chosen because they, alone among distinguished economics departments, were consistently ranked among the top 5 departments for the entire period covered in our study (1946–1988). (Changes in the rankings of the top 10 economics departments from 1925–1989 are documented in Diamond and Haurin 1991a.) The first sample consisted of economists who graduated from institutions that were highly ranked throughout the period of study; the second sample consisted of new Ph.D. economists who graduated from schools ranked below the top 16.⁵

One issue that must be addressed is the extent to which the directories are representative of the economics profession. One positive note is that the response rate for AEA surveys over the period used has always been roughly in the 70–80 percent range (Diamond and Haurin 1991a). Also, AEA membership is more valuable to those who are likely to reenter the job market; this group includes young economists. Membership is also a way for young economists to advertise their location and areas of interest. On the other hand, some economists never join the association and some allow their AEA membership to lapse.⁶ One could hypothesize that non-AEA economists will be more common among some groups than others.⁷ Stigler, for instance, suggested that “as specialist journals emerged, perhaps more and more specialists have dropped out of the AEA” (1985).

The coding of subfields changed in a major way between 1942 and 1956, in a minor way between 1956 and 1969, and again in a major way between 1969 and 1989. To make comparisons over time, we first aggregated the 48 codes in the 1981 directory into 14 combined codes. We then recoded the subfield codes for 1956 and 1969 so that they corresponded to the codes in 1981. The codes for 1989 are the same as those for 1981. The details of the aggregation and recoding may be found in an appendix available from the authors.

ESTIMATION RESULTS

The results of the estimation of equations (1) and (2) generally support the hypotheses that the changes in distribution among subfields by the elite are either

mutually causal with those of the rank-and-file or else lead those of the rank-and-file. Complete estimation results are reported in Tables 1 and 2.

Our conclusions were based on F tests of the joint significance of the coefficient vectors a_2 and a_4 . The values and significance levels are reported in

TABLE 1
Coefficients of the Vector Autoregressive Estimation Test of Whether the Percentage of Reported Codes in a Subfield from Elite Institutions Predicts the Percentage of Reported Codes in a Subfield from Rank-and-File Institutions

Rank-and-file subfield	Elite					Rank-and-file			
	Intercept	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4
General econ.	0.26	0.14	0.12	0.01	0.37*	0.11	0.26*	0.08	0.02
Theory	0.65	0.15*	0.04	0.08	0.03	0.34*	-0.09	0.24*	0.17
Thought/methods	0.65	0.45*	-0.04	0.02	0.01	0.46*	-0.06	-0.13	0.31*
History	0.13	-0.01	0.08	0.14*	-0.08	0.40*	0.36*	0.13	-0.13
Development	2.27	0.09	0.00	-0.10	0.09	0.55*	0.23*	-0.05	-0.04
Econometrics	-0.77	0.10	0.17*	0.10*	-0.01	0.41*	-0.22	0.34*	0.27
Money	1.59	0.19*	0.14*	0.04	0.10	-0.13	0.16	0.01	0.27*
Public finance	-0.29	0.20	0.05	0.04	0.12	0.31*	0.43*	-0.20	0.04
International	0.15	0.19*	0.05	0.22*	0.04	0.16	0.10	0.22	-0.03
Business adm.	0.43	-0.18	0.21	0.18	-0.09	0.15	0.12	0.34*	0.21*
Industrial org.	1.49	0.07	0.03	0.14*	0.02	0.35*	-0.05	0.25*	-0.01
Agricultural	2.20	-0.15	-0.06	-0.20*	0.01	0.27*	0.23	-0.01	0.39*
Labor	4.46*	0.12*	0.26*	0.17*	-0.05	-0.09	-0.16	0.14	0.08
Welfare/urban-reg.	1.11	0.48*	0.02	0.10	-0.04	0.16	0.21	0.07	-0.05

*Statistically significant at the .05 level. System-weighted $R^2 = 0.77$.

TABLE 2
Coefficients of the Vector Autoregressive Estimation Test of Whether the Percentage of Reported Codes in a Subfield from Rank-and File Institutions Predicts the Percentage of Reported Codes in a Subfield from Elite Institutions

Elite Subfield	Rank-and-file					Elite			
	Intercept	Lag 1	Lag 2	Lag 3	Lag 4	Lag 1	Lag 2	Lag 3	Lag 4
General econ.	0.55	0.41*	0.22	0.03	-0.23	0.08	-0.11	-0.02	-0.03
Theory	5.25*	0.58*	-0.08	0.50*	-0.39*	0.09	0.26*	-0.15	-0.34*
Thought/methods	0.71	0.34*	-0.07	-0.54*	0.18	0.03	0.21	0.14	0.26*
History	2.96*	0.26	-0.21	0.73*	-0.50*	0.12	-0.13	0.01	-0.10
Development	0.46	-0.02	0.61*	-0.30	-0.10	0.28	0.28	0.01	0.18
Econometrics	2.95	0.24	-0.21	-0.42	0.32	0.06	0.18	0.10	0.40*
Money	3.19	0.13	-0.19	-0.12	0.38	0.37*	0.10	0.01	0.11
Public finance	3.15*	0.53*	-0.41*	0.06	0.09	0.25*	0.16	0.22*	-0.28*
International	5.37*	-0.24	0.55*	-0.09	0.04	0.28*	0.04	-0.23	0.09
Business adm.	3.49*	-0.20	-0.02	0.29*	-0.20	0.36*	-0.09	0.15	0.15
Industrial org.	0.27	0.63	0.18	0.35	-0.04	0.11	0.15	-0.06	-0.12
Agricultural	3.73*	0.30*	-0.14	0.16	-0.27*	-0.05	0.15	-0.07	-0.11
Labor	-1.89	0.37	0.06	1.02*	0.12	0.08	-0.01	-0.17	-0.07
Welfare/urban-reg.	1.73	0.10	-0.20	0.86*	-0.28	0.18	-0.12	0.15	-0.28

*Statistically significant at the .05 level. System-weighted $R^2 = 0.52$.

Table 3.⁸ We used criteria spelled out earlier in this article to determine which of the four possible outcomes each case represented.

In seven subfields, we found support for the hypothesis that subfield choices among the elite and rank-and-file are affected simultaneously by external factors that are easily observed. This case applies to general economics, theory, thought/methodology, history, business, labor, and welfare/urban-regional. In four subfields, the results indicate that changes in the percentages of the reported subfield codes of new Ph.D.s from the elite institutions predicted similar changes in the percentages of reported subfield codes of new Ph.D.s from the rank-and-file institutions. If professors at the elite institutions are leaders in identifying fruitful areas of research, this information must be transferred to their students (whose choices we observe), and it is also transferred, with a lag, to professors and students at the rank-and-file schools. Our evidence suggests this case holds for the econometrics, money, international, and industrial organization subfields.

The results also suggest that the time-series movements of elite and rank-and-file new Ph.D.s are independent in development and agriculture. This finding is consistent with the observation that much research in agriculture and on developing countries occurs in land-grant universities. Changes in government policies toward research in agriculture and development likely result in rapid changes in the funding of research at these institutions. If variations in research activity in these subfields at elite schools result from variations in intellectual interests, it is reasonable to find that the two time series move independently. Finally, only in the subfield of public finance do we find the rank-and-file to lead the elite in variations of share of new Ph.D.s. We find this result puzzling.

CONCLUSIONS AND FUTURE WORK

We used the 1956, 1969, 1981, and 1989 directories of the AEA to document changes in the distribution of economists among subfields. Two samples were compared: a sample including all those who received their Ph.D.s at Harvard, Yale, or Chicago and a rank-and-file sample including all those who received their Ph.D.s at universities ranked below the top 16. The econometric analysis indicated that in seven subfields, changes in the subfield distribution of new Ph.D. economists from elite institutions were mutually causal with changes in the distribution of subfields selected by economists from lower-ranked schools. Economists from the elite and rank-and-file institutions may be simultaneously observing signals of changes in the factors that influence the distribution among subfields. These factors include job opportunities, research funding availability, and general social interest. In four subfields, the causation went from the elite to the rank-and-file. Here we found some support for the claim that information on a shared research agenda flows from the elite to the rank-and-file. In the remaining three subfields, we found independence of the time series in agriculture and development and an unexpected "reverse" causality in public finance.

To further test the hypothesis that a shared research agenda flows from the elite to the rank-and-file, one might find it useful to examine the citation patterns of articles that are frequently cited in economics (Leamer 1981; Diamond 1989). If

TABLE 3
Results of Tests of "Causality": Elite and Rank-and-File, by Subfield

Subfield	Elite cause rank-and-file: a_1 <i>F</i> statistic	Rank-and-file cause elite: a_2 <i>F</i> statistic
General economics	5.76*	5.20*
Theory	3.59*	4.85*
Thought/methodology	6.59*	7.18*
History	3.78*	3.30*
Development	1.55	2.50
Econometrics	4.78*	2.36
Money	6.29*	0.77
Public finance	2.30	5.98*
International trade	4.06*	2.06
Business administration	5.14*	3.99*
Industrial organization	4.49*	1.96
Agricultural	2.07	2.52
Labor	8.43*	5.83*
Welfare/urban-regional	13.83*	4.66*

*Statistically significant at the .01 level.

information flows from elite schools to rank-and-file schools, then we would expect to see the important articles cited first at the elite schools, and only later at the less prominent schools. In future research, it may also be useful to take a more fine-grained approach than that adopted in this study. In particular, groupings could be distinguished within the rank-and-file in order to learn whether the groups nearer to the elite responded more quickly to changes in the elite's distribution of subfields.

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NOTES

1. Our usage of *elite* is similar to, although somewhat broader than, one of the definitions given by Harry Johnson (1975, 131). The phrase *rank-and-file* has been used by Crane to indicate the members of a research group that are not "the most active and influential members of the area" (Crane 1970, 314). In *The Making of an Economist* (1990), Klamer and Colander claimed: "Approximately 150 schools offer Ph.D.'s in economics; of these, about 10 or 20 are considered elite. These elite schools dominate and shape the U.S. economics profession" (xiii).

2. "Gate-keeping" activities are those that concern the allocation of scarce research resources and professional recognition. Such activities are typically performed by journal editors and referees, conference organizers, and department chairs, among others.
3. We recognize, however, that in some societies the reward structure of the scientific community may be such that there are scientists among the rank-and-file with sufficient ability and control over resources to carry out revolutionary research. For example, Krohn notes Ben-David and Zloczower's 1962 observation that the European university system is one in which "academic forums place the preservation of established standards before innovation"; they thus conclude that revolutionary or leading research will occur in "academically marginal situations" (1970, 92).
4. That is, our sample of 1982 Ph.D.s consisted of all economists listed in the 1989 directory who reported 1982 as the year in which they received their Ph.D.
5. Besides the top 3 schools, the top 16 included: M.I.T., Berkeley, Stanford, Princeton, Michigan, Columbia, Wisconsin, Minnesota, Northwestern, Carnegie Tech (a.k.a. Carnegie Mellon), Pennsylvania, Johns Hopkins, and U.C.L.A. Because rankings of institutions by economic subfields have only rarely and recently been done (Baumann et al. 1987, Tremblay et al. 1990), we are forced to assume that the schools selected as elite are elite in all subfields. The appropriateness of this assumption when applied to particular subfields is discussed later in the text.
6. In Diamond and Haurin (1991b), we find that economists who specialize in agriculture and business are underrepresented in the AEA.
7. Preliminary tests indicated that we could not reliably use solely the 1981 survey to obtain data on subfield choices for the 1940s or 1950s. The problems resulted from nonrandom attrition and individuals changing subfields over long time periods.
8. Two alternative estimations were tried. In the first, lags were reduced to three from four. Results were quite similar. The second alternative was to insert contemporaneous variables of the rank-and-file share in equation (1) and of the contemporaneous elite share in the subfield in equation (2). The results regarding causality were unchanged. Significant contemporaneous effects (measured by a t ratio significant at the .05 level in both equations [1] and [2]) were found in three subfields: thought/methodology, development, and business.

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