MEASUREMENT OF THE SCIENTIFIC PRODUCTION IN BRAZIL: THE CASE OF ECONOMICS

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ABSTRACT

This study is an attempt to measure and analyze the Brazilian scientific production in the field of economics as reflected in Brazilian journals in the period 1980-1988. Twelve Brazilian journals were selected by fourteen specialists. On the basis of the articles published and patterns of scientific production it is shown that individual authorship is characteristic of the area. In contrast to this general situation, elite authors adopt more frequently a multiple authorship pattern. Another important finding is the strong North American influence on Brazilian economic thought.

RESUME

Cet article se propose de mesurer et d'analyser la production scientifique brésilienne dans le domaine de l'économie au cours de la période 1980-1988. A cet effet, douze journaux brésiliens ont été sélectionnés par quatorze spécialistes. Sur la base des articles publiés et des modes de production scientifique, les auteurs montrent que les articles signés par un seul auteur sont caractéristiques de ce domaine. A contrario, les chercheurs 'élites' les plus productifs signent plus fréquemment leurs articles avec d'autres auteurs. La forte influence nord-américaine sur la pensée économique brésilienne est également mise en évidence.

INTRODUCTION

The study aims to analyze the productivity of the authors in economics in the period 1980-1988, the adopted work practices and the existence of a pattern of authorship, seeking to see if the multiparadigmatic nature of the social sciences influences the standards of scientific communication in the area. Studies of the academic activity in economics show that it is a highly stratified system, in which productivity and prestige are concentrated in a small, yet dominant, elite of authors and institutions (Bensman, 1982) Thus, in a scenario of growing

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scientific production which manifests itself principally in articles, evaluation of the Journal and of the research community is today a demand of the very process of the development of Science in the country (see also Goncalves & David, 1982).

1- METHODOLOGICAL OBSERVATIONS

Various procedures were used in order to select the periodicals and articles. A preliminary list were generated for examination by specialists in the field; a basic list was then created applying criteria derived by the operational definition and from the consultation of fourteen economists; this list was then consolidated by the titles' occurrences on authorized lists (of CAPES: Coordination for the Improvement of Profressional Level Personnel, and of *"Literatura Economica"*) and in secondary sources of information (bibliographies, indices, etc... see annex)

A total of 2,225 contributions have been extracted from this list of journals for which author's name, volume, number, month and year of edition, and the institution to which the author belongs were coded.

Journals and authors productivity was computed. Upon considering the productivity of each author, as well as his/her way of producing articles (individual, collective, or both), it was decided to isolate the more productive authors (elite) given their importance in the selection of articles (Peters & Cecy, 1982). An important finding of previous research was the correlation between the elite authors' institutions and that of the editors evaluators. Our objective was to verify the level of "'endogeny" and the existence of schools of thought ("ideological inclinations") on the process of evaluation by peers.

"Endogeny" refers to the incidence of authors from one institution who write in the Journal which is published by that same institution. It can be noted that endogeny occurs both for authors and evaluators: the author can publish his/her article in his own institution, and an evaluator can write in the same journal for which he/she is part of the editorial board.

2. ANALYSIS OF THE RESULTS

2.1 Endogeny and the Pattern of Authorship

Articles written by authors who hold positions in Brazilian institutions were distinguished from authors with foreign affiliation, in order to locate the existence of an "endogeny" phenomenon. GONCALVES and DAVID (1982) also detected it, referring to "intramurally originated contributions". The pattern of authorship illustrates the level of cooperation through co-authorship.

The institutional origin of the authors is illustrated in Table 1. 85% of articles were written by authors who hold positions in domestic institutions. The 16% articles witten by authors in foreign institutions includes foreign as well as Brazilian authors abroad.

TABLE 1. GENERAL DISTRIBUTION OF ARTICLES PUBLISHED IN THE PERIOD1980-1988 ACCORDING TO ORIGIN OF THE AUTHORS

TYPE	JOURNAL	YEAR FOUNDED	DOMESTIC ARTICLES	FOREIGN ARTICLES	TOTAL
LEARNING	AN.ECON.	1983	50	5	55
AND/OR	EST.ECON.	1970	218	49	267
RESEARCH	RBE	1947	171	25	196
INSTI-	RBMEC	1975	148	9	157
TUTIONS	ENS. FEE.	1980	149	22	171
	LIT.ECON.	1976	84	48	132
	PPE	1971	244	56	300
	RBCEX	1985	86	10	96
	REN	1969	151	16	167
SUBTOTAL			1,301 58%	240 11%	1,541 69%
SCIENTIFIC	RE	1981	65	19	84
SOCIETIES	REP	1981	224	62	286
	RER	1962	301	13	314
SUBTOTAL			590 27%	94 4%	684 31%
TOTAL			1,891 85%	334 15%	2,225 100%

Regarding submissions by foreigners, GONCALVES and DAVID found 21% for the period 1970-1980 in three journals (RBE, PPE, EST.ECON). Here a proportional reduction should be noted. In some journals (EST.ECON, LIT ECON, PPE, RPE) foreign articles prevail[1]. These journals account for 65% of the total production.

Endogenous authorship can be observed In Table 2, which shows the portion of articles written by local faculty in their institution's journal.

Endogeny represents 25% of the total production in all type of journals. If we isolate articles published by LRIs we find a higher proportion (35%). This figure

[1]LIT. ECON., which shows a rather high figure, publishes regularly translations of foreign articles.

is significantly less than that found by Goncalves & David (one out of two articles were endogenous; while we find one out of three).

TABLE 2. ENDOGENOUS AUTHORSHIP OF ARTIGLES PUBLISHED BY LRI

JOURNAL	INSTITU-TION	TOTAL ARTICLES	ENDOGENOUS ARTICLES	
			abs.	%
AN. ECO.	UFRGS	55	35	63
EST.ECON	USP	267	99	37
RBE	EGV/RJ	196	58	31
RBMEC	IBMEC	157	83	53
ENS. FEE.	FEE	171	84	49
ECON	IPEA	132	22	17
PPE	IPEA	300	74	25
RBCEX	FUNCEX	96	44	46
REN	BNB	167	48	29
TOTAL		1541	547	100

2.1.2 Authorship Pattern of the Articles

The pattern of authorship practiced in the area of Economics can be observed in Table 3, which shows that 77% of articles were written individually. This pattern of individual writing was, curiously, even stronger in journals published by LRIs. Given the nature of LRI journals, more interaction among the researchers was expected but in fact did not occur. Individual authorship in the LRI journals is distributed among indices that range from 93% (AN. ECON.) to 78% (PPE). In the SS Journals the situatlon is slightly different (77%). It should be noted that one journal had a significant effect on this percentage: the RER -an interdisciplinary journal involving economy and rural sociology-, which has a 42% index., instead of the 82% for RE or 88% of REP.

2.1.3 Institutional Origin vs. Authorship Pattern

Combining the institutional affiliation with the pattern of authorship in LRI journals, we find an elevated index of endogenous and individually authored articles (30% of the articles published by the LRI journals). However, if the comparison is based on the overall total of articles studied (2,225), the index reaches 25%. Even more surprising is the index of individual authorship within the group of endogenous articles: 84%.

This seems to indicate a tendency of isolation of ideas and implies the absence of formal communication among peers. This isolation is also evidenced by the fact that 75% of non-endogenous articles are co-authored.

TABLE 3. DISTRIBUTION OF ARTICLES ACCORDING TO PATTERN OF AUTHORSHIP

TYPE	JOURNAL	AUTHORSHIP		
		Individual - %	In Collaboration - %	Total
LEARNING	AN. ECON.	51-93	4-7	55
AND/OR	EST. ECON.	218-82	49-18	267
RESEARCH	RBE	157-80	39-20	196
INSTI-	RBMEC	125-80	32-20	157
TUTIONS	ENS. FEE.	153-89	18-11	171
	LIT. ECON.	115-87	17-13	132
	PPE	234-78	66-22	300
	RBCEX	86-90	10-10	96
	REN	133-80	34-20	167
SUBTOTAL		1,272 82,5%	269 17,5%	1,541 100%
SCIENTIFIC	RE	69-82	15-18	84
SOCIETIES	REP	251-88	35-12	286
	RER	132-42	182-58	314
SUBTOTAL		452 66%	232 34%	684 100%
TOTAL		1,724 77%	501 23%	2,225 100%

2.1.4 The Influence of Individual Authorship on the Productivity of the Authors

We found a total of 1466 authors in the total list of 2225 articles. The number of articles written per author varies from one to 41 (Table 4). While 945 authors (64%) wrote only one article over the nine year period, a single author produced individually and/or in collaboration 41 articles (1.39%).

Considering the above, for this study it is necessary to apply the Law of Elitism (Price, 1972), which states that a population N (be it articles, journals, or authors) contains an effective "elite" group whose number is equal to the square root of N. Upon applying this formula to the absolute number of authors in the study (1466), the resulting elite is made up of 38 authors. When this number of authors is isolated , it is found that a total of 44 authors produced from seven to

41 articles - a substantially higher number than the formula indicates. Reducing the nucleus of elite authors to the line immediately below - line 13- a total of 37 authors are found to produce from eight to 41 articles, a valid number to represent the elite. Thus, the elite group of more productive authors represents 2.5% of the total number of authors, that produced 16.5% of articles.

Comparing the productivity of the elite to the non-elite, we find that:

- The non-elite (1,429 authors) represent 97.5% of the total number of authors and are responsible for 83.5% of the articles (2,458). The average number of articles per author is 1.7.
- The elite (37 authors) represent 2.5% of the total number of authors and are responsible for 16.5% of the articles (484). The average number of articles per author is 13.

TABLE 4. BIBLIOGRAPHIC PRODUCTIVITY OF THE AUTHORS 1980 -1988

Authors (A)	Sub-missions (S)	A	%A	%A Cumul	SxA	SA	%SA	%SA Cumul
1	41	1	0.06	0.06	41	41	1.40	1.40
1	24	2	0.06	0.12	24	65	0.90	2.30
2	22	4	0.14	0.26	44	109	1.50	3.80
1	21	5	0.06	0.32	21	130	0.80	4.60
2	20	7	0.14	0.46	40	170	1.40	6.00
1	16	8	0.06	0.52	16	186	0.50	6.50
3	15	11	0.20	0.72	45	231	1.50	8.00
1	14	13	0.14	0.86	28	259	0.90	8.90
3	12	16	0.20	1.06	36	295	1.30	10.20
2	11	18	0.14	1.20	22	317	0.80	11.00
5	10	23	0.30	1.50	50	367	1.50	12.50
5	9	28	0.30	1.80	45	412	1.50	14.00
9	8	37	0.70	2.50	72	484	2.50	16.50
19	7	56	1.20	3.70	133	617	4.50	21.00
25	6	81	1.70	5.40	150	767	5.00	26.00
39	5	120	2.60	8.00	195	962	7.00	33.00
66	4	186	4.50	12.50	264	1226	9.00	42.00
101	3	287	7.00	1.50	303	1529	10.00	52.00
234	2	521	16.00	35.50	468	1997	16.00	68.00
945	1	1466	64.50	100.0	945	2942	32.00	100.0

Moving on to the subject of individual authorship's influence on the authors' productivity, we find that a large number of authors usually write alone. 671

authors (45%), adopting the practice of markedly individual academic production. In contrast, a larger proportion of the authors (795, 55%) produce individual as well as collective works The general pattern that emerges is that those who write individually, write less. In collaboration with their colleagues, they tend to produce more.

In the elite group that produces more articles, we find that only 5 authors (14%) adopt an individual authorship pattern, and these are responsible for 9% of the production of the elite group. The other 32 authors, who write both individually and collectivelly are responsible for 91% of the production.

One of the greatest changes in scientific literature over the last decades has been the increase in multiple authorship (Price, 1963). In respect with the social and behavioral sciences, Psychiatry and Psychology, almost half of the literature has been written by research groups, while in the social sciences and sociology only one-fourth of the literature is individually authored (Lindsey, 1968).

In a total of 795 authors who did not adopt an individual pattern of authorship, we found that 234 authors wrote published individually and collectivelly while the remainig 561 (38%) wrote exclusively co-authored papers. In the elite the figure of both collectively and individual authorship is of 29 authors. Only three authors wrote exclusively as co-authors. These observations demonstrate that the elite authors behaved differently from the majority.

2.2 Elite Authors, their Institutions and the Degree of Endogeny

Once the elite group of authors was singled out, they were compared to the group of editors and evaluators in order to verify the degree of endogeny among them. In the same manner, the institutions that granted the elite authors academic degrees were compared to those of the editorial board members in order to observe any correlation between them and the possible influence on receptivity of articles submitted for publication.

We found that the elite show afiliations distributed among 19 institutions: 11 universities, five research centers, two companies and one professional association. Five institutions were responsible for 57.5% (283) of the articles, published by 48% (86) of authors. They are:

USP (Universidade de Sao Paulo) with 15% of the articles (75); PUC-RJ (Pontificia Unlversidade Catolica do Rio de Janelro) with 15% of articles; UFRJ (Unlversidade Federal do Rio de Janeiro) with 11%; UFV (Universidade Federal de Vicosa) with 8.5%; and FGV/RJ (Fundacao Getulio Vargas- Rio de Janeiro) with 8%. These are all higher education institutions, leading to the conclusion that in the area of Economy in Brazil, the strongest scientific production is generated in Univesrities.

It should be also noted that in the "institutional elite", five institutions produced six research journals. These institutions were represented by 13 economists who produced 36% of the articles. Five of them were also editors of three research journals. Furthermore, 150 economists were found in the editorial

boards of the journals. From these, 12 were in the elite group identified earlier. Endogeny is thus further emphasized. Additionally we must mention that three foreign institutions appear in the affiliations of authors from the elite. These are the Boston University, The World Bank, and Massachussets Institute of Technology.

Table 5 was drawn up in an attempt to measure the index of endogeny among the authors in the elite group. It represents 12 authors of the elite in five institutions that publish six journals. We find here a high endogeny number of 43%. Examination of each case revealed that the highest indices are those of RBMEC (83%) and ENS. FEE (83%). Excluding these two publications lowers the endogeny index to 28%, meaning that one out of every four articles originates from within the publishing institution.

TABLE 5. ENDOGENOUS AUTHORSHIP AMONG THE ELITE AUTHORS

No. AUTHORS	INSTI-TUTION	JOURNAL	ARTICLS OF AUTHORS IN JOURNALS	TOTAL NB OF ARTICLES OF AUTHORS	%
4	USP	EST.ECON	14	75	19
2	FGV/RJ	RBE	11	29	38
2	IBMEC	RBMEC	19	18	83
2	FEE	ENS.FEE	15	18	83
2	IPEA	PPE/LIT.ECON	12	25	48
12	5	6	71	166	43

2.3 Elite Authors vs. Evaluators: the Influence of Institution from which Academic Degree was earned

The academic degrees of the more productive elite authors, the distribution of articles among the primary journals, and the number of authors granted degrees by each institution were examined jointly in detail. 29 authors had been granted doctorate degrees, only two had a masters degree, and six had not indicated their degree level.

American universities were the principal institutions granting degrees (19 authors). English, Canadian, and French universities accounted for 5 authors, and four Brazilian universities granted degrees to seven authors. The majority of the published articles were written by authors who earned degrees from American universities: that is, 257 articles were written by 19 authors. The journals that published a high number of articles are of a general nature: PPE, with 70; RBE

and REP, with 38 each: and EST. ECON., with 25. Only one primary journal dedicated to a specific sub-area, that of rural economy, with 42 articles (RER).

The degree of endogeny and possible "ideological inclinations" of those specialists who edit and evaluate the articles submitted for publication in the journals is obtained by comparing the academic degrees of the elite authors with the academic degrees of specialists that form the editorial boards of the Journals. Survey of these specialists' degrees showed the presence of 13 American universities and one English University, out of 22 different universities.

In a more detailed analysis, table 6 shows that some of the most productive authors are members of editorial boards. Moreover the author's affiliation seems to be an important factor when judging the articles. Finally, authors associated to the same institution that granted the degrees to the members of the board seem to be privileged.

TABLE 6. ELITE AUTHORS PARTICIPATION ON EDITORIAL BOARDS OF THE PRIMARY JOURNALS

AUTHORS	INSTITUTIONS	JOURNALS	ARTICLES
A*	FGV/SP	REP	20
B*	FGV/SP	REP	9
C*	FGV/SP	REP	8
D*	IPEA	PPE	10
E	IBMEC	RBMEC	11
F	UFRJ	RBCEX	14
G	USP/ESALQ	RER	24
H	USP	EST.ECON.	21
I*	FGV/RJ	RBE	15
J	PUC/RJ	RBE	12
K	USP	EST.ECON.	22
L	USP/ESALQ	EST.EGON.	8

* Editors.

3. FINAL CONSIDERATIONS

The research results allow some overall observations to be made. We found a high index of endogenous production and high individual rates of publication, which seem to indicate a lack of interaction within the scientific community of economics. Individual authorship is characteristic of the area. It may be the multi-paradigmatic nature of the social sciences that explains these authorship practices Also individual productivity is lower for those who write individually. In contrast to this general situation, the elite of authors adopt a multiple authorship pattern

more frequently, confirming what is known from the sociology of science: collective authorship improves the productivity of the authors.

Finally, another important finding was the indisputable north american influence on Brazilian economic thought, verified by the academic degrees earned by the more productive authors, as well as the editors of journals in the field.

It is hoped that the results of this study will open the debate about the subject, contributing to a better understanding of the communication patterns inside the scientific community.

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ANNEX

JOURNALS PUBLISHED BY LEARNING AND/OR RESEARCH INSTITUTIONS (LRI)

-Analise Economica (AN. ECON.) Faculdade de Ciencias Economicas - Unlversidade Federal do Rio Grande do Sul - (UFRGS)
-Ensaios FEE (ENS. FEE) Fundacao de Economia e Estatistica Siegfried Emanuel Heuser (FEE)
-Estudos Economicos (EST. ECON.) Instituto de Pesquisas Economicas da Universidade de Sao Paulo - (USP)
-Literatura Economica (LIT. ECON.) Instituto de Pesquisas do Instituto de Planejamento Economico e Social - (IPEA)
-Pesquisa e Planejamento Economico (PPE) Instituto de Pesquisas do Instituto de Planejamento Economico e Social - CIPEA)
-Revista Brasileira de Comercio Exterior (RBCEX) Fundacao Centro de Estudos do Comercio Exterior (FUNCEX)
-Revista Brasileira de Economia (RBE)
Escola de Pos-Graduacao em Economia da Fundacao Getulio Vargas - (FGV)
-Revista Brasileira de Mercados de Capitais (RBMEC)
Instituto Brasileiro de Mercado de Capitals - (IBMEC)
-Revista Economica do Nordeste (REN)
Escritorio Tecnico de Estudos Economicos do Nordeste do Banco do Nordeste do Brasil - (BNB)

JOURNALS PUBLISHED BY SCIENTIFIC SOCIETIES (SS)

-Revista de Econometria (RE),
Sociedade Brasileira de Econometria - (SBE)
-Revista de Economia Politica (REP)
Centro de Economia Poiltica em co-edicao com a Editora
Brasiliense - (CEP)
-Revista de Economia e Sociologia Rural (RER)
Sociedade Brasileira de Economia Rural - (SOBER)