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WHERE ECONOMICS HAS BEEN HEADED? MULTIPLE IDENTITIES AND DIVERSITY IN ECONOMIC LITERATURE EVIDENCE FROM TOP JOURNALS OVER THE PERIOD 2000-2006 A FIRST NOTE

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MULTIPLE IDENTITIES AND DIVERSITY IN ECONOMIC LITERATURE

EVIDENCE FROM TOP JOURNALS OVER THE PERIOD 2000-2006

A FIRST NOTE

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Abstract

This short paper presents some preliminary results of an ongoing research work focusing on richness and diversity of economic literature. The key idea is that each article published in an economic journal retains multiple identities. These multiple identities are captured through the use of JEL codes. A sample of top generalist journals has been selected. The relative abundance of all JEL categories has been computed for the period 2000-2006. Moreover, a degree of diversity has been proposed for both the sampled journals and the entire Econlit database.

JEL CODE: A10

KEYWORDS: JEL, Econlit, Economic Journals, multiple identities, identity, relative abundance, diversity, evenness, richness.

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Introduction

Every article published on an economic journal retains *multiple identities*. By *multiple identities* we refer to the set of different contributions to economic literature presented in every work. Needless to say, most articles authored by professional economists study subjects which are relevant to more than one topic. In fact, a single article can contribute to different strands of literature. In order to highlight the distinctive traits and contents as well as the interest and richness economists are used to assign JEL codes to their own work.

The idea of multiple identities is akin to the concept of *named good* as expounded in Hahn (1971). That is, a good at a particular time and place owned by one agent can be distinguished from the same good when it is owned by another agent. This is a *named good*. In a similar fashion, every article in economics is identified with a finite number of double-digit codes enlisted in the JEL classification. In fact, most articles retain several JEL codes. Then, every article can be distinguished from itself when retaining a different JEL code. Say, then, that an article retains *multiple identities*. Needless to say, the existence of multiple identities contributes to variety and richness of economic literature.

Therefore, the aim of this short paper is exactly that of using JEL codes in order to derive a measure of *diversity* for economic science. By diversity, we refer to the concept known among statisticians as the *average property of a community*. To our knowledge, there is no analogous previous study. Kim, Morse e Zingales (2006) used the JEL classification to present the percentage of most cited articles grouped by economic fields. However, the authors do not analyse in depth the

variety of economic literature. They try to derive a proxy for most relevant subjects following the first-digit JEL Classification as reported in Econlit. In fact, analysing only the first-digit classification cannot capture the richness and variety of economic literature.

This work is the building block of a broader research work focusing on variety and richness of economic literature. In particular, this note first applies the concept of *diversity*, as extensively used in biological, ecological and information sciences, to analyse economists' work over the period 2000-2006. In order to do that, a dataset has been created collecting the occurrences of two-digits JEL codes over the period 2000-2006 for both the entire Econlit database and a sample of top generalist journals.

This short paper is simply designed. In a first part, the sample of selected journals and the dataset are presented. In a second part, the concept and formal derivations for both *relative abundance* and *diversity* are presented. The conclusions summarise the preliminary results.

The Econlit database and the selected journals

The classification system for economic literature has been launched in 1969 with the first issue of Journal of Economic Literature[1]. The classification scheme had been recommended by a special committee at AEA. It was a two-level classification scheme. In 1991 the classification scheme had been replaced by the

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[1] See the Editor's note published on the first issue of Journal of Economic Literature (1969)

current system[2]. In fact, the classification system is currently still evolving by adding new codes. Perlman (1973) explained in details the functioning of classification system. Most authors assign codes to their papers. However, a staff of professional economists code or recode articles whenever the codes supplied are not consistent with coding practices used at Econlit.[3]

For this study, the Econlit dataset has been used. Data have been extracted through the EBSCO service provider. Firstly, note that there is a divergence between the current number of JEL Codes and the number of codes used in this work. In fact, at the time (April 2007) the collection of data has been completed, the JEL codes available through the EBSCO provider were 712 whilst the codes listed on Econlit website are 764. For instance take code H44: Publicly Provided Goods: Mixed Markets. It is listed on the Econlit website but it was not listed on EBSCO provider.

Then, some top generalist journals have been selected: American Economic Review (AER), Quarterly Journal of Economics (QJE), Journal of Political Economy (JPE), Economic Journal (EJ), and The Review of economics and Statistics (RESTAT), The Review of Economic Studies (RESTUD), Econometrica (EC) and the Journal of Economic Perspectives (JEP).

Every choice is somehow discretionary. This follows a mixed criterion. First, since the main goal of this research work was being abreast with the evolution of economic literature, generalist journals have been preferred to specialist journals. This explains the exclusion of some top specialist journals.

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[2] See the Editor's note on the first issue of Journal of Economic Literature (1991)

[3] We must thank Steven Husted Managing Director of Econlit for this explanation.

Secondly, the sample collects journals widely acknowledged as being at the top of the discipline. With the exception of JEP (which has been launched in 1987) the sampled journals fall in the group of the 'core' economics journals as in Laband and Piette (1994) and Stigler et al.(1995).

Moreover, these journals stand continuously at the top of several rankings. See for example, the rankings produced in Kalaitzidakis et al. (2003). Consider also, that it is widely accepted that the impact of these top-journals persist over time. Costa Vieria (2004) tested this hypothesis for a sample of 23 journals. The results seem to suggest that the impact did not change between 1980 and 2000 with the exception of QJE and EC which improved their own citation impact. Furthermore, they have also an impact upon other disciplines in social sciences as well as upon policy-makers. Kodrzycki and Yu (2006) explored this issue showing that also in this case the sampled journals of our study stand in the top-list. Moreover, as generalist journals they are committed to publish top-quality contributions from all fields of economics. This also means that they must have a significant impact on different subdisciplines within economics. A peculiar study in this respect is Barrett et al. (2000). The authors present a subdiscipline-specific ranking for economic journals. They use sixteen subdisciplines based upon JEL classification (in particular, ranging from first-digit code C to R). Then, they produced a ranking for each subdiscipline. In particular, they show how the journals we have selected have a broad impact on economics in general since they appear in the top-lists of different subdisciplines. The 'Holy trinity' formed by AER, JPE and EC appears in the top-list in 15 out of 16 sub-fields. The QJE

appears in 9 top-lists out of 16 whereas RESTAT, RESTUD, EJ also appear in the elite group of journals.

With the exception of the JEP, every journal contains peer-reviewed and referred articles. Another peculiar case is given by the AER. AER publishes both peer-reviewed and unreferred contents. In fact, every year the May issue of AER also contains the unrefereed *Papers and Proceedings* (P&P) of the annual conference of AEA. Then, we disentangled AER in AERPR (peer-reviewed contents) and AERPP (papers and proceedings).

Then, the dataset took the shape of a matrix with 712 rows and 11 columns. The first nine columns correspond to the selected journals whereas the latter two columns correspond respectively to the sum of journals selected and to the entire Econlit database. Each entry can be denoted as a_{ik} where $i = 1,2,3,....,712$ and $k = 1,2,3,...,12$. Each entry is an integer which counts the number of articles exhibiting code i and published in journal k over the period 2000-2006. We relied upon the definition of 'article' as available in Econlit and searchable through EBSCO. Other pieces of literature as book reviews are not included. Then, the matrix has both zero and non-zero entries. Table 1 reports the number of non-zero entries (denoted by A) for the selected journals and the ratio over the total number of JEL categories.

TABLE 1 – SOME DESCRIPTIVE STATISTICS

	Journal	No. Non-zero entries (A)	Ratio (=A/712)	no. Articles M	Av. $m = M / A$
1	AERPR	330	0.46	670	2.6

2	EJ	294	0.41	601	2.3
3	JEP	288	0.40	543	2.0
4	AERPP	262	0.37	472	1.9
5	RESTAT	253	0.36	448	1.8
6	JPE	248	0.35	372	1.4
7	QJE	225	0.32	312	1.3
8	RESTUD	200	0.28	287	1.3
9	EC	174	0.24	266	1.2
	All Selected Journals	509	0.72		
	Econlit	681	0.96		

Source: Econlit

AERPR is the journal with the larger numbers of codes used. By contrast, EC shows the smallest number of codes used. Of course, this also depends on how many codes are assigned from authors and how many articles are published. This can vary between journals. The table below reports the number of articles published (denoted by M) and the average number of assigned codes per journal ($m = M / A$). The AERPR presents the highest figure for both M and m whilst the QJE stands at the bottom in this peculiar rankings. In order to investigate whether or not there is a correlation in these rankings it is possible to compute the Spearman's rank correlation coefficient defined as:

$$\rho = 1 - \frac{6\sum_{i=1}^{h} d_i^2}{h(h^2 - 1)} \tag{1}$$

where d denotes the difference between each rank for the same journal and h the number of pairs ($h = 1,2,...10$).The Spearman's index is always bounded between -1 and 1. The index is computed only for journals. Analyse the rankings produced in table 1 and table 3. In such a case, the Spearman's index is $\rho = .297$. This says that the correlation between the ratio of codes used and the average number of codes assigned is quite low. By contrast, the Spearman's index between table 1 and table 2 shows a high correlation between the number of articles and ratio of codes used, ($\rho = .745$).

Relative Abundance and Diversity

Relative Abundance

As noted above, the key-idea of this work is that each article published in an economic journal has multiple identities. These multiple identities are captured through the use of JEL codes. For example whenever an article retains three JEL classifications, it does also retain three identities. Note that no specific ordering for JEL codes is required. Every permutation is allowed. That is, a classification like D74, H56, F19 is perfectly equivalent to F19, D74, H56 or H56, F19, D74. Hereafter, let n_{ik} denote the number of articles presenting code i for $i = 1,2,....,s$ in journal k . Then $N_k = \sum_i^s n_{ik}$ is the total number of *identities* in journal k . If M_k denotes the number of articles published in the journal k we must have that $N_k > M_k$.

Since the identities are grouped into categories we can think of N_k as a finite quantity of individuals consisting of a finite countable number of species. Such a quantity is discrete. Let p_i denote the relative abundance of species i. That is, the relative abundance of a JEL category is defined as:

$$p_{ik} = \frac{n_{ik}}{N_k} \qquad (2)$$

with $\sum_{i=1}^{s} p_{ik} = 1$. Define a community the pair $C = (s, \mathbf{p})$ where $\mathbf{p} = (p_1, p_2, p_3, ...)$ is the species abundance vector. A community is defined as completely even if $p_1 = p_2 = p_3 = ... = p_s = 1/s$. In our context, each journal corresponds to a community.

Table 2 and table 3 reports the top JEL codes over the period 2000-2006 for the entire Econlit database and the sample of selected journals respectively.

TABLE 2. TOP 10 JEL CODES (ENTIRE ECONLIT DATABASE)

OVER THE PERIOD 2000-2006

	JEL CODE AND SUBJECT DESCRIPTOR	NO. OCCURRENCES	RELATIVE ABUNDANCE
1	O15-Human Resources; Human Development; Income Distribution; Migration	8109	0.0198

	Code and Subject Descriptor	no. Occurrences	Relative Abundance
2	O19-International Linkages to Development; Role of International Organizations	7409	0.0181
3	G12-Asset Pricing; Trading volume; Bond Interest Rates	6431	0.0157
4	G21- Banks; Other Depository Institutions; Micro Finance Institutions; Mortgages	5239	0.0128
5	O16- Economic Development: Financial Markets; Saving and Capital Investment; Corporate Finance and Governance	5002	0.0122
6	O13- Agriculture; Natural Resources; Energy; Environment; Other Primary Products	4706	0.0115
7	J24- Human Capital; Skills; Occupational Choice; Labour Productivity	4651	0.0114
8	F31 - Foreign Exchange	4390	0.0107
9	F13- Trade Policy; International Trade Organizations	4204	0.0103
10	F23-Multinational Firms; International Business	4074	0.0100

Source: Econlit Database

TABLE 3. TOP 10 JEL CODES (SELECTED JOURNALS)

OVER THE PERIOD 2000-2006

	Code and Subject Descriptor	no. Occurrences	Relative Abundance
1	J24-Human Capital; Skills; Occupational Choice; Labor Productivity	217	0.0228
2	J31-Wage Level and Structure; Wage Differentials	189	0.0198
3	D72-Models of Political Processes: Rent-	149	0.0156

	Seeking, Elections, Legislatures, and Voting Behavior		
4	I21-Analysis of Education	144	0.0151
5	D82-Asymmetric and Private Information	142	0.0149
6	E52 - Monetary Policy	141	0.0148
7	J13-Fertility; Family Planning; Child Care; Children; Youth	133	0.0140
8	D83-Search; Learning; Information and Knowledge; Communication; Belief	131	0.0137
9	D12-Consumer Economics: Empirical Analysis	126	0.0132
10	G12-Asset Pricing; Trading volume; Bond Interest Rates	125	0.0131

Source: Econlit Database

It is clear that there is a sharp divergence in actual contents between the entire Econlit database and the sampled journals. First, it is interesting to note that only two JEL codes occur in both tables: J24 and G12. The first denotes «Human Capital; Skills; Occupational Choice; Labor Productivity» whereas the latter denotes «Asset Pricing; Trading volume; Bond Interest Rates».

Secondly, in table 2, in the first ten positions of this peculiar ranking four entries are related to the first digit classification «O1 - Economic Development» whereas three entries are related to the macro-field «F –International Economics» and two to the macro-field «G- Financial Economics». Whether or not this result can suggest an actual specialization of economic literature occurred in the latter years, this point would deserve further attention.

Table 4 reports relative abundances for sampled journals. It is possible to note that code J24 (coloured in blue) «Human Capital; Skills; Occupational Choice; Labor Productivity» stands in the first or second ranking of QJE, AER, JPE, EJ and RESTAT. The same occurs for code D72 (coloured in red) denoting «Models of Political Processes: Rent-seeking, Elections, Legislatures, and Voting Behavior». It seems that top journals 'cluster' around some specific topics.

It is also interesting that the top code for both EC and RESTUD is D82: Asymmetric and Private Information. Note also that JEP seems to follow its mission "*to offer readers an accessible source for state-of-the-art economic thinking*"[4] given that the top JEL code is given by A11: Role of Economics; Role of Economists; Market for Economists. However, at this stage the goal is purely descriptive. As noted above, any further discussion about the evolution of economic thinking would deserve deeper attention.

TABLE 4 – TOP JEL CODES FOR SELECTED JOURNALS

Rank	QJE	AERPP	AERPR	JPE	EJ	RESTUD	RESTAT	JEP	EC
	D72	J15	D72	J24	J31	D82	J24	A11	D82
1	0.039	0.032	0.023	0.025	0.028	0.043	0.035	0.023	0.056
	J24	I21	J24	D72	J24	D83	J31	O47	C22
2	0.031	0.028	0.02	0.023	0.027	0.026	0.034	0.021	0.053
	J13	E52	D83	G12	E52	D44	C51	L86	D83
3	0.028	0.028	0.019	0.023	0.022	0.025	0.023	0.018	0.051
	I210	J13	D82	J31	E31	J24	I21	D72	D44
4	0.021	0.023	0.016	0.022	0.019	0.023	0.022	0.018	0.033

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[4] Extracted from http://www.aeaweb.org/jep/ (accessed August 2007).

	J16	J31	E32	J13	J13	J31	D12	O15	D81
5	0.019	0.023	0.016	0.021	0.019	0.022	0.021	0.016	0.033
	G12	**O19**	**E31**	**J12**	**D12**	**E52**	**J13**	**E62**	**C73**
6	0.017	0.023	0.016	0.02	0.017	0.02	0.019	0.014	0.027
	G32	**J24**	**O33**	**D12**	**O15**	**L11**	**L11**	**J16**	**G12**
7	0.015	0.022	0.015	0.018	0.016	0.019	0.017	0.014	0.026
	I12	**J16**	**I21**	**O15**	**O19**	**L13;O41**	**G12**	**B31**	**C20**
8	0.015	0.022	0.015	0.016	0.016	0.017	0.017	0.013	0.026
	G21	**O15**	**L11**	**D13**	**E24**	**C78.D12.D31.D72**	**E32**	**G34**	**C72**
9	0.014	0.018	0.014	0.015	0.016	0.016	0.016	0.013	0.025
	O16	**A22**	**E52**	**L11**	**O33**	**D81. E31. E32**	**F23**	**E52**	**C21**
10	0.014	0.016	0.014	0.015	0.016	0.016	0.015	0.012	0.025

Diversity

Following Patil and Taillie (1982) diversity is defined as the *average property of a community*. Diversity is influenced by two factors: *evenness and richness*. Diversity is increasing in both evenness and richness. In particular, richness has the greatest effect on diversity. The degree of diversity can be captured through the Shannon index. It has been presented in Shannon and Weaver (1949) as a measure of entropy in information theory. The Shannon index[5] is given by:

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[5] The functional form of Shannon measure adopted here has been discussed in Campiglio (1999), pp.205-207.

$$H_k = -\sum_{i=1}^{s} p_{ik} \log p_{ik} \qquad\qquad (3)$$

The Shannon index assigns diversity zero to single-species community. This also means that introducing a species increases the diversity measure of a community. The Shannon index is bounded between zero and $\ln(s)$. As noted above, diversity is influenced by evenness and richness. That is, the maximum degree of diversity is assigned whenever a community is completely even. At the same time, given two completely even communities the one with more species is more diverse. The latter point marks the difference with the concept – familiar among economists – of inequality. A measure of inequality would account only for the unevenness of the income distribution. Then, diversity indices are frequently used in the form of ratios of absolute diversity to the maximum diversity possible. This does capture the concept of evenness as expounded in Pielou (1966/1975) and Peet (1975). The relative Shannon (also labelled as relative entropy) measure is given by:

$$\widetilde{H}_k = \frac{H_k}{\ln(s)} \qquad\qquad (4)$$

As (4) approaches the unity the community is more and more diverse.

TABLE 5 - RELATIVE SHANNON INDEX FOR SELECTED JOURNALS

	Journal	$\widetilde{H}_k$
1	JEP	0.808
2	AERPR	0.806

3	EJ	0.786
4	JPE	0.776
5	RESTAT	0.762
6	AERPP	0.761
7	QJE	0.760
8	RESTUD	0.738
9	EC	0.679

Source: Econlit Database

JEP is the most diverse journal whilst EC is the less diverse. However, all the sampled journals show a high degree of diversity. This confirms their attitude to be generalist journals. It is also interesting to note that AERPR is more diverse than AERPP. And an even more striking result came from the comparison of AERPP and EJ, JPE and RESTAT. Since diversity is influenced by evenness and richness, journals with a higher number of codes used (see Table 1) could be predicted to exhibit a higher diversity than the others. In such a case, although AERPP publishes a higher number of articles, it is significantly less diverse than EJ, JPE and RESTAT. In such a case, it would be possible to say that the 'visible hand' of AEA President matters. In fact, the paper selected for publications in AERPP are chosen every year by the incoming president of AEA. Of course this point would deserve further attention. Of course only a longer term study could verify whether or not this implies a bias in the evolution of both economic thought and economic practice.

Eventually, RESTUD and EC given the low number of articles published as well as their focus on some specific topics do not show a high degree of diversity.

Conclusion

The key idea of this note is that each article published in an economic journal has multiple identities. These multiple identities are captured through JEL codes. A sample of nine top generalist journals has been selected. The relative abundance of all JEL categories has been computed for the period 2000-2006. Moreover, a degree of diversity has been proposed for both the sampled journals and the entire Econlit database. To summarise briefly the results we can say that:

1)   There is a sharp divergence in actual contents between the top generalist journals and entire Econlit database.

2)   Some Top Journals seem to cluster around some specific topics.

3)   All top generalist journals show a high degree of diversity. JEP is the most diverse whilst EC is the less diverse.

4)   The peculiar case of AER is interesting. Disentangle AERPR and AERPP. AERPP appears to be less diverse than AERPR. In the latest case, the 'visible hand' of AEA President appears to matter.

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