# 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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# 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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## 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 ten 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

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## Introduction

Every article published on an economic journal retains multiple identities. Multiple identities are commonly captured through the Jel Classification. In fact, every economist can highlight the distinctive traits and contents of her or his work by means of Jel Classification. The idea of articles' 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 is identified with title, author and Jel classification. But 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*.

The idea surrounding this short paper is exactly that of using Jel codes in order to derive a measure of diversity for economic science. 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 is an attempt to apply the concept of *diversity*, as extensively used in biological, ecological and information sciences, to analyses 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 results.

## The Econlit database and the selected journals

For this study, the Econlit dataset has been used 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. 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 rankings 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. The May issue of AER also contains the unrefereed *Papers and Proceedings* (P&P) of the annual conference of AEA. Then, we considered three shapes for AER: the refereed contents (AERPR), the unrefereed contents (AERPP) and all contents (AER) considered together.

Then, the dataset took the shape of a matrix with 712 rows and 12 columns. The first ten 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. and 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.

| | Journal | No. Non-zero entries (A) | Ratio (=A/712) |
|---|---|---|---|
| | TABLE 1 – NON-ZERO ENTRIES | | |
| 1 | AER | 380 | 0.53 |
| 2 | AERPR | 330 | 0.46 |
| 3 | EJ | 294 | 0.41 |
| 4 | JEP | 288 | 0.40 |
| 5 | AERPP | 262 | 0.37 |
| 6 | RESTAT | 253 | 0.36 |
| 7 | JPE | 248 | 0.35 |
| 8 | QJE | 225 | 0.32 |
| 9 | RESTUD | 200 | 0.28 |
| 10 | EC | 174 | 0.24 |
| | | | |
| | All Selected Journals | 509 | 0.72 |
| | Econlit | 681 | 0.96 |
| Source: Econlit | | | |

The AER is the journal with the larger numbers of codes used (in particular, as AERPR). 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. Table 2 below reports number of articles published (denoted by $M$) and Table 3 reports the average number of assigned codes per journal ($m = M / A$).

| | Journal | no. Articles $M$ |
|---|---|---|
| | TABLE 2- NUMBER OF ARTICLES | |
| 1 | AER | 1271 |
| 3 | AERPP | 670 |
| 4 | AERPR | 601 |
| 6 | EJ | 543 |
| 5 | RESTAT | 472 |
| 2 | EC | 448 |
| 9 | JEP | 372 |
| 8 | JPE | 312 |
| 7 | RESTUD | 287 |

Source: Econlit Database

|  | TABLE 3 - AVERAGE NUMBER OF ASSIGNED JEL CODES | |
| :-- | :-- | :-- |
|  | Journal | Av. *m* |
| **1** | AER | 3.3 |
| **2** | EC | 2.6 |
| **3** | AERPP | 2.3 |
| **4** | AERPR | 2.0 |
| **5** | RESTAT | 1.9 |
| **6** | EJ | 1.8 |
| **7** | RESTUD | 1.4 |
| **8** | JPE | 1.3 |
| **9** | JEP | 1.3 |
| **10** | QJE | 1.2 |

Source: Econlit Database

The AER 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 ($h = 1,2,\ldots 10$).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:

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

with $\sum_{i=1}^s p_{ik} = 1$. Defining 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, the entire Econlit database, the sample of selected journals and each journal correspond to different communities.

Table 4 and table 5 reports the top Jel codes over the period 2000-2006 for the entire Econlit database and the sample of selected journals respectively.

| TABLE 4. TOP 10 JEL CODES (ENTIRE ECONLIT DATABSE) OVER THE PERIOD 2000-2006 | | |
|---|---|---|
| JEL CODE AND SUBJECT DESCRIPTOR | NO. OCCURENCES | RELATIVE ABUNDANCE |
| **1** O15-Human Resources; Human Development; Income Distribution; Migration | 8109 | 0.0198 |
| **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; Labor | 4651 | 0.0114 |

| | | | |
|---|---|---|---|
| | Productivity | | |
| **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 5. TOP 10 JEL CODES (SELECTED JOURNALS )
OVER THE PERIOD 2000-2006

| | Code and Subject Descriptor | no. Occurences | 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-Seeking, Elections, Legislatures, and Voting Behavior | 149 | 0.0156 |
| **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

Analysing tables 4 and 5 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 4, 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 6 reports relative abundances for sampled journals. It is possible to note that code J24 stands in the first or second ranking of QJE,

AER, JPE, EJ and RESTAT. 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*"[1] 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.

<p align="center">TABLE 6 – TOP JEL CODES FOR SELECTED JOURNALS</p>

| Rank | QJE | AER | AERPP | AERPR | JPE | EJ | RESTUD | RESTAT | JEP | EC |
|---|---|---|---|---|---|---|---|---|---|---|
| | D72 | J24 | J15 | D72 | J24 | J31 | D82 | J24 | A11 | D82 |
| 1 | 0.039 | 0.021 | 0.032 | 0.023 | 0.025 | 0.028 | 0.043 | 0.035 | 0.023 | 0.056 |
| | J24 | I21 | I21 | J24 | D72 | J24 | D83 | J31 | O47 | C22 |
| 2 | 0.031 | 0.021 | 0.028 | 0.02 | 0.023 | 0.027 | 0.026 | 0.034 | 0.021 | 0.053 |
| | J13 | E52 | E52 | D83 | G12 | E52 | D44 | C51 | L86 | D83 |
| 3 | 0.028 | 0.02 | 0.028 | 0.019 | 0.023 | 0.022 | 0.025 | 0.023 | 0.018 | 0.051 |
| | I210 | J15 | J13 | D82 | J31 | E31 | J24 | I21 | D72 | D44 |
| 4 | 0.021 | 0.019 | 0.023 | 0.016 | 0.022 | 0.019 | 0.023 | 0.022 | 0.018 | 0.033 |
| | J16 | D72 | J31 | E32 | J13 | J13 | J31 | D12 | O15 | D81 |
| 5 | 0.019 | 0.017 | 0.023 | 0.016 | 0.021 | 0.019 | 0.022 | 0.021 | 0.016 | 0.033 |
| | G12 | J13 | O19 | E31 | J12 | D12 | E52 | J13 | E62 | C73 |
| 6 | 0.017 | 0.017 | 0.023 | 0.016 | 0.02 | 0.017 | 0.02 | 0.019 | 0.014 | 0.027 |
| | G32 | J13 | J24 | O33 | D12 | O15 | L11 | L11 | J16 | G12 |
| 7 | 0.015 | 0.015 | 0.022 | 0.015 | 0.018 | 0.016 | 0.019 | 0.017 | 0.014 | 0.026 |
| | I12 | J16 | J16 | I21 | O15 | O19 | L13;O41 | G12 | B31 | C20 |
| 8 | 0.015 | 0.014 | 0.022 | 0.015 | 0.016 | 0.016 | 0.017 | 0.017 | 0.013 | 0.026 |
| | G21 | D83 | O15 | L11 | D13 | E24 | C78.D12. D31.D72 | E32 | G34 | C72 |
| 9 | 0.014 | 0.014 | 0.018 | 0.014 | 0.015 | 0.016 | 0.016 | 0.016 | 0.013 | 0.025 |
| | O16 | E31 | A22 | E52 | L11 | O33 | D81. E31. E32 | F23 | E52 | C21 |
| 10 | 0.014 | 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 two indices: (a) the Simpson index; (b) the Shannon index. The first has been introduced in Simpson (1949) whilst

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

the latter has been presented in Shannon and Weaver (1949) as a measure of entropy in information theory. The Simpson index is defined by:

$$IS_k = 1 - \sum_{i=1}^{s} p_{ik}^2 \qquad (3)$$

Whereas the Shannon index[2] is given by:

$$H_k = - \sum_{i=1}^{s} p_{ik} \log p_{ik} \qquad (4)$$

Both (3) and (4) assign diversity zero to single-species community. This also means that introducing a species increases the diversity measure of a community. The Simpson index is bounded between zero and 1 whereas the Shannon index is bounded between zero and $\ln(s)$. The Simpson index is also commonly defined as *concentration index or dominance index* because it does exhibit a higher sensitivity to abundant species than Shannon index.

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). Then, the Simpson index gives:

$$E_k = \frac{IS_k}{1 - \frac{1}{s}} \qquad (5)$$

Whereas the relative Shannon (also labelled as relative entropy) measure is given by:

$$\tilde{H}_k = \frac{H_k}{\ln(s)} \qquad (6)$$

As (5) and (6) approach the unity the community is more and more diverse.

| TABLE 7 - SIMPSON EVENNESS INDEX FOR SELECTED JOURNALS | |
|---|---|
| Journal | $E_k$ |

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

| | | |
|---|---|---|
| **1** | JEP | 0.9945 |
| **2** | AERPR | 0.9941 |
| **3** | AER | 0.9939 |
| **4** | EJ | 0.9929 |
| **5** | JPE | 0.9926 |
| **6** | QJE | 0.9913 |
| **7** | RESTUD | 0.9912 |
| **8** | AERPP | 0.9909 |
| **9** | RESTAT | 0.9899 |
| **10** | EC | 0.9819 |
| | All Selected Journals | 0.9949 |
| | Econlit database | 0.9961 |

Source: Econlit Database

TABLE 8 - RELATIVE SHANNON INDEX FOR SELECTED JOURNALS

| | Journal | $\widetilde{H}_k$ |
|---|---|---|
| **1** | JEP | 0.808 |
| **2** | AER | 0.808 |
| **3** | AERPR | 0.806 |
| **4** | EJ | 0.786 |
| **5** | JPE | 0.776 |
| **6** | QJE | 0.760 |
| **7** | RESTAT | 0.762 |
| **8** | AERPP | 0.761 |
| **9** | RESTUD | 0.738 |
| **10** | EC | 0.679 |
| | All Selected Journals | 0.835 |
| | Econlit database | 0.863 |

Source: Econlit Database

Table 7 and table 8 show similar results. JEP is the most diverse journal whilst EC is the less diverse. However, all the sampled journals show a high degree of diversity. It is also interesting to note that AERPR is more diverse than AERPP. However, it is worth noting that the relative Shannon index (supposed to be more sensitive to the existence of rare species) shows that all sampled journals as well as the entire Econlit database appear to have a smaller degree of diversity.

A last insight recalls one more time the definition of diversity. 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. The peculiar case of AER is interesting. The AER is the top journal in terms of number of Jel codes used and it is also in the top-ranking in terms of relative Shannon index. Disentangle AERPR and AERPP. First, AERPP appears to be less diverse than AERPR. Take AERPP. It is significantly less diverse than JEP, AERPR, EJ, JPE, QJE and RESTAT. Only RESTUD and EC are less diverse than AERPP. Take JPE and QJE. In spite of a relatively low numbers of Jel codes used they exhibit a relatively high degree of diversity.

## Conclusion

The key idea of this note was that each article published in an economic journal has multiple identities. These multiple identities are captured through Jel codes. A sample of ten 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)      All top generalist journals show a high degree of diversity. JEP is the most diverse whilst EC is the less diverse.
3)      The peculiar case of AER is interesting. Disentangle AERPR and AERPP. AERPP appears to be less diverse than AERPR.
4)      The relative Shannon measure which is more sensitive rare 'species' shows that the also top generalist journal are significantly less diverse than a completely even community.

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