On Importance of Main Economic Categories: Jel Codes Analysis

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1. Introduction[1]

This paper is aimed to identify main trends in economics in the last ten years. To this end we observe categories and subcategories, which were most popular and analyze how these categories change over time in the studied period. We use data on topics covered by papers published in years 1998–2008 given by codes of Journal of Economics Literature (JEL) classification system. To meet the goal of the paper we use descriptive statistics, frequency analysis and trend analysis.

We assume hereby that papers published in international journals can be base to determine which subcategories of economics are considered by economists to be important. Attention is concentrated on the most influential journals, since papers published there are used in all objective procedures of research output evaluation. This is because only published journal articles undergo a widely accepted process of peer review, which is the essence of quality control in any scientific discipline. A well-received book may enhance an economist's reputation but, in economics, books are often based on previously published journal articles. In any case, the heterogeneity of book quality makes it nearly impossible to base an objective evaluation method on them (Neary et al. 2003).

The formal system of submission and evaluation of research for publication involves a selection process. It legitimizes research and systematically produces candidates for potentially contribute to the evolution of economic literature. Moreover it enforces disciplinary standards, which, in turn, influences the type of work that will be produced in the firs place. In this process subjective factors play an important, if not dominant, role.[2] We derive from this a conclusion that the papers published in top journals take up important topics, or at least topics, which are considered to be important by peers. So

[1] We are indebted to an anonymous referee for valuable comments. Any remaining errors are ours.

[2] Mackie (1998) describes results of a survey he in which he asked a sample of referees form top journals which criteria they use to decide whether to recommend a paper for publication. The responses indicate that the referees invoke at least 30 distinct criteria when determining the significance of an article. Most of the criteria require subjective estimation on the part of the referee. 18% of them explicitly revel that the topic of the paper must be "important" or "significant".

the more frequent a given topic (category) appears in periodicals the more important it is. This justifies our assumption that importance of different subfields of economics can be studied in absolute or relative terms using JEL codes of papers published in top journals.

This paper contributes to the literature on the economic profession. The interest on research on the economics profession can be motivated on three interrelated grounds: (1) for professional interest, (2) as a case study and (3) because one has interest in the sociology of knowledge. Colander (1989) provides a survey on works motivated by any of these reasons. A question on the proper choice of a promising research topic can be placed in the first of these above mentioned grounds. Summary of the most important results on this topic, theoretical as well as empirical, is provided by Diamond (1994, 1996). Our paper is linked with the latter, since it presents empirical selection of the most popular subcategories of economics and describes dynamics of their changes.

Formation, dissemination and spreading economic ideas have been studied by economists (e.g. Mackie, 1998, or Tarascio, 2002) as well as sociologies and philosophers (for an extended review of this literature see Mackinnon, 2006). Trends in topics of economic literature were subject to study in sixties (see e.g. Stigler, 1965 and Bronferbrenner, 1966) and recently there are new interests in this issue demonstrated in two papers: Kim, Morse and Zingales (2006) and Campiglio and Caruso (2007).

Topics covered by papers published in economic journals are classified according to the classification system provided by Journal of Economic Literature. There are subcategories, denoted by a letter and two-digit number, within 20 categories of economics.[3]

This classification system has been introduced in 1991. Papers published before have been classified backwards, nowadays majority of economic journals require that authors personally classify papers with JEL codes when submitted.

To our knowledge JEL codes has been rarely used in research on history of economic thought or sociology of economics. Barrett et. al. (2000) construct rankings of economics journals for specific sub-disciplines using JEL codes.[4] Kim, Morse and Zingales (2006) analyze changes in most popular topics in 35 years long period, based on most prominent papers, cited more than 500 times. They use JEL codes for establishing disciplines of economics playing critical role in subsequent periods. The main attention is concentrated on main disciplines (denoted by letters in JEL codes).

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[3] Detailed information can be accessed at the web side of JEL: http://www.aeaweb.org/journal/jel_class_system.html.

[4] Other studies using JEL codes, not directly related to our work are Chen and McKinnish (2005), which study job market for econmics PhD graduates, and Ellison (2002), which is concern with the slowdown of the economics publishing process.

Another approach to identification of tendencies in economic thought development is given by Campiglio and Caruso (2007). They measure diversification of economic publications by means of JEL codes. Their analysis is limited to years 2000–2006 and 8 top general interest journals.

Our work can be considered as an attempt to supplement Kim, et. al. (2006) by devoting more attention to most recent trends in economic literature. Since it is hard to judge which of the recent papers become really influential in the future we used the sample of all papers published in 39 selected journals. Moreover we observed that results on trends in economic literature depend strongly on level and on way of aggregation, hence we consider sub-categories of economics in the most detailed division, corresponding to two digit JEL codes.

In this paper we present results of empirical research based on data on JEL codes of papers published in selected 39 economic journals in years 1998–2007. Data was collected from American Economic Association's electronic bibliography EconLit.

Our paper is organized as follows. In the next section main hypotheses are stated, and data and methods are described. Section 3 contains static analysis of importance of sub-fields of economics in the analyzed period. Two possible ways of aggregating JEL codes are discussed. In Section 4 dynamic analysis of trends in economics literature is presented. Concluding remarks and references follows. At the end there is Appendix containing additional materials.

2. Hypotheses and Methods

Our hypotheses are:

Hypothesis 1: An increase in the number of papers published is connected with an increase in the number of different JEL codes used.

Hypothesis 2: Importance of different sub-fields of economics is changing over time.

Hypothesis 3: Aggregation of JEL codes may influence observed trends. Using most detailed JEL codes allows to observe some phenomena not visible in case of aggregation.

Our research agenda contained, after data collection, statistical analysis of collected JEL codes. Demonstration of the first hypothesis is based on descriptive statistics and trend analysis for papers published and JEL codes. The second hypothesis relies on trend analysis in relative terms. In order to show the last hypothesis we aggregated the two digit JEL codes into fewer categories, in two different ways, and observed significant differences in relative importance of the aggregated fields as well as in the trend analysis.

Before we collected data, first step of our research agenda was to select top economics journals to study JEL codes of the papers published in them. The details of our procedure are described in Karbownik and Knauff (2008). Summing up, we compared rankings generating by Journal Citation Reports

and Red Jasper, ordered according to several criteria and list of journal prepared by Kim et. al. (2006). Taking into account journals in all three sources we construct a list of 39 journals. It can be found in the Appendix. Next our database of JEL codes was colleted: it contains 56 409 JEL codes form 22 420 papers published in the selected journals in years 1998–2007. Below we provide characteristics of this data.

Notation:

$N(i, t)$—number of papers published in journal i in year t.

$T(i, t)$—total number of codes assigned to the papers published in journal i in year t.

$A(i, t)$—average number of codes assigned to one paper published in journal i in year t. $A(i, t) = T(i, t)/N(i, t)$

$U(i, t)$—total number of unique codes assigned to the papers published in journal i in year t.[5]

These quantities can be aggregated with respect to years and with respect to journals, or both. In the notation we use the rule that if a quantity is aggregated with respect to years, we omit index t, and analogously, we omit index i if it is aggregated with respect to journals. In case of aggregation with respect to both dimensions we omit both indexes, e.g. $U(i)$ is the total number of unique JEL codes assigned to the papers published in journal i in the whole period of the study, $U(t)$ is the total number of unique JEL codes assigned to the papers published in all 39 selected periodicals in year t, and finally U is the total number of unique JEL codes assigned to the papers published in all 39 selected periodicals in the whole period of the study. Note that the aggregation does not have to be a simple summation, e.g. in case of $U(t)$ it is not a sum of $U(i, t)$ for all i, since we have to exclude JEL codes repeated in different journals.

In 39 selected journals we observed high degree of topics diversity in the studied period. The greatest span in represented categories we observed in *American Economic Review*: U(*American Economic Review*) = 446. Next one in the row is U(*Economic Journal*) = 350. On the other hand, the lowest diversity we observed in case of *Journal of Financial & Quantitative Analysis*: U(*Journal of Financial & Quantitative Analysis*) = 80.

Most papers in the studied period were published in AER, more that 8 times as much as in *Journal of Law, Economics and Organization*, which is characterized by smallest number of papers published. The highest average diversity—$A(i) > 3$—is observed in case of journals on development economics and economic history: *Journal of Development Economics*, *Economic Development & Cultural Change* and *Journal of Economic History*. The smallest

[5] Each JEL code characterizing a subcategory of economics is counted only once, independent on number of times it was assigned to papers published in journal i in year t (provided it was used at least once).

number of codes for a paper—$A(i) < 2$—have periodicals devoted to econometrical methods: *Econometrica* and *Journal of Econometrics* (for the whole sample $A = 2.5$).

Number of papers $N(t)$ and joint number of observed JEL codes $T(t)$ are highly correlated (Pearson product-moment correlation coefficient $\rho = 0.96$), but the diversity measure $A(t)$ and the number of papers published $N(t)$ are not ($\rho = 0.15$), similarly the correlation between $A(t)$ and the joint number of codes $T(t)$ is weak ($\rho = -0.11$).

When studying evolution of economic literature we must take into account growing tendencies in numbers of researchers, journals and published papers, see Dreze and Estevan (2007). Indeed, our data demonstrate this effect—the total number of papers published every year, $N(t)$ is increasing, in the analyzed period we observe 32% increase. The number of codes used, $T(t)$ is growing almost two times quicker—close to 60% in the ten years. It can be easily explained by the multiple identities of most of the papers—they usually have more than one JEL code. Finally, one can analyzed number of different codes in journals $U(t)$. We can see that it also increases in time, but slower than the number of papers published $N(t)$ (19% increase). It means that increasing number of papers is connected with increasing number of categories discussed and every year new sub-categories gain importance to get publication in the top journals.

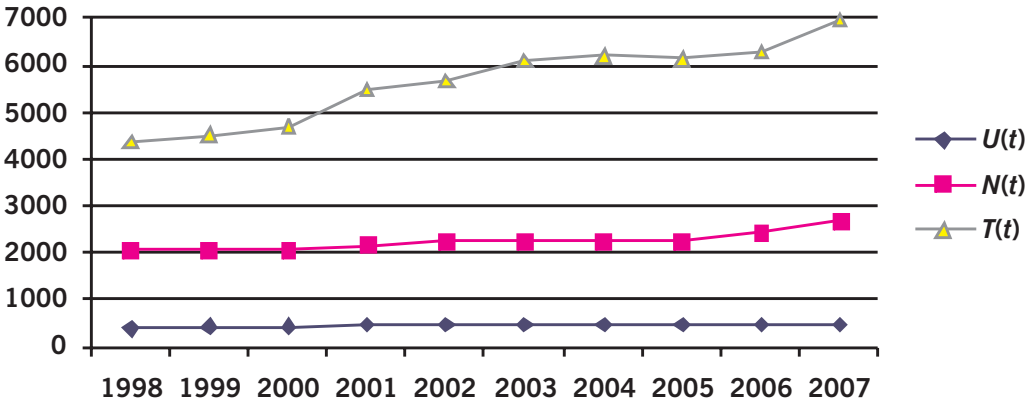

Figure 2.1.

Number of papers, all JEL codes and unique JEL codes is growing over time
Source: authors' calculations based on collected data.

In the next section we provide an attempt to describe most important categories in economics in absolute and relative terms taking into account most detailed division as well as two different ways of aggregation.

3. Most important categories of economics

We start our study form a frequency analysis. Table 3.1 presents ten most frequent observed JEL codes in our data.

Table 3.1.

Ten most important JEL codes according to the frequency in collected data

No	Code	Description	Quantity
1	G12	Asset Pricing; Trading Volume; Bond Interest Rates	1498
2	J24	Human Capital; Skills; Occupational Choice; Labor Productivity	949
3	J31	Wage Level and Structure; Wage Differentials	902
4	G32	Financing Policy; Financial Risk and Risk Management; Capital and Ownership Structure	890
5	E52	Monetary Policy	889
6	E31	Price Level; Inflation; Deflation	843
7	F31	Foreign Exchange	808
8	E32	Business Fluctuations; Cycles	781
9	G21	Banks; Other Depository Institutions; Micro Finance Institutions; Mortgages	771
10	O15	Human Resources; Human Development; Income Distribution; Migration	710

Source: authors' calculations based on collected data.

Sub-category G12 (Asset Pricing; Trading Volume; Bond Interest Rates) outnumbers all the other categories, it was observed nearly 50% times more than the next one in the row J24 (Human Capital; Skills; Occupational Choice; Labor Productivity). In the top ten category G (Financial Economics) occurs three times, similarly E (Macroeconomics and Monetary Economics). Category J (Labor Economics and Demography) appears two times, when F (International economics) and O (Economic Development, Technological Change, and Growth) are represented by one sub-category each.

Campiglio and Caruso (2007) provide set of ten most popular JEL codes for the whole EconLit, in years 2000–2007. Starting from the most frequently observed there are the following codes: O15, O19, G12, G21, O16, O13, J24, F31, F13, F23. We can observe that codes from Economic Development, Technological Change, and Growth dominate other categories, since four of them appear in this ranking. International Economics is also more often observed in EconLit than in the selected top journals. However Macroeconomics and Monetary Economics, which appears three times in the top ten of journal JEL codes, does not appear in the top ten of EconLit at all.

Our results can be compared with results of Campiglio and Caruso (2007) also with respect to 8 selected periodicals, which coincide in their sample and ours. These are: *American Economic Review*, *Quarterly Journal of Economics*, *Journal of Political Economy*, *Economic Journal*, *Review of Economics*

and Statistics, *Review of Economic Studies*, *Econometrica* and *Journal of Economic Perspectives*. Top ten JEL codes in these journals, in period 2000–2006, is following: J24, J31, D72, I21, D82, E52, J13, D83, D12, G12. One can notice high frequency of category Labor Economics and Demography, similarly like in our study based on more journals and longer time period. Unlikely to our results Microeconomics (code D) is strongly represented in top ten of Campiglio and Caruso (2007). It appears that topics connected with collective decision making, information, knowledge and uncertainty (sub-categories of category D) are subject of interests in the top general journals, when if the sample is extended to cover more specialized journals this kind of topics do not play such a big role to occur in top ten. However *Financial Economics* and *Macroeconomics and Monetary Economics*, which play crucial role in our sample of selected journals are not so frequent in the whole EconLit, they placed only one sub-category in the top ten.

The above comparisons show that the results about importance of certain categories and sub-categories are very sensitive to the sample selection. Below we are going to show that even in the same data set one can obtain different importance results for different aggregation patterns.

Consider now aggregation of the observed JEL codes into 11 categories, those suggested by Kim et. al. (2006), fields, generally adhering to the JEL aggregate fields. The 11 fields are econometrics[6] (C except game theory), microeconomics (D), game theory (C7), macroeconomics (E), international economics (F), finance (G), public finance (H and I), labor (J), industrial organization (L), growth and development (O and P) and others (K, M, Q, and R). Henceforth we denote this way of aggregation as KMZ (since it comes from the paper of Kim et. al., 2006). If we use this way of aggregation we can compute relative shares of these fields in our sample. Table 3.2 presents results of these computations and compares them with the results of Kim et. al.

Table 3.2.

Aggregation KMZ: relative shares of sub-disciplines in all collected JEL codes

Sub-discipline	Fraction of JEL codes	Fraction of JEL codes in Kim et. al. (2006)	Relation of fraction of JEL codes in Kim et. al. (2006) to overall fraction of JEL codes
Econometrics	5.25%	19.14%	3.65
Finance	13.29%	23.44%	1.76
Game Theory	1.30%	1.91%	1.47
Microeconomics	11.48%	15.31%	1.33
Macroeconomics	11.12%	14.35%	1.29
Industrial Organization	6.73%	7.18%	1.07

[6] We use capital letters to denote names of categories, hence eg. we write Economietrics if we mean the name of category from JEL classyfication system, but econometrics when we mean the disciplin in general.

Sub-discipline	Fraction of JEL codes	Fraction of JEL codes in Kim et. al. (2006)	Relation of fraction of JEL codes in Kim et. al. (2006) to overall fraction of JEL codes
Growth/Development	9.91%	9.09%	0.92
Others	8.67%	3.83%	0.44
Labor economics	11.96%	2.87%	0.24
Public economics	9.51%	1.91%	0.20
International Economics	7.25%	0.96%	0.13
Not included	3.54%	–	–

Source: authors' calculations based on collected data.

One can observe significant differences between our sample and sample considered in Kim et. al. (2006) in terms of frequencies of the subsequent sub-disciplines. In both cases finance dominates all other fields, but in our sample its share is 10% less! It is followed by econometrics, almost 20% of Kim et. al. (2006) sample, and only 5% in our data. On the other hand, public economics and international economics have very small share in Kim et. al. (2006) sample, much smaller than it follows from our computations. In the last row the Table 3.2 we give the share of all the codes which do not belong to any of the categories selected by Kim et. al. It is quite significant fraction—more than 3.5% of codes.

An interesting relation can be observed in the last column of Table 3.2. We divided the fraction of JEL codes in Kim et. al. (2006) sample by the fraction of JEL codes in our sample and sorted categories in decreasing order. The largest results are recorded for basic economics categories like micro and macroeconomics and for categories devoted to tools development like econometrics and game theory. It means that the most influential papers selected by Kim et. al. (2006) were more frequently assign to these categories than papers in our sample. One may say they were cited so intensively because their results were of importance for these basic and general categories.

There are two main sources of these differences. The most important one is of course that we consider all papers published in selected journals and Kim et. al. (2006) considered only most influential papers (cited more than 500 times). The second reason is different time span. Relative importance of same fields varies in time and we are going to study it further in the next section.

Another way of aggregating JEL codes into sub-disciplines, suggested by Christian Roesler, running econphd.net, one of the best-known non-department websites in economics, which provides, among others, publication ranking, the first to cover sub-disciplines (henceforth Roesler's aggregation).[7] Table 3.3 presents fractions of the appropriate JEL codes in the whole sample.

[7] The precise definitions of fields in terms of associated JEL codes in given in the Appendix. More detailes can be found at http://www.econphd.net/journals.htm, at the bottom of each page.

Table 3.3.

Roesler's aggregation: relative shares of sub-disciplines in all collected JEL codes

Sub-discipline	Fraction of JEL codes
Economic History & Thought	4.06%
Econometrics	4.81%
Microeconomic Theory	5.53%
Labor & Consumer Economics	18.79%
IO/Business Economics	11.24%
Public Economics	7.82%
Macroeconomics	20.24%
Trade & Development	12.26%
Financial Economics	13.33%
Resource & Agricultural Econ.	1.91%

Source: authors' calculations based on collected data.

There are 10 fields in the Roesler's aggregation, hence one less than in the aggregation KMZ. Still there are sub-disciplines not distinguished in KMZ aggregation, like Economic History & Thought and Resource & Agricultural Economics. Macroeconomics contains fields like public finance and international finance and counts more than 20% of the all collected JEL codes. From Microeconomics theory is selected as a separate filed, and consumer economics is joint with labor economics.

If one considers aggregation in this way, one may say that macroeconomics is most important category in economic literature. This result is relative: it depends on the detailed definition in terms of associated JEL codes.

In the next section we analyze dynamics of relative importance of categories and subcategories of economics within the studied period.

4. Dynamics of importance of categories in economics

Let us first consider dynamics in frames of the aggregation KMZ. We study linear trends in relative importance of the aggregative categories. During the studied period they are rather stable. With 5% significance level there is only one increasing trend—in Finance. If we allow for 10% significance level we observe also an increase in Industrial Organization share and a decrease in Econometrics and Growth/Development shares.

Now we want to compare these results with the Roesler's aggregation. With 5% significance level there are three categories which shares display changes over time: these are Financial Economics that has increasing trend and Public Economics and Economic History & Thought with decreasing trends. If we allow for 10% significance level we can observe also a decreasing trend in Resource & Agricultural Economics. Figure 4.2 illustrates these trends.

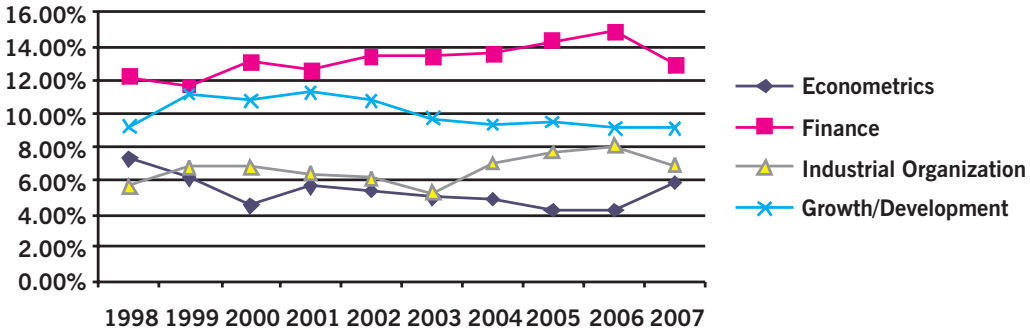

Figure 4.1.

Aggregation KMZ: statistically significant trends
Source: authors' calculations based on collected data.

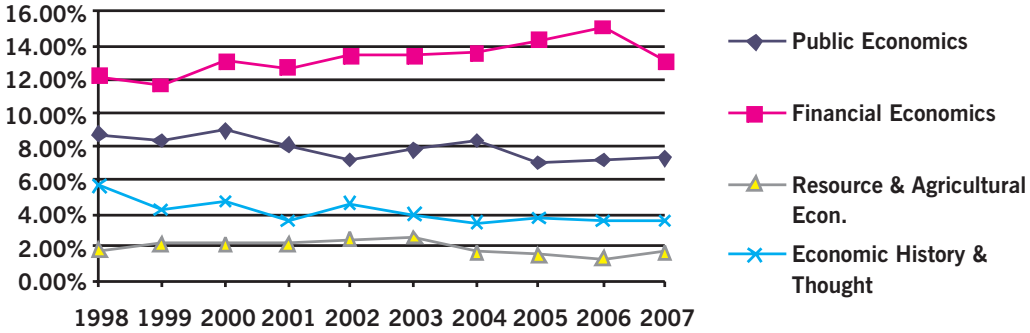

Figure 4.2.

Roesler's aggregation: statistically significant trends
Source: authors' calculations based on collected data.

Now we look deeper and try to explain the observed trends using most detailed description: two digit JEL codes.

Table 4.1.

Subcategories from Economic History & Thought, which experience statistically significant (5% significance level) trends in the studied period

Code	Description	Frequency within the category
P16	*Political Economy*	*2%*
P31	*Socialist Enterprises and Their Transitions*	*4%*
A14	*Sociology of Economics*	*2%*
B22	*History of Economic Thought since 1925—Macroeconomics*	*0%*
P32	*Collectives; Communes; Agriculture*	*2%*
B31	*History of Thought: Individuals*	*3%*

Code	Description	Frequency within the category
N31	*Labor and Consumers, Demography, Education, Health, Welfare, Income, Wealth, and Religion—U.S.; Canada: Pre–1913*	*4%*
N32	*Labor and Consumers, Demography, Education, Health, Welfare, Income, Wealth, and Religion—U.S.; Canada: 1913–*	*4%*
N91	U.S.; Canada: Pre–1913	0%
N93	Europe: Pre–1913	0%
B32	History of Economic Thought: Econometrics; Quantitative and Mathematical Studies	0%
P25	Urban, Rural, and Regional Economics	2%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined.
Source: authors' calculations based on collected data.

Category Economic History & Thought display a decrease mainly because a significant decrease in sub-categories of Economic Systems: Political Economy (P16) and Socialist Enterprises and Their Transitions (P31). Not so significant but also of some importance, due to share in the category, are relative declines in studies concerning history of US and Canada (N31 and N32).

Table 4.2.

Subcategories from Econometrics, which experience statistically significant (5% significance level) trends in the studied period

Code	Description	Frequency within the category
C50	*Econometric Modeling*	*1%*
C22	*Time-Series Models*	*19%*
C31	Multiple or Simultaneous Equation Models—Cross-Sectional Models; Spatial Models; Treatment Effect Models; Quantile Regressions	1%
C21	Single Equation Models; Single Variables—Cross-Sectional Models; Spatial Models; Treatment Effect Models; Quantile Regressions	4%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined.
Source: authors' calculations based on collected data.

In case of Econometrics, if we consider all category denoted with C (without C7—Game Theory), we observe a decline, which is not significant if we analyze in this category only these codes connected with econometric modeling (like in Roesler's aggregation). Hence it appears that this decline is due to some losses in share of sub-categories of other mathematical methods, in fact the largest decrease is observed in case of Optimization Techniques; Programming Models; Dynamic Analysis (C61), which in Roesler's aggregation are a part of Microeconomic Theory.

Table 4.3.

Subcategories from Microeconomic Theory, which experience statistically significant (5% significance level) trends in the studied period

Code	Description	Frequency within the category
C61	*Optimization Techniques; Programming Models; Dynamic Analysis*	*3%*
D80	*Information, Knowledge, and Uncertainty*	*1%*
D51	*Exchange and Production Economies*	*4%*
C63	*Computational Techniques; Simulation Modeling*	*3%*
C68	*Computable General Equilibrium Models*	*0%*
C72	*Noncooperative Games*	*8%*
D50	General Equilibrium and Disequilibrium	1%
D83	Search; Learning; Information and Knowledge; Communication; Belief	19%
D85	Network Formation and Analysis: Theory	1%
D53	Financial Markets	0%
D01	Microeconomic Behavior: Underlying Principles	1%
D86	Economics of Contract: Theory	2%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined. Source: authors' calculations based on collected data.

In case of Microeconomics some losses of such a sub-categories as Information, Knowledge, and Uncertainty (D80) is compensated by an increase of Microeconomic Behavior: Underlying Principles (D01), Financial Markets (D53) and Economics of Contract: Theory (D86), hence no change in the overall share is observed.

Table 4.4.

Subcategories from Labor & Consumer Economics, which experience statistically significant (5% significance level) trends in the studied period

Code	Description	Frequency within the category
D12	*Consumer Economics: Empirical Analysis*	*4%*
J51	*Trade Unions: Objectives, Structure, and Effects*	*1%*
J63	*Turnover; Vacancies; Layoffs*	*2%*
J28	*Safety; Job Satisfaction; Related Public Policy*	*1%*
I00	*Health, Education, and Welfare*	*0%*
J71	*Labor Discrimination*	*2%*
I32	*Measurement and Analysis of Poverty*	*1%*
D10	Household Behavior and Family Economics	0%
Z12	Cultural Economics; Economic Sociology; Economic Anthropology—Religion	0%
I31	General Welfare	1%
M52	Compensation and Compensation Methods and Their Effects	2%

Code	Description	Frequency within the category
M51	Firm Employment Decisions; Promotions	1%
J82	Labor Force Composition	0%
I21	Analysis of Education	5%
D14	Personal Finance	1%
Z13	Cultural Economics; Economic Sociology; Economic Anthropology—Economic Sociology; Economic Anthropology	2%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined. Source: authors' calculations based on collected data.

Category Labor & Consumer Economics counts for more than 18% of all collected codes. It consists of topics like consumer economics, labor markets and unemployment, wages, income distribution as well as health care, demographics, social security, economics of education. In the consumer economics one observes a decline in Consumer Economics: Empirical Analysis (D12) and an increase in sub-categories like Personal Finance (D14) and Economic Sociology; Economic Anthropology (Z13). Three codes: Safety; Job Satisfaction; Related Public Policy (J28), Trade Unions: Objectives, Structure, and Effects (J51) and Turnover; Vacancies; Layoffs (J63) lose their share in Labor and Demographic Economics when only Labor Force Composition (J82) recorded a significant (1% significance level) increase. In Economics of Education above all Analysis of Education (I21) gained a share.

Table 4.5.

Subcategories from IO/Business Economics, *which* experience statistically significant (5% significance level) trends in the studied period

Code	Description	Frequency within the category
D21	*Firm Behavior*	*1%*
L51	*Economics of Regulation*	*3%*
L43	*Legal Monopolies and Regulation or Deregulation*	*0%*
D23	*Organizational Behavior; Transaction Costs; Property Rights*	*3%*
L96	*Telecommunications*	*1%*
L73	*Forest Products*	*0%*
L16	*Industrial Organization and Macroeconomics: Industrial Structure and Structural Change; Industrial Price Indices*	*1%*
L14	*Transactional Relationships; Contracts and Reputation; Networks*	*4%*
O31	*Innovation and Invention: Processes and Incentives*	*2%*
M41	Accounting	1%
L26	Entrepreneurship	0%
L61	Metals and Metal Products; Cement; Glass; Ceramics	0%
D24	Production; Cost; Capital and Total Factor Productivity; Capacity	3%

Code	Description	Frequency within the category
L25	Firm Performance: Size, Diversification, and Scope	5%
L24	Contracting Out; Joint Ventures; Technology Licensing	1%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined. Source: authors' calculations based on collected data.

In category IO/Business Economics the fraction of industrial organization codes has grown up. Especially significant increase was observed in case of codes describing theory of the firm: Contracting Out; Joint Ventures; Technology Licensing (L24) and Firm Performance: Size, Diversification, and Scope (L25), whereas antitrust, regulation and industrial policy codes suffered a decline: Legal Monopolies and Regulation or Deregulation (L43) and Economics of Regulation (L51) recorded most significant negative change.

Table 4.6.

Subcategories from Public Economics, which experience statistically significant (5% significance level) trends in the studied period

Code	Description	Frequency within the category
H27	*Other Sources of Revenue*	*0%*
H11	*Structure, Scope, and Performance of Government*	*1%*
H30	*Fiscal Policies and Behavior of Economic Agents*	*1%*
H32	*Firm*	*2%*
H21	*Efficiency; Optimal Taxation*	*4%*
H10	*Structure and Scope of Government*	*0%*
D71	*Social Choice; Clubs; Committees; Associations*	*4%*
H25	Business Taxes and Subsidies	6%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined. Source: authors' calculations based on collected data.

Public Economics displays a negative trend mainly because a serious decline in political economy and theory of taxation, which is exemplified by codes Structure, Scope, and Performance of Government (H11) and Other Sources of Revenue (H27).

Table 4.7.

Subcategories from *Macroeconomics*, which experience statistically significant (5% significance level) trends in the studied period.

Code	Description	Frequency within the category
E10	*General Aggregative Models*	*0%*
O41	*One, Two, and Multisector Growth Models*	*4%*
D92	*Intertemporal Firm Choice and Growth, Investment, or Financing*	*1%*

Code	Description	Frequency within the category
E24	*Employment; Unemployment; Wages; Intergenerational Income Distribution; Aggregate Human Capital*	*3%*
E41	*Demand for Money*	*1%*
F43	*Economic Growth of Open Economies*	*1%*
O42	*Monetary Growth Models*	*0%*
H71	*State and Local Taxation, Subsidies, and Revenue*	*0%*
E26	Informal Economy; Underground Economy	0%
H75	State and Local Government: Health, Education, and Welfare	0%
H82	Governmental Property	0%
E23	Production	2%
E12	Keynes; Keynesian; Post-Keynesian	1%
E52	Monetary Policy	8%
E13	Neoclassical	1%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined.
Source: authors' calculations based on collected data.

Macroeconomics is the most numerous category in the Roesler's aggregation, since it encompasses intertemporal choice, economic growth, fluctuations, business cycles, monetary economics but also public finance and international finance. The overall share of this category seems to be rather stable, the most significant positive trend is displayed by Monetary Policy (E52) and General Aggregative Models: Neoclassical (E13), even though General Aggregative Models (E10) alone suffers a decline.

Table 4.8.

Subcategories from Trade & Development, which experience statistically significant (5% significance level) trends in the studied period

Code	Description	Frequency within the category
R13	*General Equilibrium and Welfare Economic Analysis of Regional Economies*	*0%*
F10	*Trade*	*0%*
F13	*Trade Policy; International Trade Organizations*	*6%*
O13	*Agriculture; Natural Resources; Energy; Environment; Other Primary Products*	*3%*
F16	*Trade and Labor Market Interactions*	*2%*
R33	*Nonagricultural and Nonresidential Real Estate Markets*	*0%*
O11	*Macroeconomic Analyses of Economic Development*	*2%*
R22	Household Analysis—Other Demand	0%
O24	Trade Policy; Factor Movement Policy; Foreign Exchange Policy	1%
R52	Land Use and Other Regulations	0%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined.
Source: authors' calculations based on collected data.

International Trade displays a decline, especially with sub-categories Trade Policy; International Trade Organizations (F13) and Trade and Labor Market Interactions (F16), although Trade Policy; Factor Movement Policy; Foreign Exchange Policy (O24) has grown up. A positive trend can be observed also in Spatial and Urban Economics, with special attention to Regional Government Analysis: Land Use and Other Regulations (R52). The overall position of the category Trade and Development stays unchanged.

Table 4.9.

Subcategories from Financial Economics, which experience statistically significant (5% significance level) trends in the studied period

Code	Description	Frequency within the category
G20	*Financial Institutions and Services*	*1%*
G22	*Insurance; Insurance Companies*	*2%*
G23	Pension Funds; Other Private Financial Institutions	4%
G24	Investment Banking; Venture Capital; Brokerage; Ratings and Ratings Agencies	4%
G11	Portfolio Choice; Investment Decisions	7%
G15	International Financial Markets	6%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined.
Source: authors' calculations based on collected data.

In case of Financial Economics it is easy to observe an important increasing trend. Most prominent changes recorded codes describing financial markets: Portfolio Choice; Investment Decisions (G11), International Financial Markets (G15) and new descriptor Investment Banking; Venture Capital; Brokerage; Ratings and Ratings Agencies (G24).

Table 4.10.

Subcategories from Resource & Agricultural Econ. which experience statistically significant (5% significance level) trends in the studied period

Code	Description	Frequency within the category
Q28	*Government Policy*	*13%*
Q20	*Renewable Resources and Conservation*	*1%*
Q18	*Agricultural Policy; Food Policy*	*3%*
Q25	*Water*	*9%*
Q23	*Forestry*	*4%*
Q15	*Land Ownership and Tenure; Land Reform; Land Use; Irrigation*	*7%*
Q21	*Demand and Supply*	*6%*
Q34	Natural Resources and Domestic and International Conflicts	0%

Code	Description	Frequency within the category
Q56	Environment and Development; Environment and Trade; Sustainability; Environmental Accounting; Environmental Equity; Population Growth	1%
Q51	Valuation of Environmental Effects	1%
Q53	Air Pollution; Water Pollution; Noise; Hazardous Waste; Solid Waste; Recycling	4%
Q58	Government Policy	7%
Q54	Climate; Natural Disasters; Global Warming	3%

They are sorted in increasing order with respect to the value of statistics *t*. Subcategories with decreasing trends are in italic. Codes with a trend significant at the level of 1% are underlined. Source: authors' calculations based on collected data.

Last aggregate category: Resource and Agricultural Economics displays a decline. It is mainly due to decreasing position of Agricultural Economics (Q15, Q18), moreover Renewable Resources and Conservation (Q20 and Q21, Q25, Q28) suffered a decline as well. On the other hand, Environmental Economics displays a positive trend, where leader of growth were codes describing Climate; Natural Disasters; Global Warming (Q54) and Government Policy (Q58).

Lets now consider the dynamics of the top ten codes. Dynamics of changes in time in frequencies in top ten is presented in Table 4.11.

Domination of sub-category Asset Pricing; Trading Volume; Bond Interest Rates denoted by code G12 seems to be very steady effect, with no exception over all studied period. Moreover one may observe a significant increase of papers connected with these topics in years 2001–2003, which can possibly follow from a shock after Enron bankruptcy, which caused more intense interest in asset pricing. It can be considered as a confirmation for hypothesis of Kim et. al. (2006) on increasing impact of empirical research and real world phenomena.

Within the studied ten years period, there were twenty sub-categories among top ten JEL codes. They belong to eight categories: Mathematical and Quantitative Methods (C), Microeconomics (D), Macroeconomics and Monetary Economics (E), International economics (F), Financial Economics (G), Labor and Demographic Economics (J), Industrial Organization (L) and Economic Development, Technological Change, and Growth (O). Codes from Financial Economics, which is the most popular, occur 30 times in Table 3.3, next one in the row jest Labor and Demographic Economics—its sub-categories appeared 20 times in top ten for subsequent years.

Only four codes (20%) appear in all ten years: Financing Policy; Financial Risk and Risk Management; Capital and Ownership Structure (G32), Human Capital; Skills; Occupational Choice; Labor Productivity (J24), Wage Level and Structure; Wage Differentials (J31) and the already mentioned Asset

Pricing; Trading Volume; Bond Interest Rates (G12). Next 10% had one year break in the top ten presence, 25% had three breaks and 30% of codes appear only once in top ten. Moreover, 15% of codes continue to stay in top ten once they appear, without breaks, but their presence does not cover the whole period.

Table 4.11.

Evolution of top ten JEL codes over time

Top ten most frequently observed JEL codes in the subsequent years[8]										
	Year									
No.	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1	G12 (121)	G12 (11)	G12 (13)	G12 (163)	G12 (213)	G12 (192)	G12 (134)	G12 (131)	G12 (154)	G12 (15)
2	F31 (78)	E31 (74)	J24 (87)	J24 (12)	J24 (9)	E52 (118)	J24 (121)	G32 (119)	E52 (121)	E31 (135)
3	E32 (76)	J24 (7)	F31 (8)	G32 (92)	J31 (87)	E31 (113)	J31 (17)	E52 (116)	G32 (121)	E52 (125)
4	G32 (7)	J31 (7)	G21 (7)	J31 (88)	E52 (83)	J24 (11)	G21 (94)	G14 (14)	J31 (118)	D82 (119)
5	J31 (66)	O15 (7)	E52 (67)	F31 (82)	F31 (8)	J31 (11)	E52 (92)	E31 (1)	E31 (113)	E32 (115)
6	G21 (6)	O41 (66)	O15 (67)	O19 (77)	O15 (8)	E32 (91)	I21 (9)	J24 (1)	L25 (112)	J24 (115)
7	J24 (6)	F31 (62)	G32 (65)	O15 (7)	G32 (77)	G32 (9)	G32 (89)	J31 (92)	F31 (17)	J31 (11)
8	C22 (54)	G32 (6)	E31 (63)	E31 (69)	E32 (71)	G21 (88)	G14 (85)	G21 (84)	G14 (96)	G32 (17)
9	D82 (53)	G21 (58)	J31 (63)	E52 (69)	C22 (67)	F31 (77)	E32 (83)	F31 (81)	J24 (94)	G21 (13)
10	C51 (52)	O16 (58)	E32 (62)	E32 (66)	D82 (66)	D83 (7)	F31 (82)	O15 (8)	E32 (93)	D83 (92)

Source: authors' calculations based on collected data.

These fluctuations suggest high volatility in top ten. It is hard anyway to discover any kind of regular pattern. If one wants to find any trends in top ten it appears that majority of codes in to ten has displays no statistically significant trend. Relative importance of 20% of codes in top ten is increasing, they are Search; Learning; Information and Knowledge; Communication; Relief (D83), Monetary Policy (E52), Analysis of Education (I21) and Firm Performance: Size, Diversification, and Scope (L25). Decreasing tendency display 10% (2 codes): Time-Series Models (C22) and One, Two, and Multisector

[8] Freqencies are in brackets.

Growth Models (O41). The rest of the codes—70%—seems to be rather stable in the studied period of 10 years.

Concentration seems to be increasing in the studied period. At the beginning of the period the top ten codes count about 15% of all codes and at the end it is nearly 17%. The increasing trend is significant at the level of 5%.

In the whole sample relative importance of JEL codes is rather stable: out of 642 codes which at least once appeared in papers published in selected journals in years 1998–2007 hardly more than 8% displayed a statistically significant increase and slightly more than 9% suffered a decline.

5. Concluding remarks

This paper is an attempt to study importance of sub-fields in economics, in absolute and relative terms, and trends in their significance. We based our considerations on data on JEL codes collected for 39 selected journals and 10 years period of time. The present study is a beginning of further research on this topic, and we want here give some ideas what we are going to examine in the future. First of all we can provide similar detailed analysis of trends for separated journals, which can be very interesting form the point of view of potential submitters. Moreover we plan to use data mining techniques to find rules helpful in making decisions where to submit a paper described by given JEL codes. Finally, we are aware that 10 years period is quite short to observe certain processes of changes in importance of sub-fields, hence we want to collect data to gasp 30 years period.

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7. Appendix

Selected journals: *American Economic Review*; *Econometrica*; *Economic Development & Cultural Change*; *Economic Inquiry*; *Economic Journal*; *Economica*; *European Economic Review*; *Industrial & Labor Relations Review*; *International Economic Review*; *Journal of Business*; *Journal of Business & Economic Statistics*; *Journal of Development Economics*; *Journal of Econometrics*; *Journal of Economic Dynamics & Control*; *Journal of Economic History*; *Journal of Economic Theory*; *Journal of Finance*; *Journal of Financial Economics*; *Journal of Financial & Quantitative Analysis*; *Journal of Human Resources*; *Journal of International Economics*; *Journal of International Money & Finance*; *Journal of Labor Economics*; *Journal of Law & Economics*; *Journal of Law*, *Economics & Organization*; *Journal of Legal Studies*; *Journal of Monetary Economics*; *Journal of Money, Credit & Banking*; *Journal of Political Economy*; *Journal of Public Economics*; *Journal of Regional Science*; *Journal of Urban Economics*; *National Tax Journal*; *Oxford Economic Papers*; *Quarterly Journal of Economics*; *Rand Journal of Economics*; *Review of Economic Studies*; *Review of Economics & Statistics*; *Review of Financial Studies.*

Roesler's aggregation:

1. Economic History & Thought

A1, A11, A12, A13, A14, A2, A21, A22, A23, B10, B11, B12, B13, B15, B20, B21, B22, B23, B25, B31, B32, B40, B41, B52, B53, N00, N01, N10, N11, N12, N13, N14, N15, N16, N17, N20, N21, N22, N23, N24, N25, N26, N27, N30, N31, N32, N33, N34, N35, N36, N37, N40, N41, N42, N43, N44, N45, N46, N47, N50, N51, N52, N53, N54, N55, N56, N57, N60, N61, N62, N63, N64, N65, N66, N70, N71, N72, N73, N74, N75, N76, N77, N80, N81, N82, N83, N84, N85, N91, N92, N93, N95, P10,

P11, P12, P13, P14, P16, P17, P19, P20, P21, P22, P23, P24, P25, P26, P27, P28, P30, P31, P32, P33, P34, P35, P36, P37, P42, P43, P44, P46, P48, P51, P52.

2. Econometrics

C00, C01, C10, C11, C12, C13, C14, C15, C16, C19, C20, C21, C22, C23, C24, C25, C30, C31, C32, C33, C34, C35, C40, C41, C42, C43, C44, C45, C46, C49, C50, C51, C52, C53, C59, C80, C81, C82, C87, C88, C90, C91, C92, C93.

3. Microeconomic Theory

C60, C61, C62, C63, C65, C67, C68, C69, C71, D00, D01, D02, D50, D51, D52, D53, D57, D58, D59, D80, D81, D82, D83, D84, D85, D86, C70, C72, C73, C78, C79.

4. Labor & Consumer Economics

D10, D11, D12, D13, D14, D18, D19, D30, D31, D33, I00, I10, I11, I12, I18, I20, I21, I22, I28, I29, I30, I31, I32, I38, J00, J10, J11, J12, J13, J14, J15, J16, J17, J18, J19, J20, J21, J22, J23, J24, J26, J28, J30, J31, J32, J33, J38, J40, J41, J42, J43, J44, J45, J48, J50, J51, J52, J53, J54, J58, J60, J61, J62, J63, J64, J65, J68, J70, J71, J78, J80, J81, J82, J88, M50, M51, M52, M53, M54, M55, Z10, Z11, Z12, Z13.

5. IO / Business Economics

D20, D21, D23, D24, D40, D41, D42, D43, D44, D45, D46, D49, L10, L11, L12, L13, L14, L15, L16, L17, L19, L20, L21, L22, L23, L24, L25, L26, L30, L31, L32, L33, L40, L41, L42, L43, L44, L51, L52, L53, L60, L61, L62, L63, L64, L65, L66, L67, L68, L69, L70, L71, L72, L73, L74, L80, L81, L82, L83, L84, L85, L86, L88, L89, L90, L92, L93, L94, L95, L96, L97, L98, M10, M11, M12, M13, M14, M21, M30, M31, M37, M40, M41, M42, O30, O31, O32, O33, O34, O38.

6. Public Economics

D60, D61, D62, D63, D64, D70, D71, D72, D73, D74, D78, D79, H00, H10, H11, H20, H21, H22, H23, H24, H25, H26, H27, H29, H30, H31, H32, H39, H40, H41, H42, H43, H44, K00, K10, K11, K12, K13, K14, K19, K20, K21, K22, K23, K31, K32, K33, K34, K35, K36, K39, K40, K41, K42, K49.

7. Macroeconomics

D90, D91, D92, E00, E01, E10, E11, E12, E13, E17, E19, E20, E21, E22, E23, E24, E25, E26, E30, E31, E32, E37, E40, E41, E42, E43, E44, E47, E50, E51, E52, E58, E60, E61, E62, E63, E64, E65, E66, F30, F31, F32, F33, F34, F35, F36, F37, F40, F41, F42, F43, F47, H50, H51, H52, H53, H54, H55, H56, H57, H60, H61, H62, H63, H70, H71, H72, H73, H74, H75, H76, H77, H81, H82, H83, H87, O40, O41, O42, O43, O47.

8. Trade & Development

F00, F01, F02, F10, F11, F12, F13, F14, F15, F16, F17, F18, F20, F21, F22, F23, F24, O10, O11, O12, O13, O14, O15, O16, O17, O18, O19, O20, O21, O22, O23, O24, O51, O52, O53, O54, O57, R10, R11, R12, R13, R14, R15, R20, R21, R22, R23, R28, R30, R31, R32, R33, R38, R40, R41, R42, R48, R50, R51, R52, R53, R58.

9. Financial Economics

G00, G10, G11, G12, G13, G14, G15, G18, G19, G20, G21, G22, G23, G24, G28, G29, G30, G31, G32, G33, G34, G35, G38.

10. Resource & Agricultural Economics

Q01, Q10, Q11, Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q20, Q21, Q22, Q23, Q24, Q25, Q26, Q27, Q28, Q30, Q31, Q32, Q33, Q34, Q38, Q41, Q42, Q43, Q48, Q50, Q51, Q52, Q53, Q54, Q55, Q56, Q57, Q58.

Abstract **On Importance of Main Economic Categories: Jel Codes Analysis**

This article contributes to an increasing number of papers on economic profession and deals with analysis both the most popular categories for the period 1998–2007 and their dynamics over time. We use data on topics covered by papers published in years 1998–2008 given by codes of Journal of Economics Literature (JEL) classification system. The data are analyzed not only by using descriptive statistics but also by applying tools of frequentist trend. We show that an increase in the number of papers published is connected with an increase in the number of different JEL codes used. Moreover we study the importance of different sub-fields of economics, how it is changing over time. Aggregation of JEL codes may influence observed trends. Using most detailed JEL codes allows to observe some phenomena not visible in case of aggregation.