ECONOMIC ACTIVITY AND PATENTS

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We present in that work the results of an empirical study conducted by cross-referencing the main International Patent Classification (IPC) assigned to Spanish published patents with the economic activity classifications of the Spanish firms that hold these patents. This approach allows us to correlate economic activity with technological innovation. Industry level data on patenting is informative for policy makers because knowledge output of industries can be used as an indicator to evaluate technology or industrial policies. In studies at the industry level, patents have to be matched to sectoral classifications of industries, what is not easy with the known tools.

Previous attempts to study the relations between economic activity and patents with the use of the classifications of patents and firms have been carried out by Lybbert & Zolas [1] and Dorner & Harhoff [2]. The first one uses statistical algorithms based in text and keywords to match patents to its economical classification. Doner's approach uses inventors to identify the precise industrial origin of inventions and thus the economical fields. Those works aimed to build an improved concordance table.

In our previous studies, Turmo [3] & [4], we have published results on the relationship between economic activity and trademarks. In those studies, the Nice classification of trademarks were compared to the economic classifications of the assignees. Statistics from information theory have been instrumental in characterizing these classifications and analyzing the relationships between them. Information theory offers various parameters for measuring entropy and information, thereby enabling us to develop intuitive statistical tools for analyzing the classifications. These tools are applied here to patents and economic activity classifications showing the entropy and mutual information between the IPC and NACE classifications, indicating the extent to which these classifications share information. Relating economic activity to patents has been a significant objective for policymakers in innovation; our work sheds light on this subject

CLASSIFICATIONS

One fundamental intellectual need is to classify things, a principle at the heart of scientific inquiry. Scientific work necessitates the establishment of classification systems that are universally recognized within the scientific community, enabling the sharing of observational results. Classifications, whether theoretical or empirical, are typically designed to create a set of mutually exclusive categories. The intended purpose of a classification often dictates its structure and development.

National Activity Classification for Economy, NACE

The National Activity Classification for Economy (NACE) is a statistical tool uti-

lized at the national level to facilitate economic activity studies. The United Nations organized the UN Statistical Commission to ensure the provision of homogeneous systems worldwide. The outcome is the UN Statistical Commission's recommendations for a Uniform Industrial International Classification. Following these guidelines, the European Union has developed NACE (Regulation (EC) No 1893/2006 of the European Parliament and of the Council on the European Classification of Economic Activities) to harmonize economic classification systems across Europe. NACE is a four-digit code system that provides a framework for the collection and presentation of a wide range of statistical data related to economic activity in various fields, including production, employment, and national accounts. In Spain, Royal Decree 474/2007 establishes the National Classification of Economic Activities 2009 (CNAE), which is mandated for use by all government bodies and is utilized in this study. Throughout this article, we refer to it by its English acronym, NACE.

NACE is structured hierarchically, starting with 21 sections labeled A to U at the first level. The second level, comprising 88 divisions, is identified by a two-digit numerical code describing different economic activities. These divisions are further divided into 272 groups at the third level, identified by a three-digit code, with the first two digits corresponding to their division. The most detailed level consists of 629 classes describing specific economic activities. Economic activities of firms may be classified not just at the class level but sometimes also at the group or division level.

The classification code for a firm is self-reported at the time of registration or when annual accounts are submitted to the Spanish Commercial Registry (Registro Mercantil). This classification may change over time. For details on the uncertainty of NACE data, refer to Christensen [5].

International Patent Classification, IPC

The International Patent Classification (IPC) is an elaborate hierarchical system that encompasses sections, classes, subclasses, and groups. The latest IPC edition includes eight sections, around 120 classes, approximately 630 subclasses, and about 69,000 groups. It categorizes all technological fields into sections labeled A to H, ranging from "Human necessities" to "Electricity". Each section is further divided into classes, subclasses, and groups, providing a detailed framework for identifying technical features in patent documents. This classification facilitates patent examiners and other technology experts in conducting searches to determine prior art during the novelty and inventive step assessment of a patent application. Despite advancements in technology that ease patent information searches, the intellectual effort of patent experts globally is pivotal in maintaining and updating IPC classifications to keep pace with technological evolution. The IPC is managed by the World Intellectual Property Organization (WIPO), with ongoing contributions from patent office experts worldwide to ensure its relevance and accuracy.

Legal person tax identification number (NIF - Número de Identificación Fiscal)

The tax identification number allocated to Spanish firms by the tax authority bridges the gap between the economic and technical classifications. This number enables the association of firm's economic activity classifications with the main technical fields designated by the patent examiner for a firm's patent invention content.

DATA SET

We have collected data on Spanish patents, including European patents, national patents, and utility models, with applicants being legal entities registered in Spain, from January 1, 1990, to April 2020. Each record includes the publication date, application number, applicant name, applicant tax number (NIF), main IPC Classification, and the NACE classification corresponding to the legal entity. NACE classifications were

obtained through the use of the tax identification number. Patents attributed to firms lacking a known NACE classification were excluded. Any minor errors encountered were rectified using available internet databases.

In a collection of 190.688 published patents, we found 104.847 owned by legal persons. We were able to allocate the NACE classification of the owners to 57.059 patents. The reduction of the sample is not even in the different kinds of legal persons but it cannot affect the relation between patents and the economic activity of the patent owner.

From the Tax Identity number we can differentiate the sort of Legal Persons being most of them, 78,85%, filed by firms in the A and B categories (44.994 patents filed by privet run firms). Public sector (P-S) have filed 9.436 applications (16,54%). Public sector patents are filed mainly by universities and research institutions.

Our dataset encompasses information on 57,059 patents, comprising 4,323 European patents, 27,412 Spanish patents, and 25,324 utility models. These patents were applied for by 14,521 distinct firms or institutions.

INFORMATION THEORY STATISTICS

Information theory was developed by Shannon to study communications. Since then it has been applied in a wide range of fields. i.e. in Ecology by Margalef [6] or in Patent Classification by Costantea et al. [7]

In our previous research, we incorporated information theory statistics to analyze the NACE and NIZA classifications and their interrelations. Information theory offers intuitive analytical tools, such as entropy and mutual information, to examine and characterize classifications. These tools enable us to measure the shared information between classifications and the entropy of one classification in relation to another. Importantly, this latter metric aids in predicting the most likely classification of a patent based on the economic classification of the producing firm, and vice versa, effectively showing the information one classification reveals about the other.

The use of a contingency table to cross-reference both classifications assists in elucidating their interrelationships. Such statistics find also application in mathematical methods for the automatic generation of classifications and in algorithms for automatic classification. The formulas applied in our study include:

Classification entropy (here for IPC Classes)

$$H(IPC\ classes) = -\sum_{i=1}^{n} p\big(IPC\ classes(i)\big) * \log_2\big(p(IPC\ classes(i))\big) \quad \text{Eq. (1)}$$

One classification entropy depending upon the other (IPC, depending upon NACE here)

$$H\big(ipc \,|\, cnae\big) = -\sum_{i=1}^{n} p\big(ipc(i)\big) * \log_2\big(p(ipc(i))\big);\ \ cnae = j \quad \text{Eq. (2)}$$

Mutual information:

$$MI(ipc, cnae) = -\sum_{i=1}^{n}\sum_{j=1}^{m} \mathrm{p}\big(\mathrm{ipc(i)}, \mathrm{cnae(j)}\big) * \log 2\ \frac{p(ipc(i), cnae(j))}{p(ipc(i)) * p(cnae(j))} \quad \text{Eq. (3)}$$

Normalized Mutual Information. Two ways to calculate it, NMI:

$$NMI(ipc, nace) = \frac{MI(ipc,nace)}{\sqrt{H(ipc) * H(nace)}} \quad \text{Eq. (4)}$$

Normalized Mutual Information allows us to compare Mutual Information of classifications regardless their size.

Joint Entropy

$$H(ipc, nace) = -\sum_{i=1}^{n}\sum_{j=1}^{m} p\,(\mathrm{ipc(i)}, \mathrm{nace(j)}) * \log_2(\mathrm{p(ipc(i)}, \mathrm{nace(j)})) \quad \text{Eq. (5)}$$

Information Variation

$$\mathrm{IV\ (ipc,nace)=H\ (ipc)+H\ (nace)-2I\ (ipc,nace)} \quad \text{Eq. (6)}$$

In all formulas, only cells containing data are considered, treating empty cells as having zero entropy.

The maximal entropy value correlates with the classification size, i.e., the number of cells available for patent classification (N). The highest entropy occurs in a classification where all cells are equally probable. Maximal Entropy grows asymptotically with the number of cells.

RESULTS

This section offers a detailed quantitative analysis of the dataset, employing information theory statistics to elucidate the relationship between IPC and NACE classifications.

Legal persons

The NIF contains information about the legal form of the company or type of entity.

Table 1 depicts the distribution of the sort of legal entities in the dataset that we are using for our study. Information should be interpreted cautiously as in the creation of the sample not all sorts of legal persons are represented equally.

Entropy information

Following the methodology from our previous work on trademarks and economic sectors, we calculated the entropy values using Information Theory Statistics. Shannon defined Entropy to measure the uncertainty and information content within communication channels. Application of equation (1) to IPC and NACE classifications yielded the following entropy values at different levels as shown in Table 2.

These figures suggest similar entropy levels for IPC and NACE, albeit with lower entropy for NACE compared to our trademark study (6.96 bits for Groups and 8.33 bits for Classes), underscoring the narrower economic activity range patents cover.

TABLE 1
FREQUENCY OF PATENT HOLDERS BY LEGAL ENTITY SORT

Frequency of firms	%		Legal person sort	Patents	Patents per legal person
4.182	28,80	A	Public Limited Companies	21.982	5,256
9.786	67,39	B	Limited Liability Companies	23.012	2,352
1	0,01	D	Limited Partnership	4	4,000
11	0,08	E	Joint ownerships and oder entities lacking legal personality	22	2,000
144	0,99	F	Cooperative societies	1.285	8,924
246	1,69	G	Associations	1.262	5,130
16	0,11	J	Civil Societies	21	1,313
12	0,08	P	Local Corporations	21	1,750
102	0,70	Q	Public Institutions	9.396	92,118
10	0,07	R	Congregations & religious institutions	32	3,200
8	0,06	S	State Administration & Autonomous Community Institutions	19	2,375
3	0,02	V	Economic Interest Grouping	3	1,000

Source: Author own work

TABLE 2
CLASSIFICATIONS ENTROPY

Classifications Entropy		Entropy
IPC	Classes	5,670
	Subclasses	7,771
NACE	Divisions	5,005
	Classes	7,333

Source: Author own work

Joint entropy

We also determined the Joint Entropy Equation (5) for IPC and NACE, revealing insights into their interrelation. As Table 3 shows joint Entropy increases with the granularity of the classification. Joint Entropy would be the sum of both classifications entropies if they would not share any information at all and it would be the value of the highest one if they share all the information.

TABLE 3
JOINT ENTROPY OF BOTH CLASSIFICATIONS

Join Entropy		NACE	
		Divisions	Classes
IPC	Classes	9,527	11,037
	Subclasses	11,141	12,265

Source: Author own work

Mutual information

Mutual Information analysis, Eq. (3), demonstrates how much one classification reveals about the other. Notably, as Table 4 shows, Mutual Information increases as we go down to more granular levels of the classifications. Mutual Information for IPC Classes vs. NACE Divisions is 1.148 bits and vs. Classes 1.966 bits while IPC Subclasses vs. NACE Divisions yields 1.635 bits, and vs. NACE Classes 2.837.

TABLE 4
MUTUAL INFORMATION OF THE CLASSIFICATIONS

Mutual Information		NACE	
		Divisions	Classes
IPC	Classes	1,148	1,966
	Subclasses	1,635	2,839

Source: Author own work

Normalized mutual information

Normalized Mutual Information, Eq. (4), calculated to facilitate comparison across classification sizes, confirms that deeper classification levels share more Mutual Information as seen in Table 5. This trend contrasts with our trademark study, highlighting the unique interplay between patent classifications and economic sectors.

Normalized Mutual Information for IPC Classes vs. NACE Divisions is 0.351, increasing to 0.730 for IPC Subclasses vs. NACE Classes.

TABLE 5
NORMALIZED MUTUAL INFORMATION

Normalized Mutual Information		NACE	
		Divisions	Classes
IPC	Classes	0,351	0,545
	Subclasses	0,457	0,730

Source: Author own work

Meila [8] introduces the variation of information, inverse of Mutual Information, as a function that measures the distance between two partitions of the same data set. In accordance to existing terminology, such a function is called a criterion for comparing partitions. Meila stresses the intuitive value of the Information Theory metrics. Those metrics are all interrelated and Information Variation can be calculated from the entropies of both classifications and their mutual information.

Dependent entropy

Dependent Entropy, Eq. (2) defined as the entropy of one classification given knowledge of the other, enables the comparison of classifications through contingency tables. Lower dependent entropy values suggest a strong relationship between classifications at the analyzed hierarchical level, indicating a high degree of predictability in one classification based on knowledge of the other. We present the results of crossing NACE Divisions within IPC Classes, NACE Classes within IPC Classes, IPC Classes within NACE Divisions and IPC Subclasses within NACE Divisions. That is, dependent entropy at different levels of both classifications.

NACE divisions within IPC classes

Analysis of the frequencies of NACE divisions within IPC classes (Table 6 A & B in annexes) highlights the most economically active sectors in patent filing across various technological fields:

The predominant fields in our data set include Medical or veterinary science (A61), Furniture and domestic appliances (A47), and Materials handling (B65), with these three fields alone accounting for 40% of patent activity among Spanish firms.

Notably, sectors such as Building (E04), Agriculture (A01), Measuring and testing (G01), and Vehicles (B60) also show significant patent activity.

These data provide valuable insights into the dominant sectors of Spanish patent activity, reflecting the nation's innovation landscape. To carry this analysis we will focus on the IPC classes with the highest and lowest values of entropy.

Low Entropy Examples: IPC Class A43 (Footwear) shows exceptionally low entropy, primarily due to its significant association with the manufacture of leather and related products (NACE Division 15). Similarly, IPC Class C07 (Organic Chemistry) demonstrates low entropy, with a substantial portion of patents belonging to the pharmaceutical sector (NACE Division 21).

High Entropy Fields: Conversely, areas like Agriculture (A01) and Shipbuilding (B63) exhibit high entropy, indicating a wide variety of economic sectors involved in patenting activities within these fields, making it challenging to predict the NACE classification based on the IPC class.

NACE classes within IPC classes

Further analysis at the NACE class level (Table 7 A & B in annexes) reveals that Organic Chemistry (C07) and Biochemistry (C12) show low dependent entropy, reflecting a concentrated pattern of patenting activity within specific economic activities, notably in research and pharmaceuticals.

In contrast, fields such as Material Handling (B65) display high entropy, suggesting a broad diversity of economic activities contributing to patent filings in this area. From a statistical point of view, knowing the field in which they protect patents does not help much to know in which NACE class they are classified.

IPC classes within NACE divisions

This section examines the distribution of IPC Classes across various NACE Divisions, (Table 8 A & B in annexes), identifying the economic sectors most active in patent filings:

Eight economic activities each account for over 2,000 patents, led by education (Division 85) with 6,042 patents and followed closely by wholesale trade (Division 46), machinery manufacturing (Division 28), and fabricated metal products (Division 25), among others.

Interestingly, only half of these top divisions are associated with manufacturing, with the remaining sectors relating to services, impacting the mutual information between classifications due to their diverse nature.

These eight divisions represent more than half (53.59%) of the patents in the dataset, highlighting the significant concentration of patent activity within specific economic sectors.

Low Entropy Divisions are mainly found among manufacture divisions. Division 21 (pharmaceuticals) displays exceptionally low entropy, especially in IPC Classes A61 (medical or veterinary science) and C07 (organic chemistry), indicating a strong alignment between this economic sector and specific technological fields.

Division 17 (paper products) also shows low entropy, primarily in IPC Class B65 (material handling), suggesting a concentrated patenting effort in areas directly related to the division's focus.

Division 10 (Food Industry) shows low entropy but the innovation area where they file most of the patents corresponds to A23 Class in the Packaging field.

Contrastingly, divisions like wholesale trade (46), retail trade (47), and education (85) exhibit high entropy, reflecting their service-oriented nature and the diverse technological fields in which they file patents, thus showing low prediction value of these classifications. Results show that Division 46 is responsible of a high number of patents because the firms in this Division are really goods producers. As all the firms producing goods sell their products, Division 46 should be reserved to firms whose main activity is wholesale trading and not goods producing. Division 46 has many product-oriented firms under a service activity classification what impacts in the results.

Although we would not expect service oriented divisions to have lower entropy values, we found some of them, like telecommunications (61) and health activities (86), that do as they align closely with specific IPC Classes (H04 and A61, respectively).

Other Service-oriented divisions (72, 80, 85), despite their high patent filing frequencies and entropy values, provide valuable insights into the research and educational activities of the entities involved, underscoring their role in the broader innovation ecosystem. We have observed that some research institutions have been wrongly classified in division 80 and should be in 72.

This analysis shows the complexity and diversity of the relationship between economic activities and patent filings, highlighting sectors with concentrated innovation efforts as well as those with broader, more diverse technological interests.

IPC subclasses within NACE divisions

The analysis extends to the distribution of IPC Subclasses across NACE Divisions (Table 9 A & B in annexes), revealing:

Entropy values are generally higher for IPC Subclasses compared to Classes, indicating greater diversity and specificity in patent filings within more detailed technological areas.

Division 17 (paper products) and Division 21 (pharmaceuticals) showcase low entropy, highlighting a concentrated pattern of patent activity in specific technological subclasses relevant to their economic activities.

At this IPC subclass level Division 10 (food industry) relates to B65D subclass, dealing with innovation in packaging, showing that the innovative activity of the food industry relates mainly to the packaging technology.

Contrastingly, divisions like 28 (machinery manufacturing) and 71 (architectural and engineering activities) exhibit high entropy, suggesting a broad range of technological innovations stemming from these sectors.

DISCUSSION

Patents show a lower entropy value compared to trademarks, suggesting a narrower range of economic sectors involved in patent production. This reflects a focused innovation landscape where significant patent activity is concentrated in a few key technological sectors.

The analysis underscores a clear distinction between manufacturing and service sectors in terms of their patent filing behaviours and the related technological fields. While manufacturing sectors often show lower entropy, indicating a close match with specific IPC fields, service sectors tend to have higher entropy due to their broader and more varied innovation activities. However, few service sectors (Telecommunications and Health activities) show innovation activity in very specific IPC fields.

The study highlights the complexities of creating concordance tables between economic and patent classifications, exacerbated by the dynamic nature of IPC classifications adapting to technological advancements. Nevertheless, some fields show predictive properties as they share more mutual information allowing us to build concordance tables. The Information Theory Statistics provide us with metrics that allow us to measure the predictabil-

ity of one classification based on the other one. Each category within the classification has different predictability.

The fact that Division 46 houses many firms that are actually product oriented ones is a problem that distorts the analysis of this information.

Patent classifications serve as economic indicators, yet the findings caution against overly simplistic interpretations of patent activity as direct representations of industry-wide innovation, especially in sectors like food industry where innovation in packaging is significant.

CONCLUSION

This analysis provides valuable insights into the dynamics of patent filings across economic sectors, illustrating the intricate relationship between sectoral economic activities and technological innovation. It emphasizes the diversity of innovation across sectors, the specific alignment between certain economic activities and technological fields, and the challenges in using patent data to fully capture the breadth of innovation activities across the economy.

The use of the Spanish Tax Identification system allows us to carry the empirical study linking the main IPC classification of the Spanish patents to the economic activity of the patent holders.

Information theory statistics proves to be a useful tool to analyse patent and economic classifications and it could be helpful to further developing the classifications.

Knowing the information that each classification has from the other one allows us to build concordance tables with quantitative information.

The detailed examination enriches our understanding of the innovation ecosystem, underscoring the need for nuanced approaches in linking economic activities with patent data to inform innovation policy and research.

Theory Information Statistics as can provide tools to develop and improve classifications as they allow to measure information and shared information between classifications.

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ANNEXES

TABLE 6 A
NACE DIVISIONS DEPENDING ON IPC CLASSES

IPC Class	Frequency	Entropy	NACE Division	%	NACE Division	%	NACE Division	%	NACE Division	%	NACE Division	%
A 01	2.222	1,367	85	14,54	28	12,96	46	10,04	22	6,93	80	6,93
A 21	229	0,971	10	31,88	28	26,64	46	5,68	27	5,24	85	5,24
A 22	259	1,035	28	33,59	10	15,83	46	9,65	22	8,49	47	3,86
A 23	1.357	1,091	10	24,32	28	14,08	46	11,35	80	11,35	85	11,35
A 24	71	1,213	46	12,68	85	12,68	12	11,27	17	9,86	18	8,45
A 41	309	1,151	46	23,95	14	17,15	13	14,24	47	8,41	32	3,24
A 42	107	1,216	46	15,89	13	13,08	22	13,08	45	6,54	47	6,54
A 43	480	0,944	15	39,79	46	23,96	22	3,96	32	3,96	68	3,54
A 44	245	1,075	46	26,53	32	20,82	47	8,98	24	5,31	15	4,49
A 45	518	1,225	46	26,83	22	15,06	32	7,72	47	4,83	85	4,05
A 46	81	0,886	22	35,80	32	24,69	86	7,41	25	6,17	13	4,94
A 47	4.391	1,299	31	20,36	46	14,64	25	9,79	22	6,99	27	5,03
A 61	4.726	1,200	85	20,50	21	14,90	72	11,45	46	9,86	80	7,93
A 62	172	1,393	25	12,79	46	11,05	26	6,98	72	6,40	85	6,40
A 63	1.238	1,061	32	45,48	46	10,26	85	6,95	47	3,88	74	3,23
B 01	1.197	1,208	85	29,41	80	15,46	28	6,35	72	6,10	46	5,26
B 02	90	1,014	28	45,56	71	5,56	72	4,44	85	4,44	24	3,33
B 03	47	1,204	28	14,89	38	10,64	85	10,64	80	8,51	25	6,38
B 04	12	0,788	28	41,67	25	8,33	26	8,33	27	8,33	33	8,33
B 05	361	1,199	28	29,36	46	13,30	20	6,65	85	6,65	22	5,82
B 06	19	0,753	80	36,84	28	15,79	46	15,79	29	10,53	85	10,53
B 07	88	1,201	28	26,14	72	9,09	85	7,95	25	6,82	46	6,82
B 08	136	1,283	28	19,85	46	9,56	71	9,56	25	8,09	85	5,88
B 09	67	1,197	85	17,91	28	13,43	80	11,94	71	7,46	20	5,97
B 21	322	1,077	28	34,78	25	12,42	64	7,76	85	7,14	24	5,90
B 22	122	1,126	85	18,85	72	13,11	28	11,48	46	10,66	80	7,38
B 23	518	1,027	28	39,38	25	10,42	27	8,49	85	8,49	72	5,60
B 24	145	0,921	28	37,93	23	22,76	46	8,97	64	6,21	25	3,45
B 25	312	1,102	25	29,81	28	18,27	46	8,01	85	7,69	72	6,09
B 26	150	0,975	28	39,33	25	15,33	46	11,33	71	5,33	22	4,00
B 27	153	1,154	28	15,69	16	13,73	25	13,07	46	12,42	85	9,15
B 28	348	1,016	28	40,23	23	13,22	25	7,47	45	5,75	46	5,17
B 29	500	1,249	22	14,00	46	14,00	28	13,60	71	9,80	72	9,20
B 30	89	0,766	28	60,67	64	5,62	46	4,49	68	4,49	22	3,37
B 31	211	0,953	46	28,44	17	19,43	28	18,01	1	7,58	35	3,79
B 32	224	1,376	22	13,39	46	8,04	85	7,59	23	6,70	16	5,80
B 33	5	0,217	85	80,00	80	20,00						
B 41	283	0,944	28	49,47	18	7,07	46	5,65	22	5,30	20	4,59
B 42	256	1,258	18	19,92	17	12,89	46	10,55	73	7,81	74	7,42
B 43	50	1,158	46	18,00	32	12,00	72	8,00	85	8,00	17	6,00
B 44	106	1,207	23	15,09	28	14,15	85	11,32	46	9,43	22	6,60
B 60	2.103	1,087	29	39,90	46	9,22	71	8,27	28	7,04	25	4,33
B 61	206	0,903	30	48,54	49	12,62	47	4,37	71	4,37	85	3,88
B 62	887	1,208	46	24,92	29	19,05	32	6,31	85	4,74	25	4,51
B 63	252	1,375	71	14,68	85	13,49	28	7,94	30	5,56	46	4,76
B 64	160	1,112	30	23,75	71	16,25	85	14,38	28	8,75	72	6,25
B 65	4.381	1,300	22	15,57	17	15,36	28	13,10	46	12,23	25	4,95
B 66	573	1,104	28	35,25	64	9,77	25	8,03	24	7,16	46	5,41
B 67	263	1,141	46	20,91	28	19,39	22	12,17	11	9,89	25	6,08
B 68	21	0,876	15	33,33	13	14,29	28	14,29	14	9,52	22	4,76
B 81	28	0,599	85	35,71	26	28,57	80	25,00	72	7,14	64	3,57
B 82	121	0,624	85	44,63	80	28,10	72	16,53	11	3,31	35	1,65
C 01	235	0,981	85	30,21	80	25,11	72	11,06	20	8,09	24	2,98
C 02	418	1,278	85	22,25	72	7,89	20	7,42	28	7,18	36	6,94
C 03	114	1,052	20	22,81	27	18,42	23	14,04	71	7,02	80	7,02
C 04	334	1,061	85	25,45	80	19,16	23	11,98	46	8,38	72	7,78
C 05	105	0,892	20	42,86	85	17,14	80	8,57	46	6,67	38	3,81
C 06	26	0,586	20	50,00	64	23,08	84	15,38	43	3,85	70	3,85
C 07	1.050	0,869	21	28,57	85	22,95	80	14,67	46	12,29	72	8,57
C 08	268	1,189	85	22,39	20	14,18	80	11,57	72	7,84	22	6,34
C 09	156	1,130	20	23,72	85	16,03	80	12,82	46	8,97	72	7,69

Source: Author own work

TABLE 6 B
NACE DIVISIONS DEPENDING ON IPC CLASSES

IPC Class	Frequency	Entropy	NACE Division	%	NACE Division	%	NACE Division	%	NACE Division	%	NACE Division	%
C 10	103	1,125	80	15,53	71	14,56	85	13,59	46	7,77	64	7,77
C 11	79	0,855	20	43,04	85	13,92	80	10,13	10	7,59	46	6,33
C 12	1.070	0,907	85	34,11	72	20,09	80	20,09	86	4,86	21	2,34
C 13	4	0,602	28	25,00	46	25,00	55	25,00	72	25,00		
C 14	5	0,699	20	20,00	45	20,00	46	20,00	72	20,00	80	20,00
C 21	32	1,020	72	25,00	85	15,63	80	12,50	24	6,25	28	6,25
C 22	97	0,966	24	19,59	72	19,59	80	18,56	85	14,43	71	6,19
C 23	92	0,919	85	27,17	80	22,83	72	19,57	64	5,43	24	4,35
C 25	58	1,124	72	17,24	85	17,24	25	8,62	27	8,62	24	6,90
C 30	15	0,383	80	53,33	85	40,00	72	6,67				
C 40	2	0,000	85	100,00								
D 01	47	0,734	28	53,19	13	10,64	46	8,51	85	6,38	32	4,26
D 02	13	0,614	13	38,46	28	30,77	14	15,38	46	7,69	72	7,69
D 03	68	0,810	13	48,53	46	13,24	14	10,29	85	7,35	27	4,41
D 04	42	0,951	28	28,57	13	21,43	27	9,52	46	7,14	72	7,14
D 05	10	0,518	28	40,00	46	40,00	14	10,00	31	10,00		
D 06	450	0,865	27	51,78	28	11,33	22	6,00	64	4,00	13	3,78
D 07	7	0,641	13	42,86	27	14,29	28	14,29	64	14,29	85	14,29
D 21	33	0,927	85	39,39	84	12,12	46	9,09	17	6,06	80	6,06
E 01	653	1,381	25	11,03	42	9,04	71	8,42	43	7,20	22	6,43
E 02	349	1,278	71	13,75	85	12,32	43	9,74	24	9,17	23	6,59
E 03	366	1,162	22	19,95	23	15,57	46	12,84	28	9,02	25	5,19
E 04	2.958	1,296	25	18,66	23	11,56	46	10,01	43	7,40	22	6,22
E 05	984	1,043	25	44,82	46	8,23	27	6,00	29	5,89	24	3,46
E 06	926	1,044	25	35,96	16	12,96	46	9,83	24	5,29	22	4,97
E 21	80	1,160	28	16,25	42	13,75	43	11,25	84	8,75	71	7,50
F 01	117	1,083	85	23,08	29	14,53	91	12,82	27	10,26	28	6,84
F 02	170	1,041	29	32,94	85	13,53	26	9,41	27	7,65	28	4,71
F 03	505	0,884	28	48,91	85	10,10	71	8,91	35	6,34	72	5,15
F 04	130	1,086	28	30,77	46	13,85	27	7,69	82	6,92	72	6,15
F 15	34	0,877	27	20,59	28	17,65	85	17,65	25	14,71	46	14,71
F 16	1.729	1,284	25	13,71	46	13,30	28	12,61	27	11,16	22	8,91
F 17	62	0,831	46	50,00	32	11,29	25	6,45	35	4,84	20	3,23
F 21	691	0,985	27	41,53	46	20,26	25	4,78	26	4,34	22	2,75
F 22	14	0,958	25	21,43	43	14,29	77	14,29	24	7,14	27	7,14
F 23	252	1,101	27	23,41	25	21,43	28	9,92	64	9,13	46	5,56
F 24	1.167	1,173	27	28,02	25	9,17	35	7,63	46	6,77	85	6,26
F 25	292	1,199	27	18,49	64	14,38	28	13,70	25	7,88	43	6,85
F 26	32	1,028	28	21,88	46	15,63	25	9,38	43	9,38	23	6,25
F 27	38	1,029	28	15,79	23	13,16	46	13,16	20	10,53	24	10,53
F 28	131	1,017	29	37,40	85	9,92	25	9,16	28	6,11	27	4,58
F 41	182	1,002	25	37,91	47	12,09	46	9,89	13	5,49	26	4,95
F 42	74	0,903	25	31,08	20	28,38	46	12,16	64	4,05	28	2,70
G 01	2.152	1,130	85	37,17	72	11,52	80	9,39	26	6,32	71	4,51
G 02	274	1,037	85	35,77	46	12,04	72	11,31	26	6,93	27	5,47
G 03	77	1,271	85	19,48	72	9,09	26	7,79	74	6,49	80	6,49
G 04	23	0,921	46	30,43	26	17,39	47	8,70	72	8,70	85	8,70
G 05	280	1,221	85	21,43	27	15,71	46	7,50	26	7,14	28	6,79
G 06	751	1,254	85	29,16	62	10,25	72	8,39	46	6,52	71	6,52
G 07	556	1,230	28	30,40	46	10,25	74	10,07	26	6,12	71	4,32
G 08	259	1,372	85	13,51	46	9,65	26	8,88	27	7,72	71	6,95
G 09	756	1,411	73	13,89	18	13,76	46	8,99	25	5,29	27	4,89
G 10	87	1,115	85	26,44	74	11,49	28	9,20	61	8,05	32	6,90
G 11	59	1,113	22	23,73	18	11,86	46	11,86	15	8,47	80	6,78
G 12	13	0,958	80	23,08	29	15,38	26	7,69	27	7,69	28	7,69
G 16	2	0,000	86	100,00								
G 21	41	0,949	24	24,39	72	19,51	85	17,07	35	7,32	71	7,32
H 01	1.309	1,045	27	34,68	26	16,42	85	12,38	46	6,65	80	3,44
H 02	862	1,031	27	41,30	85	11,48	46	7,08	26	6,38	28	5,34
H 03	140	0,895	85	34,29	26	23,57	71	8,57	80	7,14	64	6,43
H 04	945	1,082	61	28,68	85	15,34	26	14,07	46	8,04	62	6,14
H 05	391	0,764	27	57,03	26	15,09	46	4,86	85	3,32	25	2,56

Source: Author own work

TABLE 7 A
NACE CLASSES DEPENDING ON IPC CLASSES

IPC class	Frequency	Entropy	NACE class	%	NACE class	%	NACE class	%	NACE class	%	NACE class	%
A 01	2.222	6,14153	8543	12,42	2830	10,58	8030	6,93	2229	4,19	4661	3,78
A 21	229	4,8314	2893	17,47	1071	15,28	1043	6,11	1072	4,80	2751	4,80
A 22	259	4,61613	2893	29,34	1013	9,27	2222	8,11	6209	2,70	6820	2,70
A 23	1.357	5,8105	8030	11,35	8543	9,80	2893	9,29	1043	3,76	7211	3,24
A 24	71	4,74765	8543	12,68	1200	11,27	1712	8,45	1812	5,63	3212	4,23
A 41	309	5,95017	4642	7,12	1414	4,53	1320	4,21	1413	4,21	4641	3,56
A 42	107	5,04889	1399	10,28	2219	6,54	7740	6,54	2229	5,61	4649	5,61
A 43	480	4,24217	1520	39,17	4642	10,83	4616	3,33	4624	3,13	2219	2,29
A 44	245	5,29544	3212	11,84	3213	6,94	4672	6,53	4648	5,71	2454	4,90
A 45	518	5,97399	2229	11,58	4649	5,98	3240	5,21	4645	4,25	8543	3,86
A 46	81	3,45837	2229	29,63	3291	20,99	8623	7,41	2593	6,17	1392	4,94
A 47	4.391	6,52044	3109	11,36	2229	4,78	3103	4,74	2751	4,24	3101	3,69
A 61	4.726	5,1188	8543	18,35	2120	13,04	8030	7,94	7211	5,57	4646	4,91
A 62	172	5,82928	2651	5,81	2599	5,23	8543	5,23	4690	4,65	7219	4,65
A 63	1.238	4,64531	3240	39,98	8543	5,57	4649	5,09	3230	4,85	4690	2,26
B 01	1.197	5,14697	8543	26,15	8030	15,37	7112	3,76	7219	3,43	2899	2,34
B 02	90	4,92283	2893	12,22	2830	10,00	2829	6,67	7112	5,56	2891	4,44
B 03	47	4,73832	8543	10,64	8030	8,51	2899	6,38	2120	4,26	2599	4,26
B 04	12	2,9183	2893	33,33	2599	8,33	2660	8,33	2751	8,33	2899	8,33
B 05	361	5,89649	2830	8,31	4669	6,65	8543	6,09	2229	4,43	2829	4,16
B 06	19	2,89785	8030	36,84	2931	10,53	4690	10,53	8543	10,53	2651	5,26
B 07	88	5,23898	2830	7,95	8543	6,82	2892	5,68	7219	5,68	2893	4,55
B 08	136	5,89332	2893	5,88	8543	5,88	7111	4,41	7112	4,41	4669	3,68
B 09	67	4,53282	8543	14,93	8030	11,94	2812	8,96	3811	5,97	7112	5,97
B 21	322	5,45855	2849	9,32	6420	7,76	8543	6,83	2899	6,52	2891	4,04
B 22	122	4,70025	8543	16,39	8030	7,38	2891	6,56	4669	6,56	4110	5,74
B 23	518	5,53467	2849	9,85	8543	7,14	2829	6,95	2841	6,18	2891	5,60
B 24	145	4,40911	2391	20,00	2849	19,31	2841	8,28	6420	6,21	2829	3,45
B 25	312	5,21708	2573	23,08	8543	7,69	2824	4,49	2829	2,88	7112	2,88
B 26	150	5,3042	2893	8,00	4669	6,67	2571	5,33	2895	5,33	2829	4,67
B 27	153	5,2506	2573	10,46	8543	8,50	2899	7,84	1621	5,23	1629	5,23
B 28	348	5,35551	2892	13,22	2849	10,06	2899	8,33	2829	5,17	2361	3,45
B 29	500	5,62	4669	9,40	7112	9,20	2229	7,80	7219	6,60	8543	4,20
B 30	89	4,46739	2829	15,73	2822	10,11	2899	10,11	2849	7,87	2893	5,62
B 31	211	3,98253	4669	27,01	1721	14,69	2895	11,37	123	7,58	3519	3,79
B 32	224	6,05109	8543	6,25	2229	5,80	7112	4,46	2222	3,13	2849	3,13
B 33	5	1,37095	8543	60,00	8030	20,00	8532	20,00				
B 41	283	4,67463	2896	21,20	2899	13,43	1812	6,01	2829	5,65	2849	4,24
B 42	256	5,21697	1812	17,58	1723	9,38	7311	7,42	7420	5,86	4649	3,52
B 43	50	4,65418	3240	10,00	4690	10,00	3101	6,00	4762	6,00	8543	6,00
B 44	106	5,3345	8543	11,32	2849	10,38	2331	4,72	1812	3,77	2370	3,77
B 60	2.103	5,2423	2910	18,12	2932	16,36	7112	7,89	2920	4,95	8543	3,99
B 61	206	3,68193	3020	47,09	4900	6,31	4779	3,88	8543	3,88	7112	3,40
B 62	887	5,66086	4649	12,85	2932	10,26	2910	5,19	3240	4,74	4618	4,62
B 63	252	5,57	7112	12,30	8543	10,71	3011	3,57	9102	3,17	4520	2,78
B 64	160	4,21829	3030	23,75	7112	13,13	8543	13,13	2822	6,88	7211	3,75
B 65	4.381	6,56159	1721	13,74	2222	7,40	2229	5,68	2829	2,44	2899	2,19
B 66	573	4,97824	2822	25,65	6420	9,77	2410	6,46	7112	3,66	2932	3,49
B 67	263	5,53422	2893	11,03	2221	7,98	1105	7,22	4649	5,70	2899	4,18
B 68	21	3,03963	1512	33,33	1392	14,29	1419	9,52	2829	9,52	2229	4,76
B 81	28	2,15804	8543	32,14	2630	28,57	8030	25,00	7219	7,14	6420	3,57
B 82	121	2,73698	8543	35,54	8030	28,10	7211	9,09	8532	6,61	7219	5,79
C 01	235	3,94155	8543	26,81	8030	25,11	7219	7,66	2011	3,40	2013	2,55
C 02	418	5,52074	8543	18,18	3600	6,94	7112	5,50	7219	4,55	2059	2,87
C 03	114	4,49777	2751	17,54	2030	10,53	2012	8,77	8030	7,02	7112	6,14
C 04	334	4,90411	8030	19,16	8543	17,66	8541	6,59	7219	5,69	4673	3,29
C 05	105	3,59601	2015	37,14	8543	15,24	8030	8,57	3821	3,81	4613	2,86
C 06	26	1,946	2051	50,00	6420	23,08	8422	15,38	4322	3,85	7022	3,85
C 07	1.050	3,72758	8543	19,62	2120	17,52	8030	14,67	2110	11,05	4646	7,33
C 08	268	5,02201	8543	19,40	8030	11,57	3103	3,73	7211	3,73	7219	3,73
C 09	156	4,8538	8543	15,38	8030	12,82	2030	8,97	7219	7,69	2059	5,13

Source: Author own work

TABLE 7 B
NACE CLASSES DEPENDING ON IPC CLASSES

IPC class	Frequency	Entropy	NACE class	%	NACE class	%	NACE class	%	NACE class	%	NACE class	%
C 10	103	4,45804	8030	15,53	8543	12,62	6420	7,77	7111	7,77	7112	6,80
C 11	79	3,96302	2041	27,85	8030	10,13	2042	8,86	8543	8,86	1043	5,06
C 12	1.070	3,84806	8543	29,63	8030	20,09	7211	11,68	7219	6,54	8541	2,62
C 13	4	2	2893	25,00	4621	25,00	5510	25,00	7211	25,00		
C 14	5	2,32193	2016	20,00	4531	20,00	4664	20,00	7219	20,00	8030	20,00
C 21	32	3,90252	8543	15,63	8030	12,50	7211	9,38	7219	9,38	3831	6,25
C 22	97	3,98827	8030	18,56	8543	14,43	2444	10,31	7219	10,31	7112	6,19
C 23	92	3,7208	8030	22,83	8543	21,74	7211	7,61	7219	7,61	6420	5,43
C 25	58	4,32116	8543	17,24	7219	12,07	8030	6,90	2751	5,17	3299	5,17
C 30	15	1,27291	8030	53,33	8543	40,00	7219	6,67	104	0,00	110	0,00
C 40	2	0	8543	100,00								
D 01	47	3,0493	2894	44,68	2829	8,51	1320	6,38	8543	6,38	3299	4,26
D 02	13	2,93121	2894	30,77	1392	15,38	1310	7,69	1320	7,69	1399	7,69
D 03	68	3,98927	1320	29,41	1414	8,82	1392	7,35	8543	7,35	1396	4,41
D 04	42	3,57948	2894	28,57	1395	11,90	2732	9,52	7219	7,14	8543	7,14
D 05	10	2,32193	2894	40,00	4616	20,00	1431	10,00	3103	10,00	4645	10,00
D 06	450	3,52378	2751	50,89	2894	6,22	2829	4,00	6420	4,00	2222	2,89
D 07	7	2,52164	1310	28,57	1320	14,29	2732	14,29	2815	14,29	6420	14,29
D 21	33	3,22301	8543	39,39	8411	12,12	4669	6,06	8030	6,06	1043	3,03
E 01	653	6,10279	2511	6,89	7112	6,13	8543	5,36	4211	4,90	3020	4,29
E 02	349	5,58299	7112	11,46	8543	11,17	2452	4,58	2451	3,72	2361	3,15
E 03	366	5,02677	2342	14,75	2229	13,93	2814	6,01	4674	6,01	4110	4,10
E 04	2.958	6,49355	2511	8,76	2512	5,92	8543	5,41	4673	3,58	7112	3,31
E 05	984	4,80963	2572	32,01	2512	7,11	2790	4,98	4674	3,56	2932	2,74
E 06	926	4,96683	2512	26,67	1623	11,02	2599	3,24	4674	3,24	4672	2,81
E 21	80	4,49862	2892	12,50	8430	8,75	4339	7,50	7112	7,50	4213	6,25
F 01	117	4,32738	8543	19,66	2932	12,82	9102	12,82	2711	5,98	2811	4,27
F 02	170	4,08854	2932	27,06	8543	13,53	2611	9,41	2711	4,71	7219	4,12
F 03	505	3,53421	2811	46,14	8543	9,50	7112	8,32	3519	4,55	7219	2,38
F 04	130	4,67218	2813	20,00	2751	6,92	8299	6,92	7219	5,38	4643	4,62
F 15	34	4,20881	8543	14,71	2711	8,82	2790	8,82	4669	8,82	2511	5,88
F 16	1.730	6,46443	2814	5,38	4674	4,22	2229	3,76	2221	3,41	2599	3,30
F 17	62	3,76788	4671	37,10	3250	6,45	3299	4,84	4690	4,84	2011	3,23
F 21	691	4,64141	2740	35,75	4647	7,38	4652	4,20	2611	2,89	2790	2,60
F 22	14	3,52164	2529	14,29	7740	14,29	2420	7,14	2521	7,14	2751	7,14
F 23	252	4,51589	2751	22,62	2521	14,68	6420	9,13	2823	4,37	7490	3,57
F 24	1.167	5,20007	2751	24,85	3519	7,20	8543	5,66	6420	4,20	7112	3,86
F 25	292	4,9132	2751	18,15	6420	14,38	2825	7,19	4322	5,14	8543	4,79
F 26	32	4,47641	2899	9,38	2893	6,25	4321	6,25	4669	6,25	7112	6,25
F 27	38	4,70175	2352	7,89	2011	5,26	2030	5,26	2443	5,26	2452	5,26
F 28	131	3,88423	2932	37,40	8543	9,16	2521	6,87	3519	3,82	2751	3,05
F 41	182	4,13146	2540	36,81	4764	9,34	2651	3,30	2932	3,30	1396	2,75
F 42	74	3,28182	2540	31,08	2051	28,38	4618	6,76	6420	4,05	2899	2,70
G 01	2.153	4,85112	8543	33,55	8030	9,06	7211	5,48	7219	5,11	7112	3,53
G 02	274	4,49491	8543	34,67	7211	6,57	7219	4,38	8030	4,38	2670	4,01
G 03	77	4,69942	8543	18,18	8030	6,49	2670	5,19	7220	5,19	2790	3,90
G 04	23	4,08878	2652	8,70	4648	8,70	4690	8,70	7211	8,70	8543	8,70
G 05	280	5,26423	8543	20,00	2751	7,50	2790	5,36	7112	5,00	2611	3,57
G 06	751	5,24465	8543	27,30	7112	5,86	7211	5,46	6209	4,93	8030	2,93
G 07	556	5,32722	2899	17,27	7490	10,07	2829	9,71	2611	3,78	7112	3,24
G 08	259	5,74766	8543	11,58	7112	6,18	6209	4,63	4321	4,25	4652	3,86
G 09	756	6,11832	1812	12,43	7311	12,17	2229	3,57	8543	3,04	6820	2,78
G 10	87	4,23512	8543	26,44	7490	10,34	2829	9,20	3220	4,60	6120	4,60
G 11	59	4,58144	2229	11,86	1512	8,47	2222	6,78	8030	6,78	8299	6,78
G 12	13	3,18083	8030	23,08	2932	15,38	2651	7,69	2711	7,69	2893	7,69
G 16	2	1	8610	50,00	8690	50,00	104	0,00	110	0,00	111	0,00
G 21	41	3,4762	2446	24,39	7219	17,07	8543	14,63	7112	7,32	3517	4,88
H 01	1.309	5,12382	8543	11,54	2740	11,08	2630	10,08	2790	8,94	2712	4,43
H 02	862	5,23959	2712	12,88	2732	11,14	8543	11,02	2740	4,99	2790	4,41
H 03	140	3,49314	8543	33,57	2630	16,43	7112	8,57	6420	6,43	8030	6,43
H 04	945	4,59637	6120	17,35	8543	15,03	2630	11,43	6190	10,69	7112	5,08
H 05	391	3,3701	2751	51,92	2611	8,44	2630	5,12	8543	3,32	2740	2,56

Source: Author own work

TABLE 8 A
IPC CLASS DEPENDING ON NACE PRODUCT DIVISIONS

NACE Division	Frequency	Entropy	IPC Class	%	IPC Class	%	IPC Class	%	IPC Class	%	IPC Class	%
1	122	0,912	A 01	36,89	B 31	13,11	B 65	12,30	A 23	11,48	A 61	7,38
2	20	0,977	A 01	30,00	A 61	10,00	B 60	10,00	E 04	10,00	A 47	5,00
3	15	0,783	A 01	33,33	A 22	13,33	B 01	13,33	B 65	13,33	G 03	13,33
5	33	1,075	C 04	18,18	C 02	15,15	C 08	12,12	B 65	9,09	C 03	9,09
6	3	0,477	B 42	33,33	F 03	33,33	G 09	33,33				
7	7	0,759	C 13	28,57	B 01	14,29	C 05	14,29	G 07	14,29	G 09	14,29
8	51	1,153	C 04	17,65	B 28	11,76	C 01	9,80	E 04	9,80	A 01	7,84
9	2	0,301	C 04	50,00	F 16	50,00	A 01	0,00	A 21	0,00	A 22	0,00
10	806	0,837	A 23	40,94	B 65	25,06	A 21	9,06	A 47	5,71	A 22	5,09
11	192	1,185	B 65	23,44	B 67	13,54	C 12	9,38	A 23	6,77	A 47	6,77
12	18	0,661	A 24	44,44	A 01	16,67	B 65	16,67	E 05	11,11	E 06	5,56
13	650	1,342	A 47	23,38	B 65	12,15	E 04	6,92	A 41	6,77	D 03	5,08
14	129	1,062	A 41	41,09	A 47	7,75	D 03	5,43	A 01	4,65	A 61	4,65
15	275	0,625	A 43	69,45	A 45	5,82	A 44	4,00	B 65	3,27	A 47	2,55
16	588	1,032	A 47	25,00	E 06	20,41	E 04	14,29	B 65	12,41	F 16	4,76
17	966	0,612	B 65	69,67	A 47	9,83	B 31	4,24	B 42	3,42	G 09	1,86
18	528	1,156	B 65	19,89	G 09	19,70	A 47	15,34	B 42	9,66	A 63	5,11
19	7	0,587	A 47	28,57	B 60	28,57	B 67	28,57	B 01	14,29		
20	1.265	1,498	A 61	14,39	A 01	10,67	B 65	7,83	E 04	5,22	A 23	4,51
21	1.134	0,514	A 61	62,08	C 07	26,46	C 12	2,20	B 65	2,03	A 23	1,94
22	2.520	1,321	B 65	27,06	A 47	12,18	E 04	7,30	A 01	6,11	F 16	6,11
23	952	1,200	E 04	35,92	A 47	8,19	E 03	5,99	B 28	4,83	E 01	4,41
24	623	1,437	E 04	17,17	E 06	7,87	A 47	7,22	B 66	6,58	F 16	6,10
25	3.744	1,422	E 04	14,74	E 05	11,78	A 47	11,49	E 06	8,89	F 16	6,33
26	1.332	1,452	H 01	16,14	G 01	10,21	H 04	9,98	A 61	5,41	H 05	4,43
27	3.190	1,349	H 01	14,23	H 02	11,16	F 24	10,25	F 21	9,00	D 06	7,30
28	4.725	1,632	B 65	12,15	A 01	6,10	F 03	5,23	F 16	4,61	B 23	4,32
29	1.640	0,978	B 60	51,16	B 62	10,30	F 16	4,63	E 05	3,54	F 02	3,41
30	395	1,231	B 61	25,32	B 64	9,62	B 62	8,61	E 01	7,09	B 60	6,08
31	1.296	0,670	A 47	68,98	A 61	7,64	E 04	2,62	E 06	2,47	F 16	2,47
32	1.390	1,098	A 63	40,50	A 61	15,40	A 47	6,55	B 62	4,03	A 44	3,67

Source: Author own work

TABLE 8 B
IPC CLASS DEPENDING ON NACE SERVICE DIVISIONS

CNAE Division	Frequency	Entropy	IPC Class	%	IPC Class	%	IPC Class	%	IPC Class	%	IPC Class	%
33	319	1,501	A 01	12,85	B 65	11,60	G 01	8,46	B 01	5,02	B 28	4,39
35	351	1,417	F 24	25,36	F 03	9,12	H 01	6,27	G 01	5,70	B 01	3,42
36	91	0,960	C 02	31,87	B 01	20,88	E 03	10,99	G 01	8,79	F 16	5,49
37	29	0,919	C 02	27,59	E 04	17,24	B 01	13,79	B 65	10,34	C 01	6,90
38	144	1,335	B 65	28,47	A 61	4,17	A 62	4,17	C 10	4,17	B 01	3,47
39	13	0,975	A 01	15,38	B 01	15,38	B 65	15,38	A 47	7,69	A 61	7,69
41	493	1,414	E 04	23,73	F 16	9,33	E 01	7,71	A 47	5,48	B 65	4,87
42	277	1,372	E 01	21,30	E 04	9,39	E 02	7,94	C 02	5,42	B 01	4,33
43	923	1,477	E 04	23,73	F 24	6,50	A 47	5,53	E 01	5,09	B 65	4,01
45	287	1,385	B 60	24,74	B 62	7,32	B 28	6,97	A 01	4,18	A 47	3,48
46	5.692	1,607	A 47	11,30	B 65	9,42	A 61	8,19	E 04	5,20	F 16	4,04
47	1.016	1,548	A 47	17,52	A 61	10,43	A 63	4,72	B 65	4,72	A 01	4,04
48	1	0,000	A 41	100,00								
49	164	1,254	B 61	15,85	B 60	15,24	B 65	10,98	G 01	10,98	E 01	9,15
50	27	0,716	E 04	44,44	B 66	18,52	B 63	11,11	B 65	11,11	A 42	3,70
51	2	0,000	G 09	100,00								
52	81	1,278	B 65	16,05	B 60	11,11	E 01	9,88	A 47	6,17	B 63	6,17
53	12	0,688	A 47	41,67	B 65	16,67	G 07	16,67	B 42	8,33	B 62	8,33
55	132	1,404	B 01	17,42	A 01	6,82	A 23	6,82	C 08	6,82	G 01	6,82
56	68	1,173	A 47	20,59	A 23	14,71	B 65	13,24	A 21	7,35	G 07	7,35
58	72	1,211	A 63	16,67	B 42	13,89	A 47	9,72	G 09	9,72	B 65	8,33
59	32	1,100	F 25	15,63	A 63	12,50	B 65	12,50	B 42	9,38	B 67	9,38
60	6	0,577	G 06	33,33	H 04	33,33	G 01	16,67	H 01	16,67		
61	384	0,609	H 04	70,57	G 06	7,03	H 01	3,65	G 08	2,34	G 01	2,08
62	371	1,360	G 06	20,75	H 04	15,63	A 61	5,12	G 01	4,85	G 08	4,58
63	60	1,309	G 06	11,67	G 09	11,67	A 61	6,67	B 05	6,67	B 65	6,67
64	774	1,633	A 47	9,43	B 66	7,24	F 24	6,46	F 16	6,33	F 25	5,43
65	3	0,276	B 65	66,67	B 62	33,33						
66	55	1,150	A 01	18,18	B 65	14,55	G 06	12,73	G 07	7,27	A 45	5,45
68	712	1,522	A 47	10,96	B 65	9,69	E 04	7,58	A 01	6,88	B 62	5,62
69	190	1,270	A 61	30,53	B 65	8,42	G 01	7,37	B 01	4,21	B 60	3,68
70	299	1,471	B 65	12,37	A 61	11,71	A 47	10,70	B 60	6,02	A 01	5,35
71	1.709	1,635	B 60	10,18	E 04	9,83	G 01	5,68	B 65	4,97	F 24	3,63
72	2.563	1,503	A 61	21,11	G 01	9,68	C 12	8,39	A 01	5,66	C 07	3,51
73	418	1,241	G 09	25,12	A 47	15,07	B 65	11,48	A 63	7,42	B 42	4,78
74	573	1,565	A 61	9,77	G 07	9,77	B 65	7,50	A 63	6,98	E 04	4,71
75	2	0,301	A 01	50,00	G 01	50,00						
77	246	1,375	E 04	13,82	A 61	12,60	B 62	10,16	A 47	8,13	F 16	5,28
78	3	0,276	B 26	66,67	G 01	33,33						
79	13	0,726	F 24	30,77	E 03	23,08	A 41	15,38	G 03	15,38	B 62	7,69
80	2.104	1,353	A 61	17,82	C 12	10,22	G 01	9,60	B 01	8,79	A 01	7,32
81	106	1,302	A 01	16,98	E 04	12,26	B 66	10,38	G 09	7,55	B 08	5,66
82	339	1,538	B 65	11,80	A 47	10,62	E 04	7,37	A 61	5,01	H 04	4,72
84	229	1,429	G 01	13,97	A 61	12,23	C 12	7,86	C 07	6,11	G 05	4,37
85	6.042	1,520	A 61	16,04	G 01	13,24	C 12	6,04	B 01	5,83	A 01	5,35
86	450	0,752	A 61	60,22	C 12	11,56	A 01	4,22	G 01	3,78	A 47	3,33
87	47	0,733	A 61	59,57	A 01	4,26	A 45	4,26	C 12	4,26	F 21	4,26
88	13	0,894	A 61	23,08	B 65	23,08	A 01	7,69	A 45	7,69	B 42	7,69
89	1	0,000	A 47	100,00								
90	11	0,781	A 63	27,27	E 04	27,27	B 65	9,09	F 16	9,09	F 21	9,09
91	174	1,462	G 01	10,92	F 01	8,62	C 12	8,05	E 04	6,32	F 03	6,32
92	21	0,876	A 63	28,57	G 07	23,81	B 65	9,52	G 06	9,52	A 43	4,76
93	73	0,995	A 63	38,36	G 07	13,70	E 04	6,85	G 09	6,85	A 01	5,48
94	27	1,245	A 63	14,81	G 06	11,11	A 61	7,41	B 65	7,41	A 01	3,70
95	81	1,220	A 47	33,33	B 41	6,17	G 01	6,17	B 65	3,70	D 06	3,70
96	111	1,138	A 61	27,93	A 01	14,41	E 04	12,61	A 47	7,21	A 63	5,41
98	1	0,000	A 47	100,00								
99	4	0,301	A 41	50,00	A 61	50,00						

Source: Author own work

TABLE 9 A
IPC SUBCLASS DEPENDING ON NACE PRODUCT DIVISIONS

NACE Divisio	Frequency	Enthropy	IPC Subclas	%	IPC Subclas	%	IPC Subclas	%	IPC Subclas	%	IPC Subclas	%
1	122	4,415	A 01G	13,11	B 31B	13,11	A 01K	12,30	B 65D	10,66	A 61K	5,74
2	20	3,784	A 01N	15,00	A 61K	10,00	B 60R	10,00	E 04H	10,00	A 01B	5,00
3	15	2,733	A 01K	33,33	A 22C	13,33	B 01D	13,33	G 03B	13,33	A 47J	6,67
5	33	3,813	C 04B	18,18	C 02F	15,15	B 65D	9,09	C 03C	9,09	B 01J	6,06
6	3	1,585	B 42C	33,33	F 03B	33,33	G 09F	33,33				
7	7	2,522	C 12M	28,57	A 63B	14,29	C 04B	14,29	G 06Q	14,29	G 08B	14,29
8	51	4,505	C 04B	17,65	A 01G	5,88	B 28B	5,88	E 04B	5,88	E 21B	5,88
9	2	1,000	C 04B	50,00	F 16K	50,00						
10	806	4,438	B 65D	19,85	A 23L	16,00	A 23G	8,56	A 21D	5,71	A 22C	4,71
11	192	4,710	B 65D	22,92	B 67D	11,98	C 12G	6,77	A 23L	3,65	A 61K	3,65
12	18	3,086	A 24C	22,22	A 01G	16,67	B 65D	16,67	A 24B	11,11	A 24D	5,56
13	650	5,990	B 65D	7,38	A 47L	6,15	A 47G	5,23	D 03D	4,92	A 47C	4,46
14	129	4,629	A 41D	24,03	A 41C	9,30	A 41B	5,43	D 03D	5,43	A 45C	3,88
15	275	2,447	A 43B	66,55	A 45C	4,73	A 44B	4,00	B 65D	2,55	B 68C	2,55
16	588	4,716	E 06B	19,22	A 47F	10,20	A 47B	9,52	B 65D	8,50	E 04F	7,48
17	966	2,614	B 65D	66,98	A 47F	5,59	B 31B	3,00	B 42F	2,17	A 47G	1,86
18	528	4,738	G 09F	19,13	B 65D	17,42	A 47F	10,42	B 42D	6,82	A 63H	3,60
19	7	2,236	A 47F	28,57	B 67D	28,57	B 01J	14,29	B 60P	14,29	B 60S	14,29
20	1.265	6,334	A 61K	10,43	B 65D	6,96	A 01N	5,22	C 11D	2,53	C 02F	2,45
21	1.134	2,677	A 61K	56,79	C 07D	16,84	C 07C	5,47	C 07K	2,03	A 61F	1,76
22	2.520	5,815	B 65D	23,17	A 47G	3,69	F 16L	3,33	A 01G	2,86	A 01K	2,38
23	952	5,502	E 04C	10,19	E 04B	9,03	E 04F	8,40	A 47K	5,25	E 03D	5,04
24	623	6,062	E 04F	6,58	E 06B	6,58	B 66B	5,62	A 47B	4,65	E 04B	3,21
25	3.744	6,543	E 06B	8,65	E 05B	7,45	E 04G	5,21	A 47B	3,63	E 04F	3,61
26	1.332	6,863	H 01Q	6,98	H 01R	3,53	H 04N	3,08	G 01R	2,40	H 05B	2,18
27	3.190	5,921	F 24C	7,93	D 06F	7,27	H 02G	6,99	H 05B	6,74	H 01R	5,92
28	4.725	7,053	F 03D	5,16	B 65B	4,19	B 65G	2,79	B 66B	2,50	A 23N	2,43
29	1.640	5,506	B 60R	18,11	B 62D	7,50	B 60J	6,22	B 60P	4,45	B 60N	4,27
30	395	5,658	B 61F	10,38	B 61D	7,09	E 01B	6,84	B 64C	6,58	B 62K	5,82
31	1.296	3,728	A 47C	34,34	A 47B	22,15	A 61G	7,10	A 47F	6,94	A 47K	2,62
32	1.390	5,223	A 63H	29,14	A 63F	5,18	A 61B	5,04	A 63B	4,17	A 61C	3,17

Source: Author own work

TABLE 9 B
IPC SUBCLASS DEPENDING ON NACE SERVICE DIVISIONS

CNAE Division	Frequency	Enthropy	IPC Subclass	%	IPC Subclass	%	IPC Subclass	%	IPC Subclass	%	IPC Subclass	%
33	319	6,353	A 01K	7,84	B 01D	4,70	B 65G	4,70	B 65D	4,08	B 28B	2,82
35	351	5,606	F 24J	23,08	H 01L	5,41	F 03D	3,99	F 03G	3,99	B 01D	2,85
36	91	3,728	C 02F	31,87	B 01D	17,58	E 03B	9,89	F 16K	3,30	G 01F	3,30
37	29	3,548	C 02F	27,59	E 04H	13,79	B 01J	6,90	C 01B	6,90	G 01M	6,90
38	144	5,301	B 65F	17,36	B 65D	9,03	B 03B	3,47	A 61L	2,78	A 62C	2,78
39	13	3,393	A 01M	15,38	B 01D	15,38	A 47B	7,69	A 61L	7,69	B 03B	7,69
41	493	6,173	E 04B	7,71	E 04G	6,09	F 16K	5,48	E 04H	4,06	B 65D	3,25
42	277	5,799	E 01B	8,30	C 02F	5,42	E 01F	5,42	E 01C	4,69	E 04G	3,97
43	923	6,599	E 04F	7,91	E 04B	4,88	E 04G	3,90	E 04H	3,79	F 24J	3,03
45	287	6,159	B 28D	6,97	B 60P	5,92	B 60R	4,88	B 62D	4,53	B 60S	3,48
46	5.692	7,238	B 65D	6,31	A 61K	4,01	B 62B	3,32	A 47B	2,27	E 04F	1,74
47	1.016	6,962	A 47B	4,33	A 47C	4,13	B 65D	3,64	E 06B	2,76	A 47G	2,46
48	1	0,000	A 41H	100,00								
49	164	5,517	B 65D	10,37	E 01B	8,54	B 60M	6,10	B 61L	6,10	B 61D	4,88
50	27	3,184	E 04B	25,93	B 66C	14,81	E 04F	14,81	B 65G	11,11	B 63H	7,41
51	2	0,000	G 09F	100,00								
52	81	4,894	B 65D	12,35	E 01F	9,88	G 07B	6,17	B 60P	4,94	B 63B	4,94
53	12	3,022	A 47G	25,00	G 07F	16,67	A 47F	8,33	A 47J	8,33	B 42D	8,33
55	132	5,543	B 01D	8,33	B 01J	8,33	A 01G	4,55	G 01N	4,55	A 23L	3,79
56	68	4,955	B 65D	10,29	A 47J	8,82	A 23L	7,35	G 07F	5,88	A 21D	4,41
58	72	4,571	B 42D	12,50	A 63F	11,11	B 65D	8,33	A 45C	6,94	A 47F	5,56
59	32	4,140	B 65D	12,50	B 67D	9,38	F 25D	9,38	A 63B	6,25	A 63J	6,25
60	6	2,585	G 01D	16,67	G 06F	16,67	G 06Q	16,67	H 01Q	16,67	H 04B	16,67
61	384	3,871	H 04W	26,04	H 04L	22,40	H 04B	7,03	H 04M	6,51	H 04Q	4,43
62	371	6,087	G 06F	9,16	G 06Q	5,12	H 04L	4,85	G 06K	4,58	H 04B	4,58
63	60	5,102	G 09F	10,00	B 05B	6,67	B 65D	6,67	G 06F	5,00	A 61J	3,33
64	774	6,627	B 66B	7,11	F 24C	4,65	F 16K	4,39	F 25D	4,26	A 47J	3,88
65	3	0,918	B 65D	66,67	B 62D	33,33						
66	55	4,506	B 65D	10,91	A 01K	9,09	G 06Q	7,27	G 07F	7,27	A 01D	5,45
68	712	6,626	B 65D	7,02	B 62B	3,79	A 01K	3,09	E 06B	3,09	E 04B	2,95
69	190	5,568	A 61K	12,11	A 61J	5,79	A 61M	5,26	G 01N	4,74	B 01L	4,21
70	299	6,110	B 65D	10,37	A 61K	6,35	A 61F	4,01	B 60R	4,01	A 01G	3,34
71	1.709	7,261	E 04B	3,51	B 60J	3,45	B 29C	2,63	F 24J	2,52	B 60R	2,28
72	2.563	6,846	A 61K	10,42	G 01N	5,54	A 61B	4,80	C 12Q	3,98	C 12N	3,08
73	418	5,072	G 09F	24,40	B 65D	9,33	A 47G	6,22	A 47F	3,83	E 04H	3,35
74	573	6,642	G 07F	6,63	B 65D	5,93	A 63F	3,66	A 61C	3,49	G 09F	2,79
75	2	1,000	A 01K	50,00	G 01G	50,00						
77	246	5,914	A 61F	7,72	B 62D	6,50	E 04G	5,69	B 65D	4,47	B 60J	3,25
78	3	0,918	B 26B	66,67	G 01S	33,33						
79	13	2,412	F 24C	30,77	E 03C	23,08	A 41D	15,38	G 03B	15,38	B 62J	7,69
80	2.104	6,071	A 61K	13,64	G 01N	6,13	B 01J	5,32	C 12N	5,32	A 23L	3,18
81	106	4,969	A 01M	11,32	B 66B	9,43	G 09F	7,55	E 04H	6,60	B 08B	5,66
82	339	6,459	B 65D	7,96	A 47G	5,90	E 04B	3,54	F 04B	2,65	H 04N	2,65
84	229	5,888	G 01N	9,61	A 61K	8,30	C 12N	3,93	C 12Q	3,93	G 05F	3,49
85	6.042	7,039	A 61K	7,65	G 01N	6,11	A 61B	4,55	B 01J	3,33	C 12Q	2,58
86	450	4,489	A 61B	17,33	A 61K	16,89	C 12Q	9,33	A 61C	7,78	A 61F	5,33
87	47	3,576	A 61K	36,17	A 61B	6,38	A 61F	6,38	A 01H	4,26	A 45C	4,26
88	13	3,547	A 61G	15,38	A 01G	7,69	A 45C	7,69	A 61H	7,69	B 42D	7,69
89	1	0,000	A 47F	100,00								
90	11	2,845	E 04H	27,27	A 63H	18,18	A 63J	9,09	B 65D	9,09	F 16B	9,09
91	174	6,053	F 01K	7,47	E 04B	5,17	C 12N	4,02	F 03B	3,45	C 12Q	2,87
92	21	3,268	A 63F	23,81	G 07F	19,05	B 65D	9,52	G 06F	9,52	A 43B	4,76
93	73	4,301	A 63B	19,18	G 07F	13,70	A 63C	8,22	G 09F	6,85	A 63G	4,11
94	27	4,459	A 61B	7,41	A 63C	7,41	B 65D	7,41	G 06F	7,41	A 01K	3,70
95	81	4,896	A 47J	20,99	A 47C	6,17	B 41F	6,17	A 47G	3,70	D 06F	3,70
96	111	4,785	A 61G	17,12	A 01G	8,11	E 04H	7,21	A 01K	6,31	A 47K	6,31
98	1	0,000	A 47B	100,00	A 01B							
99	4	1,500	A 41D	50,00	A 61H	25,00	A 61J	25,00				

Source: Author own work