

THE MACROECONOMIC DIMENSION OF THE EFFECTIVENESS OF THE SYSTEM APPROACH TOWARDS THE MANAGEMENT¹

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Abstract. The study provides the results of the analysis of the relation between the number of the granted certificates of management systems, chosen macroeconomic data and indicators characterizing the EU27 member states. The strongest correlations were noticed between the number of gathered certificates and such factors as: employment in medium-sized enterprises, the value of trade and the value of foreign investments, the area, the population and the weak correlation was noticed with the inflation. While the problem of the influence of the certification on the activity in the microeconomic scale was described in details in literature, it is hard to find a lot of studies in which the relations between the number of the certified organizations in the country and its macroeconomic condition were analyzed.

Key words: management systems, ISO certificates, macroeconomic conditions

INTRODUCTION

Under conditions of the increased market competition and continuous changes, which accompany the business activity each enterprise faces the extremely difficult task which is an identification of all elements and aspects of functioning of the organization as well as environment factors, which largely determine its development.

The effective way, which sets the direction for the actions of the organization and allows to monitor the degree of the achievement of the goals and the thorough analysis of problems appearing in the organization, is the implementation of the system approach towards management. Its main objective is to maximize the profit of the enterprise, while maintaining a balance between individual elements of the organization.

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The system approach towards managing the organization consists of managing individual aspects of functioning of organization, such as: quality, food safety, environment, information security etc.

Organizations implement more and more universally numerous system solutions as confirmed by the Figure No. 1, showing the structure of certificates obtained by enterprises in the EU countries. The system approach towards the management is based on requirements of individual norms, such as:

- ISO 9001 – it includes requirements concerning the quality management system which an enterprise should take into account, in order to both demonstrate its ability for delivering products that meet legal and customer requirements and increase customer satisfaction [Łunarski 2008].
- ISO 14001 – Environmental management systems. Requirements and guidelines for implementing, which are the base for an enterprise to apply for the certificate. The main objective is to create the effective system of the environmental management, which is a part of the integrated management system in the organization. It is the intention of the system to assist organizations by achieving business objectives, while complying with the principles of the protection of the environment [Poskrobko 2007].
- ISO 16949 – ISO/TS 16949: 2002 is an ISO technical specification, in which the American (QS-9000), German (VDA6.1), French (EAQF) and Italian (AVSQ) norms of quality management systems in the automotive industry were standardized, in order to eliminate the need of multiple certification schemes depending on needs of recipient systems. Except the needs described in the standard, also individual requirements of a customer may appear, which are required by individual manufacturers of vehicles [ISO/TS 16949: 2009].
- ISO 27000 – ISO/IEC 27001 – an international standard standardizing information security management systems. It was published on the basis of the British BS standard

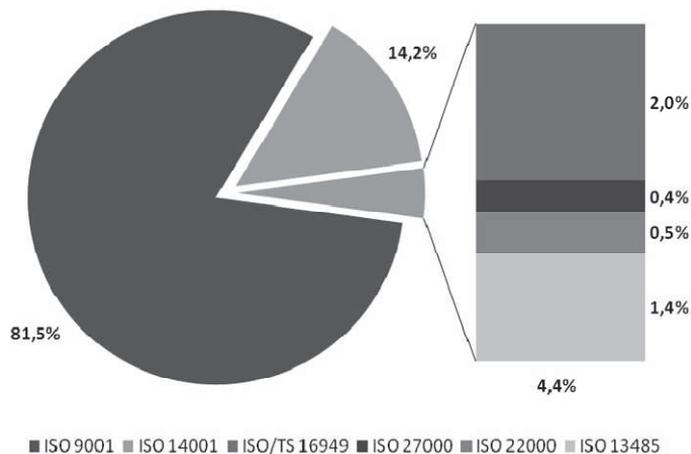


Fig. 1. Structure of certificates in the European Union

Rys. 1. Struktura certyfikatów w Unii Europejskiej

Source: own study 2010 on the basis of ISO Survey 2009

Źródło: opracowanie własne 2010 na podstawie ISO Survey 2009

7799-2, published by BSI, on the 14th October 2005. It was in Poland, that the standard ISO/IEC 27001 was published as PN-ISO/IEC 27001: 2007 on the 4th January 2007. ISO/IEC 27001: 2007 is a specification of information security management, with which conformity may be confirmed by audits, on the basis of which certificates are issued.

- The standard EN ISO 22000:2005, Food safety management systems – Requirements for any organization in the food chain, was issued in 2005, while its Polish version – the standard PN-EN ISO 22000:2006 Food safety management systems – Requirements for any organization in the food chain comes from 2006. This standard has the structure similar to the standard PN-EN ISO 9001:2009 “The quality management systems – Requirements” and the standard PN-EN ISO 14001:2005 “The environmental management systems – specifications and guidelines for implementation” what greatly facilitates their mutual integration [Wysokińska-Senkus 2009].
- ISO 13485 “Medical products – quality management systems – requirements for the systems due to legal requirements” specifies requirements for quality management systems, which can be implemented by organization for designing and development of production, installation and servicing medical devices as well as designing, development and providing services associated with it.

While studies, which confirm the impact of implementation of the systems on micro-economic variables characterizing organizations, are widely known [Wysokińska-Senkus 2008], the studies on relation between the number of certificates and variables characterizing individual economies had not been found. Therefore the author of the study decided to make an attempt to conduct such analysis.

METHODOLOGICAL BACKGROUND OF THE STUDY

The units of the study were the countries being members of the European Union (EU27). The study consisted in determining the coefficient of correlation between the number of certificated organization within the scope of previously defined norms² and basic macroeconomic indicators describing economies such as: population, area, unemployment rate, inflation, number of active enterprises, GDP per capita, number of employed people, employment structure by sizes of the enterprises, added value of the industry, the labour productivity, value of the export, value of the import, average salary, minimum salary, the difference between the remuneration of men and women (%), the inflow of foreign investments, investments abroad. The data for the study were from 2008 and were the most up-to-date available data at that time.

²ISO 9001 norms – quality management systems – Requirements, ISO 14001 – Environment management systems – Requirements and guidelines for applying, ISO 16949 – Quality management systems – Particular requirements for the application of ISO 9001:2008 for automotive production and relevant service part organizations 1, ISO 27001 – information systems, safety requirements, ISO 22000 – food safety management systems – requirements for any organization in the chain of food manufacturers, ISO 13485 – medical products – quality management systems – requirements towards systems due to legal requirements.

The Pearson's linear correlation coefficient which is a measure of the strength of the relation between two measurable characteristics was used as the tool of the analysis. It takes the values from the range: $-1 < r < +1$ and can be calculated as follows [Aczel 2000]:

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2} \sqrt{\sum_{i=1}^n (y_i - \bar{y})^2}},$$

$$r_{xy} \in [-1, 1].$$

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i, \bar{y} = \frac{1}{n} \sum_{i=1}^n y_i$$

where:

x and y are random variables with continuous distributions,

x_i, y_i are values of random samples of these variables ($i = 1, 2, \dots, n$),

\bar{x}, \bar{y} – average values of these samples.

The positive sign of the coefficient of correlation points out to the existence of the positive interdependence (positive), negative however indicates the negative interdependence (negative). The closer the value of the modulus of the coefficient of the correlation to 1 is, the stronger the correlative relation between examined variables is. It is as an indication that it is assumed that correlation between two characteristics is: indistinct – if modulus of $r < 0.3$; average – if $0.3 < \text{modulus of } r < 0.5$; clear – if modulus of $r > 0.5$.

RESULTS OF THE ANALYSES

The summary table (Table 1) presents the correlation coefficients. Due to the strong positive relation between the number of ISO 9001 certificates and other ISO certificates, which were analysed in the study, the detailed results will be discussed only on the example of the relation between the number of ISO 9001 certificates and other characteristics.

The analysis showed the strong positive relation between geographical (area of the country) and demographic variables (the population) – that was 0.501 and 0.764 respectively. Such a relation does not appear in the rest of the world. The existence of such a correlation can be explained in connexion with the relation with the number of registered enterprises and, consequently, with strong competition in the European Union. The distribution of variables – the number of certificates and the population – were presented on Figure 2 and the distribution of variables: the number of certificates and the number of enterprises were presented on Figure 3.

Table 1. The correlation table of selected ISO standards and macroeconomic indicators
 Tabela 1. Tabela korelacji wybranych norm ISO i wskaźników makroekonomicznych

		Area Powierzchnia	Population Liczba ludności	ISO 9001	ISO 14001	ISO/TS 16949	ISO 27000	ISO 22000	ISO 13485	Unemployment Bezrobocie
		A	B	C	D	E	F	G	H	I
ISO9001	1	.501(**)	.764(**)	1	.890(**)	.609(**)	.565(**)	-0.010	.582(**)	0.076
ISO14001	2	.612(**)	.715(**)	.890(**)	1	.529(**)	.648(**)	-0.024	.428(*)	0.051
ISO16949	3	.555(**)	.860(**)	.609(**)	.529(**)	1	.437(*)	-0.057	.939(**)	0.028
ISO27000	4	0.271	.654(**)	.565(**)	.648(**)	.437(*)	1	-0.062	.509(**)	0.225
ISO22000	5	0.042	0.024	-0.010	-0.024	-0.057	-0.062	1	-0.095	-0.061
ISO13485	6	.419(*)	.818(**)	.582(**)	.428(*)	.939(**)	.509(**)	-0.095	1	-0.075

		Inflation Inflacja	Number of com- panies Liczba firm	GDP per capita PKB na 1 miesz.k.	Value added Wart. dod.	Employment Zatrudnienie	Employment structure (%) Struktura zatrudnienia % (nf.)			
		J	K	L	M	N	Micro Mikro	Small Małe	Medium Średn.	Large Duże
ISO9001	1	-0.254	.845(**)	0.029	.682(**)	.784(**)	0.325	0.007	-.502(**)	-0.134
ISO14001	2	-0.246	.791(**)	0.047	.662(**)	.762(**)	0.219	0.012	-.483(*)	-0.018
ISO16949	3	-0.297	.648(**)	0.045	.827(**)	.847(**)	-0.028	-0.021	-0.270	0.195
ISO27000	4	-0.212	.411(*)	0.015	.745(**)	.731(**)	0.021	-0.199	-0.384	0.278
ISO22000	5	-0.047	0.060	-0.143	-0.110	-0.026	.600(**)	-0.388	-.451(*)	-0.314
ISO13485	6	-0.295	.539(**)	0.109	.849(**)	.816(**)	-0.092	-0.015	-0.238	0.253

		Productivity Prod. pracy	Export and import/ca Eksp. i imp./ca	Export Eksport	Import Import	Average wage Średnia płaca	Minimum wage Płaca min.	Incoming investment Napływ inwestycji	Investments abroad Inwestycje za granicą
		S	T	U	V	W	X	Y	Ż
ISO9001	1	0.177	0.029	.585(**)	.637(**)	0.124	0.192	.502(**)	.514(**)
ISO14001	2	0.161	0.047	.495(**)	.567(**)	0.090	0.112	.537(**)	.568(**)
ISO16949	3	0.161	0.045	.905(**)	.892(**)	0.193	0.191	.648(**)	.647(**)
ISO27000	4	0.116	0.015	.533(**)	.591(**)	0.234	0.207	.712(**)	.758(**)
ISO22000	5	-0.129	-0.143	-0.096	-0.078	-0.427	-0.093	-0.139	-0.126
ISO13485	6	0.220	0.109	.923(**)	.898(**)	0.307	0.440	.675(**)	.663(**)

Source: own elaboration based on EUROSTAT 2010, ISO Survey 2009

Źródło: opracowanie własne na podstawie EUROSTAT 2010, ISO Survey 2009

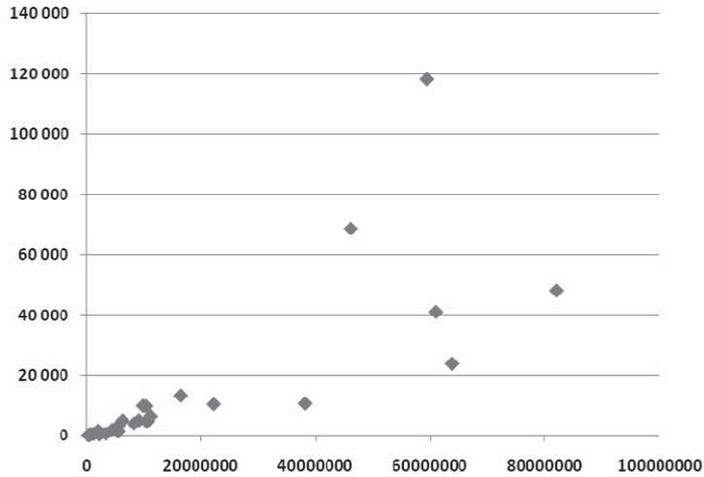


Fig. 2. The relation between the number of the ISO 9001 certificates and population of the EU27 countries

Rys. 2. Zależność pomiędzy liczbą certyfikatów ISO 9001 a liczbą ludności w krajach UE27

Source: own elaboration

Źródło: opracowanie własne

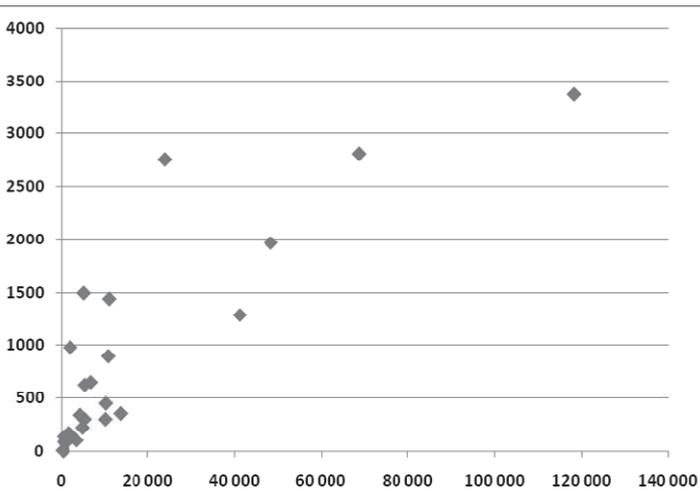


Fig. 3. The relation between the number of the ISO 9001 certificates and the total number of companies in the EU27 countries

Rys. 3. Zależność pomiędzy liczbą certyfikatów ISO 9001 a liczbą przedsiębiorstw w krajach UE27

Source: own elaboration

Źródło: opracowanie własne

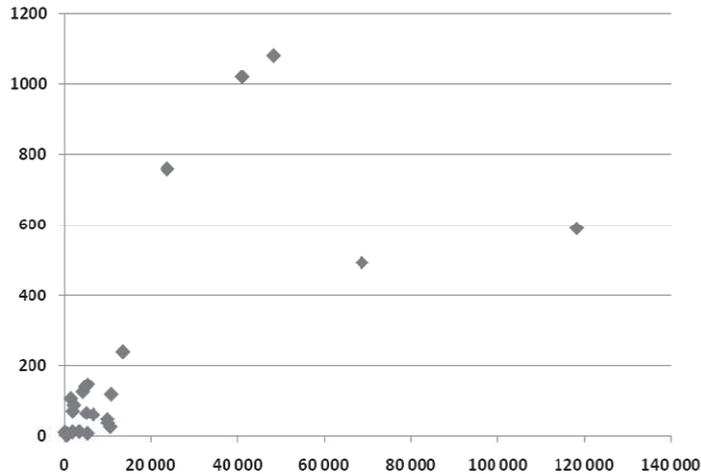


Fig. 4. The relation between the number of the ISO 9001 certificates and the value added in the EU27 countries

Rys. 4. Zależność pomiędzy liczbą certyfikatów ISO 9001 a wartością dodaną w krajach UE27

Source: own elaboration

Źródło: opracowanie własne

Such a significant positive correlation between the number of ISO 9001 certificates and the number of enterprises can be explained by the fact that many organizations implement the ISO 9001 standard due to the fact that it has become an essential standard of operation in many fields and it increases the marketing prestige of the organization, as well as it contributes to construction of the competitive edge of enterprises.

The analysis of the relation of the number of certified organizations and the value added of economies demonstrated that these are the features strongly related with one another – the correlation coefficient of 0.682. It is possible to find reasons for appearing of such a relation in combination with analysis of the relation of the number of certificates and the number of people employed – 0.784 (Figure 5), and with the number of certificates and the value of the trade: of export – 0.585 (Figure 6) and of import – 0.637 (Figure 7).

It is possible to explain such relations with fact that by holding certificates, the enterprises meet customary requirements for the quality of goods and services, in the trade exchange, they are able to conduct the free trade on a higher scale than other countries in the world and additionally the products of higher value added are subject to a trade within countries of the EU27 (Figure 4).

The analysis of the relation of the number of certificates and the employment structure in enterprises in terms of their size revealed a statistically significant negative relation towards medium-sized enterprises – -0.502 and a moderate positive relation towards micro-enterprises – 0.325. This is due to the fact that medium-sized enterprises, which are the most numerous among the certified organizations, take care particularly about the productivity (Figure 8).

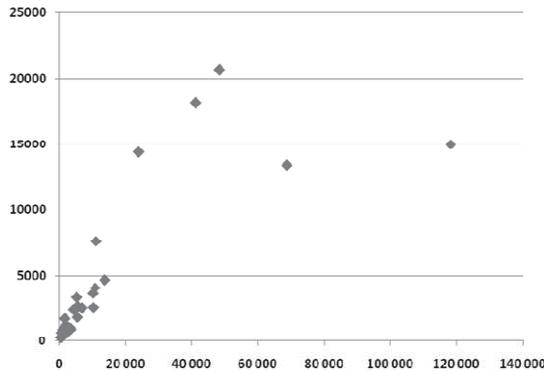


Fig. 5. The relation between the number of the ISO 9001 certificates and workforce in the EU27 countries

Rys. 5. Zależność pomiędzy liczbą certyfikatów ISO 9001 a liczbą pracujących w krajach UE27

Source: own elaboration

Źródło: opracowanie własne

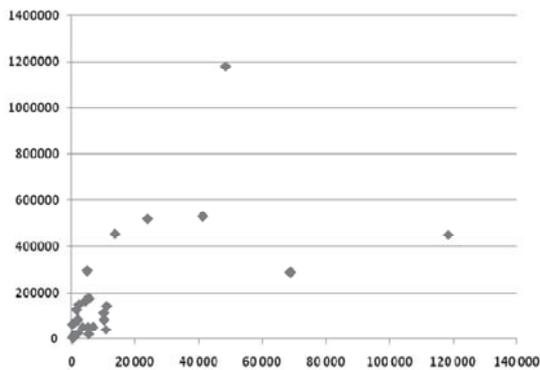


Fig. 6. The relation between the number of the ISO 9001 certificates and export of the EU27 countries

Rys. 6. Zależność pomiędzy liczbą certyfikatów ISO 9001 a wartością eksportu w krajach UE27

Source: own elaboration

Źródło: opracowanie własne

The countries, in which the number of certified enterprises is higher, are also perceived better as the aim of foreign investments (Figure 9). It is evidenced by a high positive correlation between the inflow of the foreign capital and the number of certificates – 0.502. These countries handle also quite well as potential investors – in this case the value of the coefficient is 0.514 (Figure 10).

One more relation is noteworthy – between the number of certificates and the inflation. The correlation coefficient of -0.254 points out to the fact that it is in countries, where more certified enterprises operate that the lower inflation rate is recorded.

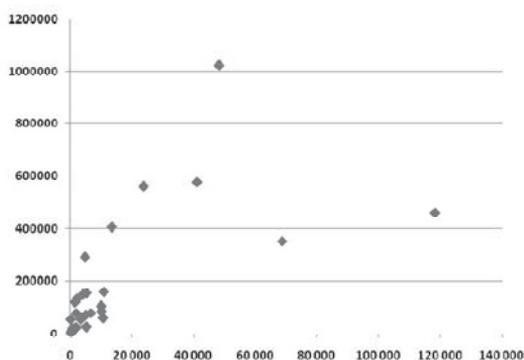


Fig. 7. The relation between the number of the ISO 9001 certificates and import of the EU27 countries

Rys. 7. Zależność pomiędzy liczbą certyfikatów ISO 9001 a wartością importu w krajach UE27

Source: own elaboration

Źródło: opracowanie własne

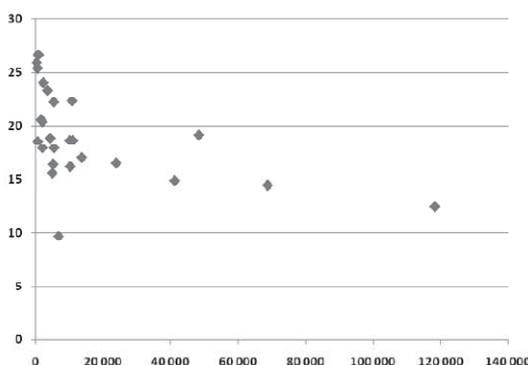


Fig. 8. The relation between the number of the ISO 9001 certificates and number of SME workers EU27 countries

Rys. 8. Zależność pomiędzy liczbą certyfikatów ISO 9001 a odsetkiem zatrudnionych w sektorze średnich przedsiębiorstw w krajach UE27

Source: own elaboration

Źródło: opracowanie własne

The studies did not show statistically significant relation between the number of certificates, the unemployment, the labour productivity, the minimum wage, the difference in earnings of women and men or the average wage.

SUMMARY

The results of analysis presented above, show that there is a relation between the number of certified enterprises and some indicators attesting to the condition of economies of the countries of the EU27. This means that the better the economic position of

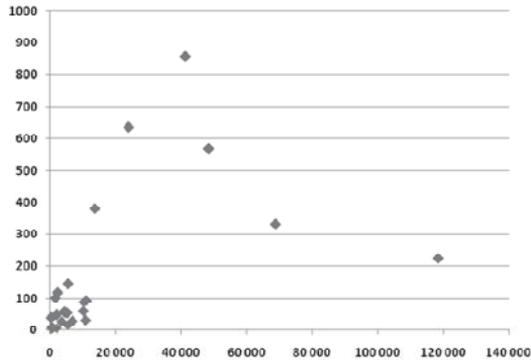


Fig. 9. The relation between the number of the ISO 9001 certificates and foreign investments in the EU27 countries

Rys. 9. Zależność pomiędzy liczbą certyfikatów ISO 9001 a napływem inwestycji zagranicznych w krajach UE27

Source: own elaboration

Źródło: opracowanie własne

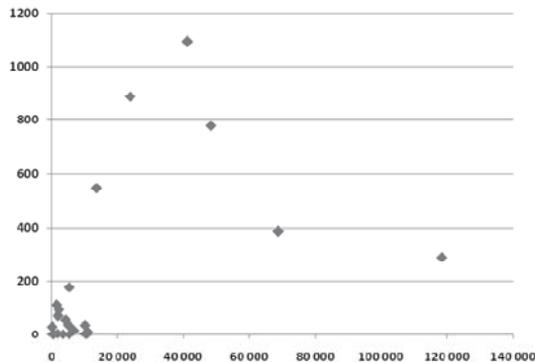


Fig. 10. The relation between the number of the ISO 9001 certificates and investments outside of the EU27 countries

Rys. 10. Zależność pomiędzy liczbą certyfikatów ISO 9001 a inwestycjami za granicą w krajach

Source: own elaboration

Źródło: opracowanie własne

analysed countries is, the more certified enterprises exist. It is worthwhile to monitor the strength of the relation between examined characteristics or conduct studies with separation for “old” and “new” countries of the UE.

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MAKROEKONOMICZNY WYMIAR EFEKTYWNOŚCI SYSTEMOWEGO PODEJŚCIA DO ZARZĄDZANIA

Streszczenie. Powyższe opracowanie stanowi przedstawienie wyników analizy zależności pomiędzy liczbą przyznanych certyfikatów systemów zarządzania, wybranymi danymi makroekonomicznymi, wskaźnikami charakteryzującymi państwa członkowskie UE27. Najsilniejsze korelacje dostrzeżone zostały pomiędzy liczbą certyfikatów a zatrudnieniem w średnich przedsiębiorstwach, wartością wymiany handlowej i wartością inwestycji zagranicznych, powierzchnią, liczbą ludności i dostrzeżono słaby związek z inflacją. O ile problem wpływu certyfikacji na mikroekonomiczną skalę działalności został dość szczegółowo opisany w literaturze, to do chwili obecnej nie można znaleźć wielu opracowań, w których próbuje się znaleźć powiązania pomiędzy liczbą certyfikowanych organizacji w danym kraju a jego kondycją makroekonomiczną.

Słowa kluczowe: systemy zarządzania, certyfikacja ISO, makroekonomia

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