Clustering of European countries based on ISO 9000 certification diffusion

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Abstract

Purpose – One of the stated goals behind the formation of the International Organization for Standardization was to develop standards to facilitate international trade in goods and services. This goal has caused different country-group trends in the diffusion of ISO certification. The purpose of this paper is to create a taxonomy of ISO 9000 certification diffusion in Europe.

Design/methodology/approach – The diffusion of ISO certificates in Europe was analyzed using the single linkage clustering algorithm. Then the features of each cluster were highlighted.

Findings – European nations were found to belong to three macro areas which differ for patterns of ISO 9000 certification diffusion: the constant growth area, the saturation area and the decline area.

Research limitations/implications – The present study deals with European nations, focusing on ISO 9000 standards. Future research will be addressed toward the analysis of other standards in a wider geographical area in order to see if the results found for the European reality may be extended. In addition the outcomes of such analysis may be used to enhance the existing models for the diffusion of ISO 9000 certification.

Practical implications – The analysis of the evolution of the certification market may arouse the interest of both companies and certification bodies that, from this study, may gain an insight into the future possible demand of certification. Furthermore, this study can be interesting from a legislature point of view, providing an answer to a more general question: "What is the general life cycle of standards or regulations?"

Originality/value – The novelty of the paper is the clustering approach that allows the grouping of different nations according to similar diffusion dynamics.

Keywords Quality standards, ISO 9000 series, Transfer processes, Cluster analysis, Europe

Paper type Research paper

1. Introduction

The ISO 9000 certification system for firm quality was introduced in 1987, and by the end of 2007, more than 950,000 ISO 9000 certificates had been issued in 175 countries and economies (ISO, 2008). So far, ISO 9000 quality standards have been the most successful and widespread set of standards implanted by the International Organization for Standardization (Casper and Hancké, 1999; Mendel, 2002; Clougherty and Grajek, 2008).

A flourishing literature attempted to identify and classify the drivers of such a remarkable spread of ISO 9000 certification. Some diffusion explanations have been identified in the role of government directives, in the government agencies mandating contractor adoption, in the multinational enterprises requiring supplier adoption, and

in the extensive adoption by trading partner and trading competitor countries (Clougherty and Grajek, 2008; Corbett, 2006; Guler *et al.*, 2002; Mendel, 2002). Although the literature about ISO diffusion drivers is rich, the macro-level economic impact of ISO 9000 certification has been an under-investigated topic.

The aim of this paper is to look at the particular diffusion pattern the ISO 9000 standards experienced across the European continent. More specifically, we are interested whether the adoption of ISO 9000 standards has suffered local influences due to particular environmental factors such as government analogous regulations or similar economic market situations. To this purpose the European Union (EU) national patterns of ISO certification diffusion have been analyzed and clustered. Data are drawn out from the annual *ISO Survey*s. Results, which are found to be robust to different clustering strategies, highlight three different European macro-areas: the Eastern Europe area together with Italy and the Iberian Peninsula in which certification is still having a rapid growth phase; the Central Europe area in which the certification phenomenon has reached a saturation; and the "Island" area where the number of certifications is slowly decreasing after having reached a maximum.

In order to support the analysis, this paper is organised as follows: Section 2 and 3 consider the properties of ISO 9000, and analyze the micro and macro-level reasons for local certification diffusion. Section 4 and 5 analyze European certification market by means of different clustering approaches. Furthermore dissimilarities between different ISO diffusion profiles are translated into a two-dimensional map. Such a map allows and eases the visualisation of the local patterns of certification. Finally, clustering results are discussed.

2. Micro-level drivers of international business

There are many reasons why companies should look for the ISO 9000 certification. Certification to ISO 9000 standards does not guarantee any quality of end products and services; rather, it certifies that formalised business processes are being applied. For this reason it can be used as an important marketing tool to develop, strengthen and ease business contacts both with national and international partners.

Scholars and researchers are unanimous in recognising that ISO 9000 quality certification may help and ease business relations between companies from different countries. In particular Clougherty and Grajek (2008) identify three principal features stimulating business-to-business relations across borders:

(1) *Quality commitment signal.* ISO 9000 companies and enterprises are proud to claim a documented quality system that is implemented and followed, ensuring that products are made to exacting specifications (Guerin and Rice, 1996). Companies themselves recognise that quality assurance elements of ISO 9000 may help in business-to-business contractual relations when a supplier's capability to design and supply conforming products needs to be demonstrated (Conti, 1999). ISO certification can signal a firm's superior but unobserved attributes, steering customer companies when they have to deal with multiple suppliers, and the attributes of suppliers are intangible (Terlaak and King, 2006). This is even more important when suppliers are not from the same country: international business relations between customers and suppliers may suffer from informational, linguistic, cultural, regulatory or managerial barriers. In such a situation, ISO quality certification can strengthen the reliability image

of foreign suppliers (Clougherty and Grajek, 2008). In short, ISO 9000 offers a relatively low-cost signal of a firm's commitment to quality reducing trade barriers between businesses.

(2) *Common language.* There is evidence that ISO 9000 certification involves a common-language that facilitate communication between businesses (Casper and Hancké, 1999; Dissanayaka *et al.*, 2001; Clougherty and Grajek, 2008). Establishing a common procedural language to be used across organisations, ISO 9000 certification represents an efficient tool to communicate internal systems to customers. The common-language of ISO 9000 thus represent an efficient improvement upon the situation where each customer specifies unique requirements for quality management. Accordingly, the common-language of ISO certification helps to reduce trade barriers between businesses from different countries by allowing for the ready communication of a firm's production system, and by eliminating costly multiple quality standards.

(3) *Conflict settling.* ISO 9000 standards may help reduce and in many cases settle organisational disputes (Mendel, 2002). Furthermore, by clarifying the division of labour and responsibilities involved with complex inter-organisational production, ISO 9000 minimise inter-organisational conflict. In other words ISO certification can help clarify situations where faults are unintended and not due to opportunistic behaviour. In this vein the certification may be used as a marketing tool to signal that the company is "easier to deal with" (Hayes, 1994). In short, the conflict-settling feature of ISO certification reduces trade barriers between businesses from different countries by defining reasonable working procedures that ease inter-firm relations.

In sum, ISO 9000 helps standardise practices and terminology, mobilise resources, and structure efforts across organisations. The quality-signal, common-language, and conflict-settling features may lower the transaction costs and information asymmetries involved with business-to-business relations across borders, thus making business easier and potentially cheaper. Because of these features, propensity of some countries toward quality certification can affect the diffusion of certifications in those countries which are involved in strong business relations.
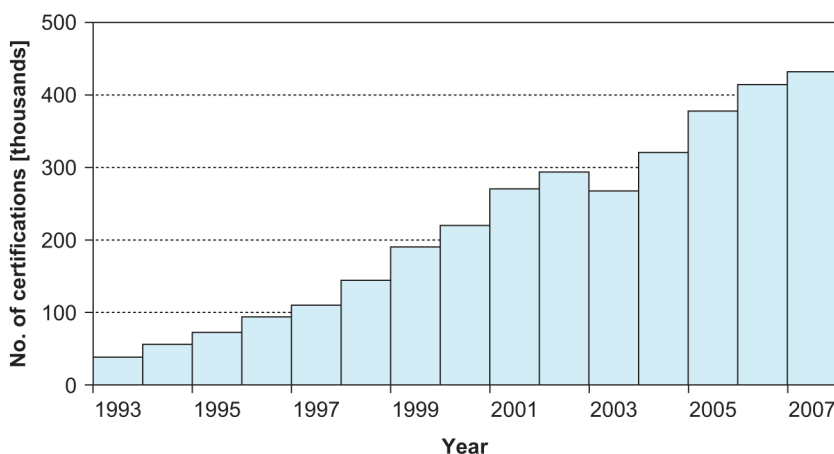
3. ISO 9000 certification evolution in Europe

The European growth of ISO 9000 certifications is still flourishing. For the purpose of our analysis, we consider Europe as defined by the annual *ISO Survey* (see Table I for more specific details). It should be noted too that the data supplied are of the numbers of certificate issued, not the numbers of sites covered by any one certificate (ISO, 2008). According to the last *ISO Survey* (ISO, 2008), the number of certifications seems to be constantly growing year by year (see Figure 1). Just around 2003 it is possible to notice a light drop due to the ISO standards changeover from the ISO 9000:1994 to the ISO 9000:2000 version.

From Figure 1 it is noteworthy how the market of ISO certification does not seem to face any crisis in Europe. The phenomenon has not reached a saturation level yet. On the other hand, the European share of the world certifications appears to be constantly decreasing (see Figure 2). This is not due to a slow down of the European trend of certifications but it is rather the result of a faster increase of Far East contribution to

	Europe	Africa and West Asia	North America	Far East	Oceania	Central and South America	Total
January 1993	23,092	1,272	2,613	1,583	3,184	140	31,884
September 1993	37,779	1,855	4,915	3,091	4,629	475	52,744
June 1994	55,400	2,619	7,389	5,979	6,479	733	78,599
March 1995	71,918	3,378	10,374	9,240	10,526	1,220	106,656
December 1996	92,611	6,162	16,980	18,407	9,478	1,713	145,351
December 1997	109,961	8,668	25,144	29,878	12,946	2,989	189,586
December 1998	143,674	12,150	33,550	37,920	16,751	5,221	249,266
December 1999	190,248	17,307	45,166	56,648	25,302	8,972	343,643
December 2000	220,127	20,185	48,296	81,919	27,299	10,805	408,631
December 2001	269,950	18,751	50,894	126,779	28,819	14,423	510,616
December 2002	292,970	23,534	53,806	148,573	29,204	13,660	561,747
December 2003	267,732	23,776	55,265	187,763	22,791	10,658	567,985
December 2004	320,748	31,443	49,962	220,966	19,997	17,016	660,132
December 2005	377,196	48,327	59,663	247,091	19,092	22,498	773,867
December 2006	414,232	71,438	61,436	300,851	19,590	29,382	896,929
December 2007	431,479	78,910	47,600	345,428	8,715	39,354	951,486

The heading above the table reads: Number of ISO 9000 certifications

Sources: ISO (2001, 2002, 2003, 2004, 2005, 2006, 2007)

Table I.
Number of ISO 9000
certifications per
geographic macro-areas

Source: ISO (2008)

Figure 1.
ISO 9000 certification
evolution in Europe

the total number of certifications. Nevertheless, Europe is still the macro-area with the highest number of certifications (see Tables I and II).

North America's position reveals a curious behaviour. The adoption of ISO 9000 certification has lagged behind that of other developed countries due to questions about whether the benefits of ISO 9000 registration were sufficient to offset costs and sheer complexity (Franceschini *et al.*, 2006). This behaviour was also supported by the natural dynamism of the North American market, which, in general, does not force companies in pursuing ISO 9000 certification as a distinguishing element in business
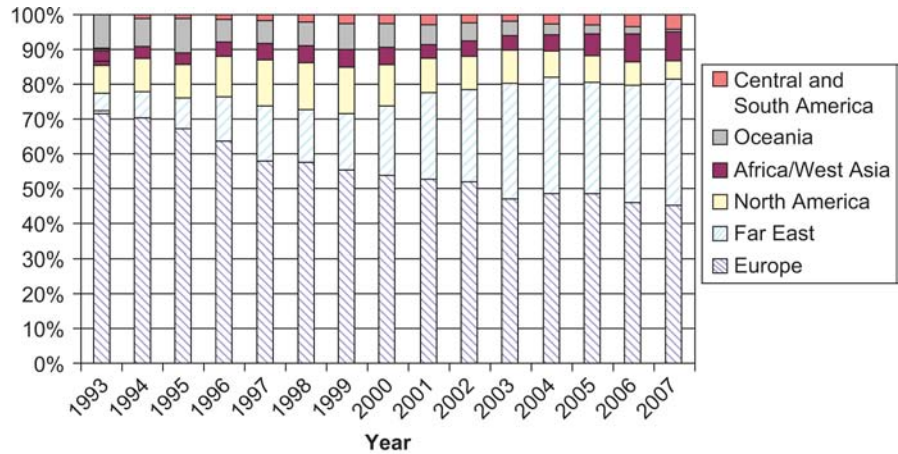
Figure 2.
Regional share of ISO 9000 certification

Source: ISO (2008)

	France	Germany	Italy	Russia	Spain	UK
			Number of ISO 9000 certifications			
January 1993	1,049	790	188	0	43	18,577
September 1993	1,586	1,534	864	5	320	28,096
June 1994	3,359	3,470	2,008	8	586	36,825
March 1995	4,278	5,875	3,146	15	942	44,110
December 1995	5,536	10,236	4,814	22	1,492	52,595
December 1996	8,079	12,979	7,321	56	2,496	53,099
December 1997	11,920	20,656	12,134	95	4,268	56,696
December 1998	14,194	24,055	18,095	132	6,412	58,963
December 1999	16,028	30,150	21,069	541	8,699	63,700
December 2000	17,170	32,500	30,367	1,134	12,576	63,725
December 2001	20,919	41,629	48,109	1,517	17,749	66,760
December 2002	19,870	35,802	61,212	1,710	28,690	60,960
December 2003	18,007	24,889	64,120	2,118	33,215	49,151
December 2004	21,769	26,654	84,485	3,816	40,972	50,884
December 2005	21,700	39,816	98,028	4,883	47,445	45,612
December 2006	21,349	46,458	105,799	6,398	57,552	40,909
December 2007	22,981	45,195	115,359	11,527	65,112	35,517

Table II.
Number of certifications for the top 6 GDP European countries

Sources: ISO (2001, 2002, 2003, 2004, 2005, 2006, 2007)

competition. On the other hand, Europe and the Far East are definitely the two macro-areas that better acknowledged the importance and potential of certification. While the exploding Far East economies are only recently looking at the international certification tool, the European countries were the first to demonstrate an interest in certification. Nevertheless it is easy to imagine that, even inside Europe, different countries experienced different reactions to the diffusion of ISO 9000 standards. Europe has been selected as the subject of the analysis, being historically the larger

market of ISO certification. Studying the European countries may help to analyze and forecast what the future of ISO certification will be both for the Old Continent and for the rest of the world.

4. Certification patterns inside Europe

In order to study the evolution of European ISO certification we pointed out some possible common traits in the evolution patterns. The aim of this analysis is to highlight certification diffusion in order to see if, on a local level, the domestic markets reacted differently to the certification phenomenon, and if the constant growth pattern in the European number of certification hides different evolution patterns similar to those that drove to a net differentiation between North America and Europe or Far East countries.

A preliminary analysis of the ISO 9000 certification diffusion shows different behaviours depending on the analyzed country. Observing Figure 3 it is evident how the certification number in Bulgaria is constantly increasing year after year, while in Belgium and the UK respectively it is keeping constant and has decreased during the last few years. Rather than different evolution patterns, the different behaviours can be interpreted as different pictures of the same phenomenon taken at different stages of its evolution. According to this interpretation, the certification evolution can be hypothesised to follow a pattern of behaviour roughly sub-divisible into three phases.

Figure. 4 qualitatively describes the three phases of certification evolution:

(1) *Growth phase*. Throughout this phase, the number of certifications constantly increases. Companies seek the certification attracted by the benefits deriving from the standards implementation.
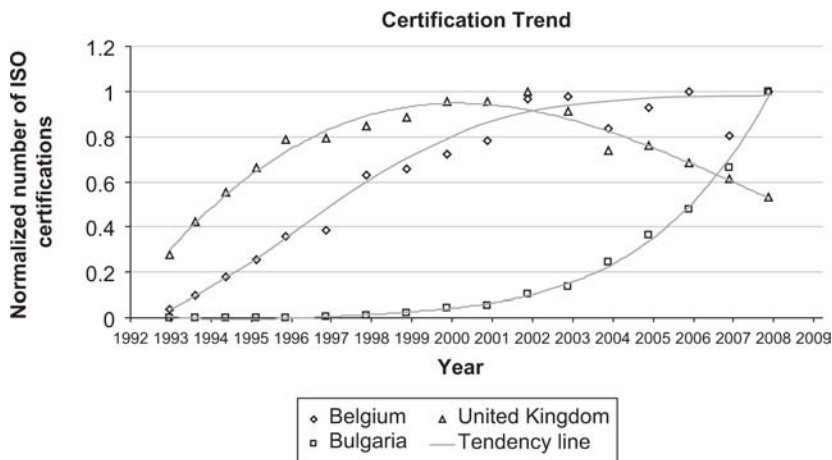

Note: For graphical reason the variable considered in our analysis is the normalized number of certification defined as the number of certifications issued divided by the maximum number of certifications issued in the period 1992-2007

Figure 3.
Number of ISO 9000
certification for a selection
of European countries
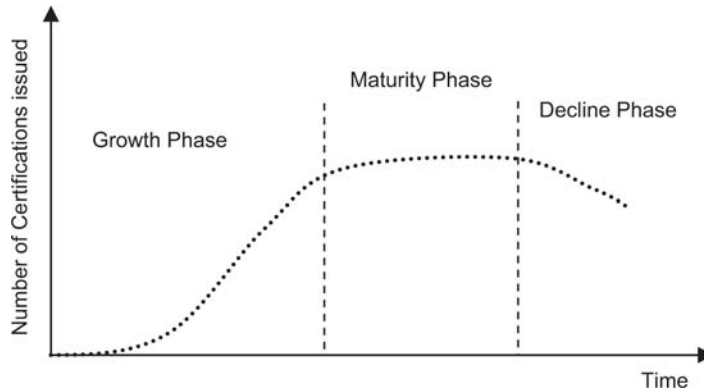
(2) *Maturity phase*. This is the phase during which the number of certifications issued keeps roughly constant.

(3) *Decline phase*. During this phase the number of certifications progressively diminishes owing to a standard loss of appeal.

The next sections are aimed at checking whether this hypothesis of distribution can apply to the European reality through a comparison and clustering of different evolution patterns.

4.1 ISO certification patterns analysis
To compare the diffusion dynamics, a dissimilarity metric can be defined considering the number of issued certifications in the corresponding European countries (ISO, 2001, 2002, 2003, 2004, 2005, 2006, 2007, Franceschini *et al.*, 2007):

$$d_{A,B} = 1 - \mathrm{corr}(n_A, n_B) \qquad (1)$$

where n_A and n_B are the numbers of certifications respectively issued within country A and B from 1992 to the end of 2007 (ISO, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008). According to the definition (equation (1)), the dissimilarity metric can be:

· close to zero for highly correlated ISO certification patterns;

· close to one for low correlated ISO certification patterns; and

· greater than one in case of negative correlation.

Although many other dissimilarity metrics can be used to this purpose, we found results produced to be robust to other possible dissimilarity definitions (such as the Euclidian distance, Manhattan distance, Mahalanobis distance, χ^2 distance, etc.) (Gower and Legendre, 1986). Considering data presented in Table III, this definition allows the construction of a dissimilarity matrix from which it is possible to classify the different behaviours of certifications diffusion.

Table IV presents the dissimilarity matrix just for a selection of European countries chosen according to the gross domestic product (GDP) and allows some preliminary reflections. It can be noticed how the German certification pattern is close to the French one, and Russia, Italy and Spain are experiencing similar diffusion dynamics. On the

Country	Jan. 1993	Sep. 1993	Jun. 1994	Mar. 1995	Dec. 1995	Dec. 1996	Dec. 1997	Dec. 1998	Dec. 1999	Dec. 2000	Dec. 2001	Dec. 2002	Dec. 2003	Dec. 2004	Dec. 2005	Dec. 2006	Dec. 2007
									Number of ISO 9000 certifications								
Austria	101	200	434	667	1,133	1,824	2,627	3,245	3,421	3,826	4,000	4,094	3,204	3,259	3,368	3,806	4,203
Belgium	180	464	870	1,226	1,716	1,871	3,042	3,176	3,495	3,760	4,670	4,725	4,032	4,471	4,810	3,865	4,822
Bulgaria				1	3	14	42	96	199	259	469	629	1,147	1,685	2,220	3,097	4,663
Croatia			2	8	22	38	96	121	336	302	415	590	580	966	1,273	1,676	2,073
Czech Republic		18	47	101	180	366	746	1,443	1,500	3,855	8,489	8,968	9,500	10,781	12,743	12,811	10,458
Denmark	326	608	916	1,183	1,314	1,387	1,902	2,200	1,962	2,258	2,163	1,900	1,195	1,050	1,219	1,840	1,794
Finland	185	324	496	646	772	951	1,445	1,450	2,105	2,200	1,870	1,872	2,058	1,784	1,914	1,986	1,804
France	1,049	1,586	3,359	4,278	5,536	8,079	11,920	14,194	16,028	17,170	20,919	19,870	18,007	21,769	21,700	21,349	22,981
Germany	790	1,534	3,470	5,875	10,236	12,979	20,656	24,055	30,150	32,500	41,629	35,802	24,889	26,654	39,816	46,458	45,195
Greece	18	46	90	162	248	348	682	764	1,050	2,173	2,325	3,180	2,000	2,572	3,255	4,753	5,132
Hungary	3	23	58	125	309	423	1,341	1,660	3,282	4,672	6,362	9,254	7,921	10,207	15,464	15,008	10,473
Iceland	2	3	4	4	12	44	59	62	28	28	30	27	25	28	43	37	16
Ireland	100	893	1,132	1,410	1,617	2,056	2,534	2,854	3,100	3,330	3,700	2,845	1,645	1,683	2,055	2,225	1,999
Italy	188	864	2,008	3,146	4,814	7,321	12,134	18,095	21,069	30,367	48,109	61,212	64,120	84,485	98,028	105,799	115,359
Luxembourg	4	10	21	40	48	46	89	106	113	136	108	148	118	108	147	145	197
The Netherlands	716	1,502	2,718	4,198	5,284	7,986	10,380	10,570	10,620	11,036	12,745	13,198	10,309	6,402	9,160	18,922	18,922
Norway	91	172	400	679	890	1,109	1,273	1,503	1,509	1,600	1,703	1,344	1,188	1,368	1,410	1,467	1,703
Poland	1	1	16	41	130	260	669	768	1,012	2,075	2,622	3,091	4,127	5,753	9,718	8,115	9,184
Portugal	48	85	181	257	389	535	819	944	1,131	1,696	2,474	3,061	4,035	4,733	5,820	5,851	5,283
Romania			6	15	42	61	214	269	466	1,032	1,670	2,463	3,189	5,183	6,097	9,426	9,633
Russia		5	8	15	22	56	95	132	541	1,134	1,517	1,710	2,118	3,816	4,883	6,398	11,527
Slovakia		5	11	27	59	135	404	575	560	522	827	1,544	1,231	2,008	2,050	2,195	2,840
Slovenia	3	16	43	62	99	152	467	502	521	843	1,026	973	466	1,811	2,114	2,182	1,886
Spain	43	320	586	942	1,492	2,496	4,268	6,412	8,699	12,576	17,749	28,690	33,215	40,972	47,445	57,552	65,112
Sweden	229	365	618	871	1,095	1,931	2,789	3,489	3,786	4,358	4,652	4,039	3,262	4,687	4,744	5,776	5,233
Switzerland	410	569	945	1,520	2,065	3,701	4,653	6,426	7,124	8,660	8,605	10,299	9,063	11,549	12,413	10,984	11,077
Turkey	26	65	106	270	434	606	1,284	1,607	1,672	2,287	2,949	3,941	3,975	5,009	10,929	12,350	12,802
Ukraine		1	4	7	8	14	30	56	82	151	269	893	387	934	1,375	1,808	2,150
UK	18,577	28,096	36,825	44,110	52,595	53,099	56,696	58,963	63,700	63,725	66,760	60,960	49,151	50,884	45,612	40,909	35,517

Sources: ISO (2001, 2002, 2003, 2004, 2005, 2006, 2007)

Table III.
Number of ISO 9000
certificates for the major
European countries

other hand, according to the dissimilarity metric definition given by equation (1), the UK pattern is far from almost all the others.

Extending the construction of the dissimilarity matrix to all the European countries, we apply the Single Linkage clustering algorithm (Gower and Ross, 1969) in order to subdivide all the certification diffusion patterns into three groups. The choice of the clustering algorithm was done according to its simplicity and efficiency, although the robustness of results has been tested with other algorithms.

Figure 5 presents a picture of the results provided by the clustering operation. Few countries are not included into the analysis due to a lack of data (Balkan and Baltic areas) or to a very low number of certifications issued (Island, Liechtenstein, Vatican City, etc.).

Figure 6 goes deeper into detail showing clustering results. For graphical reasons the plotted variable is the normalised number of ISO 9000 certifications per nation.

Figure 7 shows the evolution profiles for a selection of countries within the most highly populated cluster. All the major East European countries, together with Italy and the Iberian Peninsula belong to the constant growth area. These are countries in which the certification phenomenon seems not to suffer any crisis. Only Hungary, Slovenia, Czech Republic and Portugal suffered a slight drop during the last analysis year.

The second cluster in terms of population is the one shown in Figure 8. Most of the Western-Central Europe countries together with the Scandinavian Peninsula belong to

	France	Germany	Italy	Russia	Spain	UK
France	0	*0.04*	0.13	0.32	0.18	0.51
Germany	0		0.16	0.30	0.20	0.54
Italy			0	*0.10*	*0.01*	0.97
Russia				0	*0.07*	1.19
Spain					0	1.05
UK						0

Table IV.
Dissimilarity matrix of the top 6 GDP European countries

Notes: Low dissimilarity values suggest similar patterns of certification diffusion. Italics indicates dissimilarity values lower than 0.10
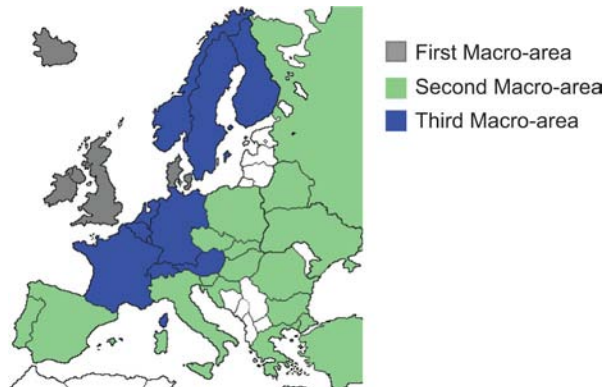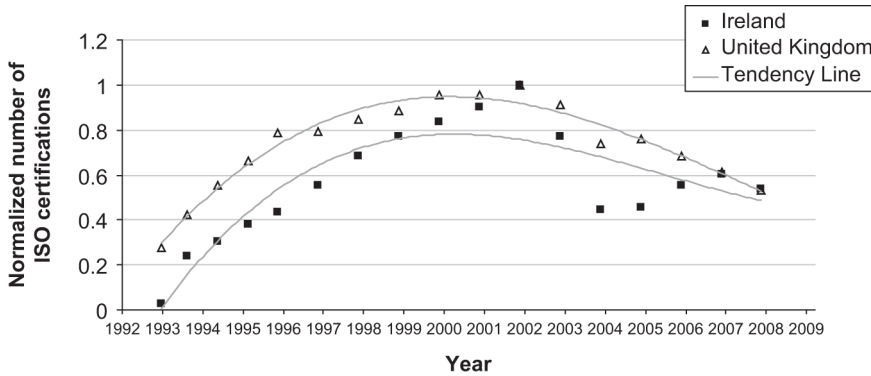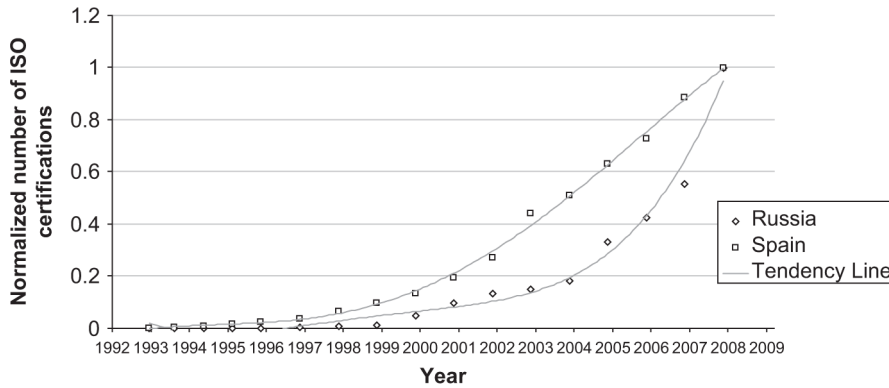

Figure 5.
Macro-areas defined by the single linkage clustering algorithm

First Macro-area
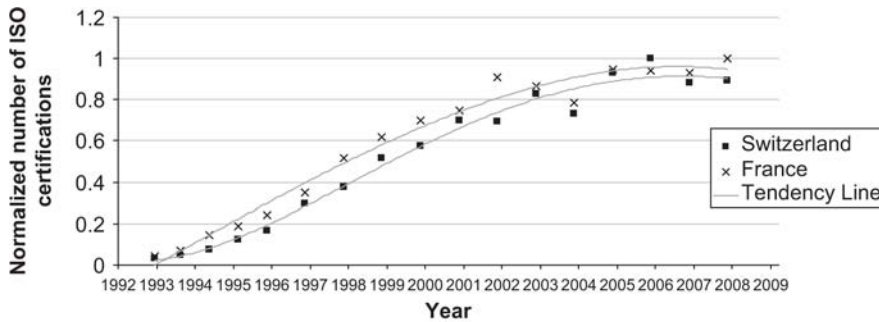Second Macro-area
Third Macro-area

Note: Ireland, United Kingdom and Denmark belong to this cluster

Figure 6.
Decline area (selection of profiles)

Note: Bulgaria Croatia Czech Republic, Greece, Hungary, Italy, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Turkey and Ukraine belong to this cluster

Figure 7.
Constant growth area (selection of profiles)

Note: Austria, Belgium, Finland, France, Germany, Luxembourg, Netherlands, Norway, Sweden and Switzerland belong to this cluster

Figure 8.
Saturation area (selection of profiles)

this area. These countries lived a certification growth period that lasted until the first years of the new millennium and then became more or less stable around a particular "market saturation level" (Franceschini *et al.*, 2004).

In some European countries, on the other hand, the certification experience acknowledged an appeal drop starting from 2002 (Figure 6). This drop strengthens in the following years with the standards changeover from ISO 9000:1994 to the ISO 9000:2000 version.

In last analysis it is remarkable how a significant difference between the three proposed macro-areas may be found in the initial conditions of the evolution patterns. Observing the normalised number of ISO certification at the end of 1992 it is clear how the certification market inside the "constant growth" area is still in its embryonic stage, the certification market inside "saturation area" is forming, while the certification market of "decline area" is already booming.

4.2 European ISO certification map

The dissimilarity matrix evaluated using equation (1) can be translated into a map to give a graphic representation of how ISO certification patterns are similar to each other.

Treating the dissimilarity metric as a Euclidean distance, it is possible to find the countries layout that better satisfies all the dissimilarity constraints. A multi-dimensional scaling (MDS) approach was used to achieve this goal (Borg and Groenen, 2005). Starting from the dissimilarity matrix, this localisation approach assigns a location to each country in a bi-dimensional space. The axes of the bi-dimensional space are defined so as to render the Euclidean distance between each proposed location the closer possible to the country pair dissimilarity metric.

Results are shown in Figure 9. The proposed layout highlights the certifications macro areas emphasised in the previous section. It is noteworthy how The Netherlands stands out from the other countries, being localised far from all the other countries. Even if classified within the constant growth area, The Netherlands presents a considerable drop of certification around the years 2003 and 2004 (see Figure 7), thus resulting, for some aspects, similar to the certification pattern of the decline area.
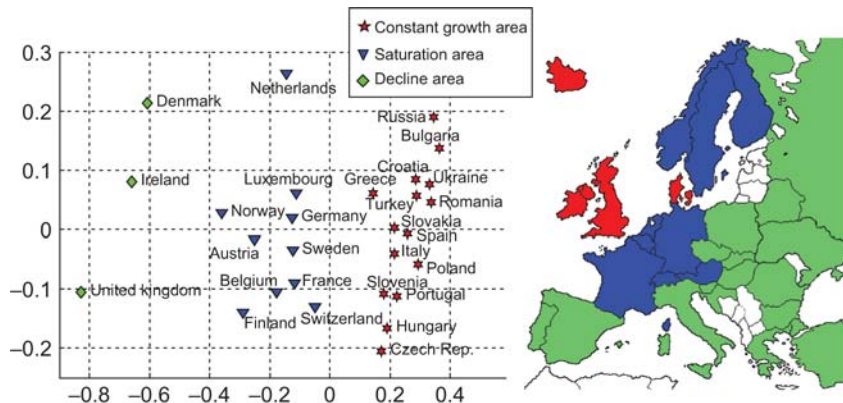
Figure 9.
European ISO 9000
certification map

Note: Countries are localized according to the dissimilarity distance defined by equation 1

4.3 ISO certification diffusion and GDP per capita
The GDP is commonly considered as an indicator of the wealth and affluence of a nation. Definitely the GDP is an index of how active the economy of a nation is. For this reason it is noteworthy how the GDP per capita (GDP_{pc}) is correlated to the number of certifications. In particular, we investigate how the clustering performed in the previous section is robust to a GDP_{pc} analysis.

For each nation, Table V presents the correlation values between the certifications number and the relative GDP_{pc}, reported in Table VI. Countries are grouped according to the clustering defined in the previous sections. It is noticeable how the clustering carried out studying the ISO evolution profiles is robust to a study of correlation between GDP_{pc} and ISO certification pattern. Apart from Slovenia, all the constant growth area countries present a correlation level close to one. On the other hand countries belonging to the saturation area are poorly correlated to the respective GDP_{pc}. The three decline area countries have a correlation level which is close to zero.

Given a general growth of GDP_{pc} (see Table VI), a low or null correlation value may be seen as a low perception of the benefits deriving from the certification: even if the economies are more and more active, the certification is not seen by companies as a necessary tool to increase or improve businesses. On the other hand, a high correlation between GDP_{pc} and the number of ISO certifications can be interpreted as if the companies appreciate and recognise benefits deriving from the certification, considering the certification as one of the key factors that drove them toward the economic improvement.

5. Results analysis
Observing the statistical analysis presented, it can be definitely outlined that the certification phenomenon is highly contagious: there is a sort of chain effect involving adjoining countries, for which the certifications market suffers similar dynamics. This can be primarily ascribed to different factors:

- Pressure from competitors: there is a chain emulation effect produced by a free and competitive market. A company may will the certification to bridge a gap in competitiveness with its neighbouring competitors acting on its local market.

- Pressure from customer companies: local customer companies can involve suppliers in their certification process, thus setting a group trend toward the certification. Suppliers, in turn, may involve their suppliers and so on.

- Similar economies, regulations, and politics may concurrently drive and push local companies toward the certification.

From the literature, there is evidence that ISO 9000 perceived benefits do decrease over time (Casadesùs and Karapetrovic, 2005a, b). It appears that companies that are at the beginning stages of their quality journeys find that the ISO 9000 series of standards provides them with a guide for implementing a basic quality system. But for companies with good quality systems, the standard often just adds costs, delays and burdensome documentation, rather than providing any further competitive advantage (Terziovski *et al.*, 2003, 1997). Furthermore, with the passing of the years, the number of certified competitors may potentially increase, thus reducing the competitive gap between certified and not certified companies and causing a fall in the certification appeal (Franceschini *et al.*, 2004, 2008).

Nation	Saturation area Correlation GDP per capita – ISO certifications	Constant growth area	Constant growth area Correlation GDP per capita – ISO certifications	Decline area	Decline area Correlation GDP per capita – ISO certifications
Austria	0.43	Bulgaria	0.95	Denmark	−0.01
Belgium	0.60	Croatia	0.96	Ireland	0.11
Finland	0.60	Czech Republic	0.90	UK	−0.14
France	0.64	Greece	0.90		
Germany	0.43	Hungary	0.94		
Luxembourg	0.74	Italy	0.95		
The Netherlands	0.64	Poland	0.97		
Norway	0.55	Portugal	0.96		
Sweden	0.67	Romania	0.99		
Switzerland	0.62	Russia	0.95		
		Slovakia	0.95		
		Slovenia	0.72		
		Spain	0.98		
		Turkey	0.92		
		Ukraine	0.96		

Table V.
Correlation between ISO
certification pattern and
GDP per capita from 1992
to 2008

Country	Gross domestic product (US dollars billions)															
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Austria	189.71	203.97	239.80	236.47	209.00	214.15	213.39	194.41	193.35	208.57	255.84	293.19	305.34	321.93	348.66	364.58
Belgium	216.21	236.02	277.04	275.43	249.63	255.50	253.89	232.93	231.93	252.66	310.51	359.16	372.73	393.59	423.54	441.12
Bulgaria	4.45	7.82	13.11	9.90	10.37	12.85	12.98	12.64	13.61	15.61	19.97	24.33	26.72	30.61	35.78	39.16
Croatia	10.90	14.58	18.81	19.87	20.11	21.63	19.91	18.43	19.83	23.03	29.61	35.26	38.51	42.46	47.42	51.16
Czech Republic	36.65	42.54	55.26	62.01	57.14	61.85	60.19	56.72	61.84	75.28	91.36	108.21	123.98	141.80	160.45	172.50
Denmark	140.84	153.90	182.18	184.48	170.64	173.90	174.17	160.53	160.58	174.42	212.98	243.85	259.22	276.61	302.56	316.16
Finland	87.42	100.71	130.75	128.53	123.43	130.47	130.95	122.22	125.27	135.97	165.03	189.41	195.79	210.84	225.43	235.11
France	1,292.66	1,366.48	1,571.89	1,575.34	1,427.07	1,475.55	1,456.80	1,333.04	1,341.39	1,463.90	1,804.99	2,059.71	2,127.17	2,231.63	2,401.44	2,512.69
Germany	2,005.56	2,151.03	2,524.95	2,439.35	2,163.23	2,187.48	2,146.43	1,905.80	1,892.60	2,024.06	2,444.28	2,744.22	2,791.74	2,897.03	3,080.55	3,184.13
Greece	117.84	126.13	148.03	156.51	152.89	153.74	158.29	146.55	150.46	170.94	222.32	264.49	284.23	307.71	341.83	367.05
Hungary	38.60	41.51	44.67	45.16	45.72	47.05	48.04	47.96	53.32	66.71	84.42	102.16	111.57	114.27	125.02	131.55
Ireland	50.47	55.38	67.13	74.13	81.38	88.35	96.67	96.61	104.57	122.72	157.12	183.47	200.77	222.08	250.24	267.00
Italy	1,022.66	1,054.90	1,126.63	1,259.95	1,193.62	1,218.67	1,202.40	1,100.56	1,118.32	1,223.24	1,510.06	1,728.86	1,772.77	1,852.59	1,993.72	2,075.93
Luxembourg	15.81	17.59	20.70	20.59	18.54	19.38	21.22	20.33	20.22	22.74	28.96	33.56	36.62	40.58	45.75	48.98
The Netherlands	329.25	354.08	419.35	418.11	387.01	403.20	412.00	386.20	401.00	439.36	539.34	609.04	629.91	663.12	720.94	759.49
Norway	118.28	124.74	149.01	160.17	158.55	151.16	159.09	168.67	170.98	193.18	225.31	258.99	301.74	335.28	349.17	365.78
Poland	90.37	103.68	139.10	156.66	157.08	172.00	167.94	171.32	190.33	198.03	216.55	252.67	303.16	338.69	364.83	390.68
Portugal	90.98	95.34	113.02	117.66	112.13	118.60	121.82	112.98	115.81	127.91	156.71	179.38	185.64	194.99	211.72	222.40
Romania	26.36	30.07	35.48	35.32	35.15	42.09	35.73	37.06	40.19	45.83	59.51	75.49	98.57	121.90	157.65	184.46
Russia	183.83	276.90	313.45	391.78	404.95	271.04	195.91	259.70	306.58	345.49	431.43	591.86	763.88	979.05	1,166.56	1,344.54
Slovak Republic	13.37	15.47	19.70	21.38	21.56	22.42	20.60	20.37	21.11	24.52	33.01	42.02	47.43	54.97	69.28	78.30
Slovenia	24.72	25.05	31.80	28.95	26.25	27.09	26.75	22.69	21.84	23.66	28.82	32.74	34.41	37.34	41.13	43.96
Spain	513.17	515.81	597.28	622.65	573.38	601.63	618.69	582.38	609.63	688.68	884.91	1,044.51	1,127.98	1,225.75	1,359.11	1,454.35
Sweden	200.49	215.56	251.03	272.85	249.69	250.03	253.88	242.79	221.88	244.31	304.85	349.56	358.48	385.29	423.65	442.79
Switzerland	242.61	269.56	315.28	302.88	262.36	269.60	265.23	246.32	250.57	277.11	323.07	360.15	366.51	377.24	389.41	397.49
Turkey	177.00	128.09	166.44	178.06	186.06	197.59	181.69	198.23	143.10	182.97	240.60	302.56	362.46	392.42	432.51	455.54
Ukraine	29.66	36.48	37.02	44.60	50.15	41.89	31.57	31.26	38.01	42.39	50.13	64.88	86.04	106.07	122.80	137.67
UK	965.28	1,042.99	1,136.10	1,194.97	1,328.49	1,425.83	1,467.03	1,445.19	1,435.63	1,574.47	1,814.64	2,155.16	2,230.61	2,373.69	2,660.66	2,822.66

Source: International Monetary Fund World Economic Database 2009

Table VI.
Gross domestic product
per capita

The observations pointed out by the above-mentioned authors may be the main micro-level causes that brought European countries to be distinguished into the analyzed macro-areas. Markets with a long certification history (decline area and saturation area) are characterised by the presence of a lot of companies with a well-implemented quality system, that – for the above discussed reasons – are not more interested in certification. The number of certifications inside these areas do not increase or tend to drop off. On the other hand, markets in which quality systems established later (constant growth area), still seem to perceive the certification benefits (high correlation between ISO certifications number and GDP per capita). In addition, since the certification still represents a distinction feature, the certifications number shows no sign of crisis.

6. Conclusions

Quality certifications and their evolution over time are a research topic rousing great interests. In their work, Sampaio *et al.* (2009) analyzed many important studies and research efforts carried out concerning the ISO 9000 standards, both by academicians and by quality practitioners.

According to the last ISO survey, up to the end of December 2007, 951,486 ISO 9001:2000 certificates had been issued in 175 countries and economies. The 2007 total represents an increase of 54,557 ($+6$ per cent) over 2006, when the total was 896,929 in 170 countries and economies. Despite of the international significant growth in the number of certificates issued, some countries are already reaching a market saturation level regarding the number of ISO 9000 certified entities (Saraiva and Duarte, 2003; Franceschini *et al.*, 2004).

The analysis carried out and presented in this paper highlights the presence of different European macro areas that differ for patterns of ISO 9000 certification diffusion:

- *Constant growth area.* This is the area in which the certification number is currently growing. All major European countries together with Italy and Iberian countries are part of this area. Their certification market is relatively young.

- *Saturation area.* All the European countries whose certifications market has been active for a relatively long time are part of this area. For such countries, the number of certifications issued during the last years settled around a saturation value, probably because of a reduction in the competitive gap between certified and non-certified companies (Saraiva and Duarte, 2003).

- *Decline area.* This is the area in which the certifications were introduced first. The changeover from the ISO 9000:1994 to the ISO 9000:2000 version took place in a period in which the number of certified companies had already reached the saturation level. The achievement and maintenance costs of the new certification standard caused a drop off in the certifications number during the following years.

Forecasting the future of certifications and understanding the reasons of certifications patterns evolution is important firstly for the certification bodies, for which certification is the principal business, but also for the companies that have to face high implementation and maintenance costs to achieve and update their certification. Future researches will be addressed toward the analysis of a wider geographical area in order

to see if the results found for the European reality may be extended. The outcomes of such analysis may be used to enhance the existing forecasting model for the diffusion of ISO 9000 certification (Franceschini *et al.*, 2004).

Another interesting research topic will be the analysis of the companies' reaction to the recent economic crisis in terms of number of certifications. Will the companies try to find in the quality certification the solution to face the crisis or will they face their economic troubles cutting the costs thus abandoning the certification?

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