

Competitiveness and Industrial Evolution: the Case of Ceramic Industry

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Abstract –This paper analyses the contribution of evolutionary process to economic organization activity to create and sustain competitive advantage, and to the competitiveness of firms in a dynamic and change environment.

The study targets the ceramic industry sector in the Portuguese district of Aveiro as an evolutionary example, based on the empirical analyses of the actual organizational characteristics, resulting from a secular evolution and environmental adaptation, related with the creation and sustention of a set of competitive advantages identified by the top managers and related with innovation, demand, knowledge, networks and coevolution of the industry. The investigation concludes for the relation between industry evolution and competitiveness.

Keywords *Competitiveness, Industrial Evolution, Evolutionary Economics, Competitive Advantage, Industry Studies*

“Competition is the all-pervasive law of natural-economy interactions”.

Hirshleifer (1978:322)

1. Introduction

Nowadays, the globalization assumes a dominant character in economy, where the agglomeration externalities influence the economic activity organization by its own capacity of produce and sustain firms and competitive industries. Firms must understand the evolution as a constant adaptation to change, based on innovation, that could be seen a parallelism between firms and species like natural selection, survival, creation of competitive advantage and better performances: which only the most able survive.

The concentration of productive activities belonging to an specific industry, on a particular local, constitutes a preponderant role to study the development of competitive advantages either to the industry firms or to the region where they set in, allowing to increase productivity, innovation and labour, promoting the temporary economic stability and growth. In this case, the understanding of its evolution is relevant to know peculiar competitive features. The variations in local patterns raise specific questions of industrial evolution. These questions are related to a number of factors that represent driving forces, during a certain period of time, and enable a considerable understanding of the dynamics that marked a specific industry in a special location: it competitive advantage.

The ceramic industry is a promising setting for some reasons. First, ceramic production exists around the world, however the evolution mark give it a special characteristics as habits, culture, knowledge and location. Second, is an old industry, since the primitive times, referred as one of the first human productions, is linked to human social activities, and has been progressing with the Human Society. This, in parallel with the necessity of its products, stimulates the competition, based initially in local features as abundance and quality of raw materials, manpower, sources of energy or knowledge. The ceramic artesian products evolved to industrial products, in contemporary high-tech plants, based on innovation, quality and design. Third, today the ceramic industry reflects a dynamic competition with global, complex and very mutant characteristics. This increases the value contribution to contemporary research in

industrial organization and adds a historical perspective to the present debate of competitiveness.

The organizations, like species, must learn from their environment how to survive, adapting their resources to variations and to the speed of learning that produces and influences the competitive conditions that shape performance and the character of success.

The present study examines, in an initial phase, the contribution of evolutionary economics, as an industrial evolution approach, to obtain and sustain competitive advantages to the firms of a specific industry in the context of competitiveness. In a second point, examines the global pattern of ceramic industry and its evolution in the district of Aveiro, from the nineteenth century till today. In a third point, are made the application of the statements of evolutionary economics to the firms in analyse and attempt to identify some factors that may result from industry evolution across dynamic competition. Finally, are presented some conclusions and implications of our study for research on empirical analyses of evolution - as a continuous adaptation to change – as a process that guides the industry competitiveness.

2. Evolution, Competitiveness and Competitive Advantage

Firm evolution is related with economic organization and industrial structure, centred in the permanent change, in such a way analogous to the biological evolution and natural selection, where economic systems could be interpreted as a mechanism which pursuit in an adaptive way “success” and “profits” (Alchian, 1950).

Evolutionary Economics has as fundamental hypotheses: i) firms are based more essentially on the satisfaction of necessities rather in positive profits than on profit maximization, for what turn to routines, decision rules and rationality; ii) the competitive environment rewards the success, which is based on results, considering the realization of profits a criterion to select successful and surviving firms; and iii) none industry is on equilibrium in any point on time (FitzRoy, Acs e Gerlowski, 1998).

Evolutionary economics involves in research with the aim to analyzing the evolution resorting to the role of technologic change and innovation, related to organizational change in complex environments, including in its theoretical framework an evaluative analyse of the open and complex systems (Hudgson, 2002), and considering organizations as complex adaptive systems (Arthur, 1999) and industries as systems (Malerba, 2006).

Nelson and Winter (1982), in their evolutionary theory of economic change, relates the concepts of tacit learning and routines with the Schumpeter (1934, 1942) dynamic competition. On their work they defend that firms compete essentially for improvements and innovation. On this competition, firms looking for better procedures only based on a partial knowledge of the causal structure of its own capabilities and in the technologic opportunities conjunct.

The relationship between innovation and evolution of industries is central in the Schumpeter’s approach to economic dynamics, as in evolutionary and neoclassical theories (Malerba, 2006). Schumpeter (1934, 1939, 1942) on his work presented a distinct perspective of the competitive market process. He viewed it as an evolutionary process of growth and expansion from the economic capitalism equilibrium to change in the pursuit of profits and ruled by routine activity, where the entrepreneurs represent a crucial role, introducing innovation in the form of new or improved products, services or processes or in the form of new organizational techniques, in a continuo flow of “creative destruction” contributing to opportunities for profit, continuous adaptation to change and evolution, moving the economy away from one temporary equilibrium to another.

Evolutionary theories apply natural selection arguments to face up stability and change. Organizations are viewed as in a Darwinian struggle in which only the most apt survive. The natural selection used in the evolutionary economics argumentation, according to Chiles and Choi (2000) and Alchian (1950), has three fundamental components: variation, heredity and selection. Variation relates to heterogeneity in firm characteristics that makes it differ, like routines, capabilities, histories, innovation or localized search. Heredity is related with the organizational characteristics of firms which can be transmitted or imitated in an organizational population; which embody productive and organizational knowledge, where location has a

special contribution. And selection that is related with environment's selection criteria; the organizations that meet or exceed the criteria will retain and grow, on the contrary, for those that fail to meet the criteria wither or die. For Alchian¹ (1950), positive profits or business volumes are market selection criteria.

The studies of Nelson and Winter (1982) and Hannan and Freeman (1977) represents a pioneer contribution, as an intellectual and theoretical base of ecological and evolutionary application to organizations. But, several other authors have study organizations based in evolutionary economics; studying the internal organization and organizational evolution of firms, industries and markets, in parallel with the ecologic process contributing to the development of a strategic pattern based on a subjacent evolutionary logic guided by evolution. Malerba (2006) demonstrate how the evolutionary pattern can constitute a general robust framework to study the industrial dynamics.

Such the living beings, the firms live too in an environment of competition. In the firms case, these doesn't compete for food or space, but for inputs, consumers, markets, profits that cover the costs of its options and decisions, as in a survival way. So, exists a common element between species and firms, for both competition is an important factor, that could be seen as resulting, also, from the analogy between biologic competition, resulting from evolution, and economic competition (Hodgson, 2002; Nelson e Winter, 1982).

However, in the sigh of an evolutive and change scenery, are the most apt², either species or firms, the better to adapt and survive in a constant and competitive environmental change who survive with success, which have been study by different authors proceeding from several sciences.

The evolution of firms' competencies and technical progress are relevant factors to compete in a global, complex, dynamic and continuous change market, where evolution enrolled by systematic competitive advantage improve in a deterministic and sequential logic the organization performance, competitive position and business success (Day and Wensley, 1988:2).

The contingencial character of firms establish a direct relation with the environment, with volatile and evolutionary features, that makes the organizational effectiveness depends on constant adaptation, on systematic creation of competitive advantages oriented to lead the actual and potential dynamic market, which jointly reflecting on organizational performance ordering the success and inducing the industry competitiveness.

The competitive advantage accentuates the difference between firms of a special location, and presents as a vital element to survive and to increase the value of organizations in the competitive market, stimulating the "creative destruction", innovation, continuous improvement, entrepreneurship, firm performance, face to potential competitors. Competitive advantage is related with organizational performance, influencing the success level of the organizations that survive in market and could be seen as a reward of the successful harmony in a complex and dynamic³ environment.

The firm's competitive advantage represent the value created to it stakeholders, of a distinct way from competitors, allowing to evidence in competition to several dimensions, establishing and sustaining a defensible position in the market. The competitive advantage may result from the implementation of a strategy of own value creation, distinct capabilities in competences, processes and superior resources (Day and Wensley, 1988; Barney, 1991), or from the access to some assets, tangible or intangible, to which competitors have not. Competitive advantage exists when firms generate new forms to surpass competitors (Porter and Millar, 1985).

¹ Alchian (1950) had, also, a similar ratiocination relating the evolutionary Darwinian pattern with survival and business success, concluding for the most of the economic concepts are near of biologic evolution theory, which genetic heredity, mutation and natural selection fits to organizational imitation, innovation and positive profits.

² Is a relative and temporal concept; relative face to the considered variables to survive. And temporal because a favourable features, in a given time, could be adverse in another moment.

³ Complexity includes the different factors that influence business. And dynamics is related with the speed of change, uncertainty and their impact on business that leads firms to enter or exit an industry.

Location is also an important factor which contributes to create and sustain a competitive advantage (Porter and Stern, 2001). The development of an industry in a special location could be determinant of innovation and, consequently, of firms' competitiveness, concludes for the influence of the local environment in the level of an industry success (Bianchi, 1998; Mariussen, 2001), depending on easy and better information, local knowledge and organizational learning, which implies lower transaction costs as the increase of specialization, cooperation and rivalry between firms (co-petition), and the concentration of related activities.

So, competitive advantage can be seen as resulting from a multidimensional construct, as while one relevant variable could be necessary, but mostly isn't individually sufficient to create competitive advantages. This could result, in the most of the cases, from organizational resources and from the establishment of integrated, relational and dynamic relations (Wheelwright and Hayes, 1985).

Competitive advantage has an evolutive character. It is relative to time and to the others firm's benchmarking capabilities. The comparative benchmarking firm capabilities permit to generate a creative destruction, including innovation, makes competitive advantage constantly evolves allowing a consequently level of successful adaptation to market.

The competitiveness of firms or industries can be defined as the capacity of one firm or industry, develops in a sustained way a success relation with the environment, being as the capacity of a firm or an industry compete in markets and sustain or obtain a dominant position. Are multiple the factors involved: the characteristics and actuation of firms, the microeconomic level, and the creation of synergies generated in a sector or in an aggregate level, the environment context, the macroeconomic level, or the mechanism of prices formation, the exchange or monetary regime or the wages relation.

The capacity of one firm be or sustain competitive depends on the productivity of her workforce, from her capital investments, and in the efficiency in the applicability of material inputs to produce goods and services which satisfy the necessities not only from the consumers but too from the other *stakeholders*.

Competitiveness is a relative, comparative and dynamic, which finds her sense when insert in an environment context and when related to a determinate temporal period.

The competitiveness factors are understood as factors that determinates the firms' competitiveness. Some of the factors can depend from the application object, as, for example, from internal features, from the stadium of life cycle, or from macroeconomic structural and conjectural statements. Can also depending from the location, the government political decisions, the level of education and formation, access to technology, health and social security, transports and communications, infrastructures, energy, commerce and tourism, etc. All the competitiveness factors suffer the influence of time, still the structural ones, as a constant interaction with the environment in evolution, in a continuous adaptation to change.

In a competitive evolutionary process, the kind of behaviours selected by firms are necessarily superior and relatively efficient, acting the capitalist competition as an evolutionary process, favouring the more efficient forms and modes of industrial organization (Hodgson, 1993). In this way economic evolution promotes the rational maximization and efficiency.

3 Innovation and Evolution of Industry: Demand, Knowledge, Networks and Coevolution

According with Malerba (2006), the evolution of industries is related with an involving process of transformation of knowledge, technologies, learning, features and competences of actors, types of products and processes, and institutions. In this process of transformation, the industry also changes its structure and the network of relationships among actors is relevant to innovation and to the performance of an industry. These dimensions contributes to innovation and to industry evolution and states four challenges: demand, knowledge, networks and coevolution.

The demand (size, growth, structure and composition) is related with the consumer behaviour and affects innovation playing an important role during the different stages of the evolution of an industry. Also, the process of change in knowledge and learning processes, that could differs across sectors in terms of sources, domains and applications, is at the heart of the

evolution of industries. As the networks, by the “*interaction of heterogeneous actors with different knowledge, competences and specialization, with relationships that may from competitive to cooperative from informal to formal, from market to non-market*” (Malerba, 2006:15). And as well as coevolution, as an integrated process involving knowledge, technology, actors, demand, institutions, and specific sector factors to the evolution of firms of an industry. (see Malerba 2006)

4 Evolution of Industry: The Case of Ceramics

The ceramics activity is supposed to have beginning about VIII B.C., constituting one of the first economic activities of Man, appears in result of the first surplus of agriculture that allows to transit to a productive economy, based on sedentary habits. So, there started to exist new necessities like store food resultant from agriculture; construct houses, spiritual symbols and baker’s oven, resultants from sedentary habits; inducing to the production of vases, bricks, statuettes and decorative elements in argil. The ceramic production follows the technical development of human society since the Neolithic till today, accompanied the development of new techniques and the establishment of new production relations between Man and the environment. Passing by several civilizations, the Greek for example, which valuable the ceramic in such a way that uses it as Premium to the winners of the Olympic Games. Thus the history of Ceramics is marked by a succession of eras, and associated with different cultures, habits and technologies.

The travels and European conquests disperse the introduction of new ceramic techniques, like the Portuguese’s travels venturing to orient, which begin during the Middle Age, introducing in Europe several porcelain objects from China, Japan and India. This fact induces to the introduction of the Portuguese word *porcelana*, on the vocabulary of several European countries, with some variations, like in the English, French, German, Dutch or Italian.

4.1 The Portuguese Ceramic Industry: the case of the Portuguese District of Aveiro

However the commercial affairs, the influence of oriental porcelain on Portuguese ceramic production, occur very late, only in the end of the XVIII century (Gomes, 1993:43). The centres of ceramic production was mostly potteries, scattered by important places in Portugal associated to a ceramic tradition and to local features in raw materials, man power, energy sources and consumer markets, i.e. Aveiro, Lisbon, Oporto-Gaia, Coimbra, Viana do Castelo, Caldas da Rainha, Estremoz.

The new techniques and the mechanisation verified a great development in the ceramic production and on its industrialization in the XVII and XVIII centuries, reflecting the socio-economic and technologic changes on Portuguese industry, which traduces on an increase of industrial establishments, factory workers and the first efforts to use the steam-engine. In XIX century, Portugal starts the porcelain production in the factory of *Vista Alegre*, near the city of Aveiro, established in 1824. The development of this production it was a reactive answer to the invasion of English products in Portuguese markets, with bigger quality and lower price, proceeding from Industrial Revolution. Still, in this century, appear several important national ceramic factories all over the country. The efforts of the nineteen century extended in the XX century with the development of the Portuguese industry ceramic.

At present, however the ceramic activity be distributed all over the national territory, is on the littoral bundle northward Tagus river where it has a bigger concentration and development, with the principal specialization productive centres, consequence of an accumulated know how and firm capabilities jointly with the location of the principal productive resources.

Aveiro assemble a set of peculiar features to ceramic activity, which give it an initial competitive advantage on its history evolution, like geological features, with plenty of quality raw material; plenty of sources of energy, financial assets (capital), man power, entrepreneur vision of the local businessmen; dynamic and competitive markets; the ceramic culture, knowledge and accumulated learning; and a propitious geographic location with good accessibilities of transports, by sea, river, river branches, railway, national and international

roads. Those influence the installation in this district, since 1775, with the first industrial unity, till today of important ceramic productive unities, national and international. The development in a favourable network context of the district industry and its industrial culture and knowledge made from this region an “industrial corridor” characterized by industrial firms agglomeration, in a continuous geography space, not very extended, of a diversify industrial arrangement and a strong entrepreneurship, where metallic products and ceramic industry are presented as specialization activities and potential clusters diagnosed by Porter (1998).

The organizational population of Aveiro industrial ceramics evolutes from practically self-sufficient firms, in the traditional line of Industrial Revolution, where firms structure was of total vertical integration, from raw materials exploration to products commercialization, to interdependent patterns in a several levels: technology, raw material and markets, trying to answer aptly to the functional and esthetical requisites in products that results from the changeable, evaluative and competitive, environment, dominated by the increasing consumers necessities and technical complexity of industrial processes. The industrial processes reflect the structural changes in the majority of the ceramic industrial sub sectors and adjacent industries, in a disintegration process that comes to be accentuated and global in the present. The firms upstream the productive file, producers of raw materials of added value which supply it to final producer’s, which makes possible an increase in productivity and quality of final products, as a rationalization of resources instigating the renewal of industrial ceramics.

At present, based on the more recent statistically date, the ceramic row includes several hundreds of firms and related organizations, employing directly about 33 000 workers, that jointly contributes to the ceramic industry dynamism be one of the biggest in the Portuguese economy. However, the several industrial ceramic subsectors doesn’t share from the same optimism, signed by a business heterogeneity, some firms have a stable economic situation and a good reputation in the market in opposition to a such number that survive with difficulties.

The ceramic industry sector includes a great variability of products and production processes, as in terms of proprieties and physic-chemistry characteristics, deriving from the variation of the uses of the original material: argil. Ceramic industry presents too as a supplier of other industries, for example, construction industry, to generate electricity, to telecommunications, spatial exploration, medicals, or foods.

During the last decades, the ceramic industry in the district of Aveiro had an increasing of its representativeness on the Portuguese ceramic industry. Aveiro represents the third ceramic national district as regards to the number of firms, and the first ceramic district regards to the number of employees in the sector, to the number of bigger enterprises and to the business volume and exportation volume.

Aveiro have the oldest ceramic firms in Portugal, as have the unique national ceramic firm with more than 1000 workers. That reveals a high level of adaptation and survival to dynamic and evaluative environments during time.

The ceramic of Aveiro characterizes by a great rivalry, some cooperation and some interrelation with clients, suppliers, other firms and public and private entities, like universities, industrial and commercial associations and consulting firms (Pereira, 2005).

5 Results of Empirical Research

The population universe considered in the present empirical study is based on a questionnaire sent to the 115 ceramic production firms existing in the district of Aveiro, during December 2003 and May 2004, and directed to top managers, with responsibility in general firm decisions. It was considered as valid the answers of 72 questionnaires, which represent a sample of 63%. The considered firms are heterogeneous and belong to the several industrial ceramics subsectors: 45% of domestic and ornamental ceramics; 22% of pavements and revetments, 32% of structural ceramics and 1% of sanitary ceramics. The last sub sector, for its weak representation on the sample, only was considered on global analyses.

The firm’s size, based on the number of employers, is between 20 and 49 employers, except for the pavements and revetments ceramics subsector which mostly have between 100 and 249 employers.

As regards to the age of firms, 17% have less than 10 years, 44% between 10 and 25 years, 39% more than 25 years and 10% more than 50 years.

Table 1 – Firms Age

Classes	[firm's age]	Dom & Orn ceramics (%)	Pav & Rev ceramics (%)	Strutural ceramics (%)	Total ceramics (%)
1	[0-4]	0	6	4	3
2	[5-9]	21	13	4	14
3	[10-15]	16	25	4	15
4	[16-25]	41	25	18	29
5	[26-50]	16	19	57	29
6	[51-100]	3	12	13	9
7	[> 100 anos]	3	0	0	1
	Total	100	100	100	100

Table 2 – Firms Characteristics

Variable	Ceramic Industry (%)
Firms that have passed by restructuring processes	58
The capital is in Majority of the district of Aveiro	79
Firms with a familiar social capital	46
Firms belonging to a group	67
Firms with associated firms	42
Firms that exports	68

Mostly of the analysed firms have passed by restructuring processes, denoting that have been an evolution as an adaptation process to the environment. The majority of its social capital belongs to the district of Aveiro, which confers to management internal characteristics related with local culture, beyond an observed tendency of the decrease of the familiar nature of capital; however the most of it have beginning with familiar capitals and management, which have been transmitted till time to new generations. Most of the actual firms are integrated in a group, which it evolutes for the creation of a group of existent firms, was acquired to an existent group, or was born inside an existent group. The internationalization is another characteristic of this firms, most of it exports, exception to structural ceramic, according to its characteristics (weight and transport) only sell to regional markets.

In the last decade occurs an increase in the business incited by the increase of the business volume of paviments and revetments ceramics however the decrease in the structural ceramics derived by the recession on construction industry in the last years. The volume of business in the several market segments allow to observe that the total sales volume decrease in the national market to increase in the foreigner markets, this fact traduce a positive test to international markets by Aveiro ceramics. The exception going to the decrease on the volume of the exportation of the most international ceramic sub sector of the district of Aveiro, the domestic and ornamental ceramics, which top managers, refers a competitive loss in international market in spite of the aggressive global competitors of Asiatic firms.

The evolution of profits characterizes by some heterogeneity of annual values, with increases and decreases. The investments realized, in the most of times, reflecting negatively in the annual profits, but very important to create and sustain superior competences and resources that made possible the competitive advantages and a good organizational performance that conducts to success. The firms of our sample had invested in an increasing way.

According to the firms' age, which can significantly influence de organizational efficiency, is related with the manager age, his level of studies, firm' size, social capital, variation of employment, variation of business volume, exportation, and investment volume. To analyse the firms' antiquity, are considerate as young firms the ones till 10 years old and as mature firms the ones with age superior to 10 years old (Table 3).

Table 3 - General characteristics according to firms' age

	Total Ceramics (%)			Cer. Dom e Orn (%)			Cer. Pav e Rev (%)			Cer. Estructural (%)		
	Sector (%)	Firms (%)		Subsector (%)	Firms (%)		Subsector (%)	Firms (%)		Subsector (%)	Firms (%)	
		Young	Matures		Young	Matures		Young	Matures		Young	Matures
Manager age												
< 40 years old	38	67	32	37	57	32	44	100	31	35	50	33
> 40 years old	62	33	68	36	43	68	56	0	69	65	50	67
Studies level												
Superior Studies	67	50	70	63	71	56	81	33	92	65	50	67
Not Superior Studies	33	50	30	37	29	44	19	67	8	35	50	33
Size (2002)												
<50 workers	63	83	57	69	71	68	31	100	6	78	100	76
>50 workers	37	17	43	31	29	32	69	0	94	22	0	24
Social Capital												
Not Familiar	54	67	52	47	71	40	50	67	38	70	50	71
Familiar	46	33	48	53	29	60	50	33	62	30	50	29
Employment variation⁴												
Increase	21	42	17	12	57	0	44	33	46	13	0	14
Decrease	60	25	66	66	29	76	50	33	54	61	0	67
Constant	19	33	17	22	14	24	6	33	0	26	100	19
Sales variation												
Increase	40	83	35	44	86	32	63	100	54	26	50	24
Decrease	57	17	65	56	14	68	37	0	46	74	50	76
Profits(2002)												
Positive	67	67	67	63	65	58	81	79	83	57	49	61
Negative	33	33	33	37	35	42	19	21	17	43	51	39
Export												
Yes	68	83	65	94	100	92	94	100	92	13	0	9
No	32	17	35	6	0	8	6	0	8	87	100	91
Investments												
< 250 000 €	56	83	50	75	71	76	37	100	23	48	100	43
> 250 000 €	44	17	50	25	29	24	63	0	77	52	0	57

The mature firms characterizes by social capital with familiar control, top managers with age superior to 40 years old with superior studies; for a decrease on generate employment and for a decrease on business volume (exception to pavement and revetment ceramics). By their side, the young firms has great exportation volumes; smaller size and social capital with no familiar control; the managers have age inferior to 40 years old and they have not necessarily high studies; have smaller investment levels, increase of the employment variation as the business volume (exception to the structural ceramics).

⁴ The variation calculus was based in the years (2000-2002) at current values.

In a correlation analyse, made in table 4, we observe that **age** is significantly correlated with the size, business volume, restructuring processes, associated firms, global investment; but not with positive profits. Firms' **size** is correlated with age, business volume, enterprise group, associated firms, and internationalization, decreasing in national sales, positive profits, investments and managers studies. **Business volume**, directly connected with organizational success and performance, is correlated with age, size, enterprise group, associated firms, internationalization, positive profits, investments and managers studies. **Restructuring processes** that may represent the adaptive evolution to complex environment is correlated with age, social capital, enterprise group and associated firms. **Profits** are correlated with size, business volume, social capital and enterprise group.

Table 4 -Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Age (1)	1	-.663(**)	-.422(**)	.301(*)	.140	-.190(*)	-.277(*)	.117	-.039	.028	.057	-.157	-.257(*)	-.128
Size (2)	-.663(**)	1	.802(**)	.109	-.079	.275(*)	.312(**)	.236(*)	-.226 (*)	.027	-.148	.280(*)	.422(**)	.226(*)
Business Volume (3)	-.422(**)	.802(**)	1	.042	.015	.413(**)	.425(**)	.287(*)	-.182	-.116	-.089	.249(*)	.649(**)	.261(*)
Restructuring Process (4)	.301(*)	.109	.042	1	-.293(*)	.262(*)	.250(*)	-.071	-.032	.057	.052	-.089	-.105	.192(*)
Social Capital (5)	.140	-.079	.015	-.293(*)	1	-.277(*)	-.060	.104	-.103	-.008	.011	.249(*)	-.113	-.058
Enterprise Group (6)	-.190(*)	.275(*)	.413(**)	.262(*)	-.277(*)	1	.575(**)	.067	.004	.061	-.222	-.231(*)	.249(*)	.163
Associated firms (7)	-.277(*)	.312(**)	.425(**)	.250(*)	-.060	.575(**)	1	-.018	-.010	.055	-.254	.013	.239(*)	.267(*)
Internationalization (8)	.117	.236(*)	.287(*)	-.071	.104	.067	-.018	1	-.572(**)	.(a)	.(a)	.015	.218(*)	.279(*)
Sales national market (9)	-.039	-.226(*)	-.182	-.032	-.103	.004	-.010	-.572(**)	1	-.956(**)	-.546(**)	-.068	-.071	-.335(**)
Sales on UE market (10)	.028	.027	-.116	.057	-.008	.061	.055	.(a)	-.956(**)	1	.258	.001	-.212	.202
Sales rest World (11)	.057	-.148	-.089	.052	.011	-.222	-.254	.(a)	-.546(**)	.258	1	.176	-.104	-.106
Profits (12)	-.157	.280(*)	.249(*)	-.089	.249(*)	-.231(*)	.013	.015	-.068	.001	.176	1	.079	-.046
Mean Invest (13)	-.257(*)	.422(**)	.649(**)	-.105	-.113	.249(*)	.239(*)	.218(*)	-.071	-.212	-.104	.079	1	.314(**)
Managers studies (14)	-.128	.226(*)	.261(*)	.192(*)	-.058	.163	.267(*)	.279(*)	-.335(**)	.202	-.106	-.046	.314(**)	1

** p ≤ 0.01

* p ≤ 0.05

° p ≤ 0.10

a Cannot be computed because at least one of the variables is constant.

The top managers of the mature industrial ceramic firms identified as representative sources of competitive advantage of ceramic firms, face to the principal potential competitors, the variables presented on Table 5. On the questionnaire was used a Lickert's scale of 1 to 7, where 1 represents a Great Competitive Disadvantage, and 7 represents a Great Competitive Advantage.

The principal competitive advantages identified by top managers were: quality, relations with clients, human resources, consumers' satisfaction, image and firm reputation and the service to the clients.

These competitive advantages are related with innovation (product and process) and with the challenges referred by Malerba (2006): demand (clients and consumers), knowledge and learning, networks (suppliers, clients), and coevolution (the ones mentioned behind, and technology, actors, institutions, reputation and image evolution) as to the economic evolution of rational maximization and effectiveness.

Table 5
Mean and standard deviations of the punctuations of the sources of competitive advantage

Sources of Competitive Advantage	Ceramics Industry		Dom&Orn		Pav&Rev		Structural Cer.	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Quality	5,72	1,345	5,66	1,260	5,75	1,183	5,78	1,622
Relations with Clients	5,72	1,103	5,59	1,132	5,94	,574	5,74	1,356
Human Resources	5,56	1,099	5,53	1,295	5,63	,719	5,52	1,082
Consumers satisfaction	5,47	1,087	5,41	1,103	5,75	,683	5,35	1,301
Image and firm reputation	5,42	1,184	5,31	1,120	5,31	1,078	5,57	1,343
Service to the client	5,39	1,120	5,41	1,214	5,50	,730	5,26	1,251
Entrepreneurship and initiative of managers	5,32	1,320	5,06	1,294	6,06	1,237	5,09	1,240
Productivity	5,31	1,194	5,12	1,431	5,31	,873	5,57	1,037
Knowledge and Organizational Learning	5,25	1,135	5,06	1,294	5,63	,719	5,22	1,126
Satisfaction of personal /human resources	5,22	1,091	5,06	1,268	5,31	1,014	5,35	,885
Relations with suppliers	5,21	1,186	5,06	1,134	5,06	1,063	5,48	1,344
Continuous efforts to costs reduction	5,18	1,427	5,13	1,362	5,44	1,365	5,04	1,609
Process Innovation	5,14	1,377	5,03	1,402	5,31	,946	5,13	1,632
Brand Image	5,13	1,342	5,00	1,164	5,75	1,238	4,87	1,576
Process Flexibility with rapid answer to the client	5,11	1,488	5,22	1,385	5,38	1,025	4,70	1,820
Product innovation	5,10	1,302	5,22	1,362	5,44	,727	4,65	1,465
Effectiveness of organizational structure and competencies	5,06	1,299	4,84	1,417	5,31	1,250	5,13	1,180
Technology	5,04	1,409	4,75	1,437	5,31	1,195	5,17	1,466

6 Conclusions

In this paper we analyse the contribution of evolution to the understanding of a located economic organization activity and to create and sustain competitive advantages which contributes, in a circular flow, to adapt and evolves to the global, dynamics, change and complex environment increasing the competitiveness of firms.

Evolutionary economics explains how processes of dynamic change adaptation and learning are driven by entrepreneurial creativity through evolution of time. Showing how the past can be a prologue to the future evolution. Many current successful industries populations have their origins in actions taken long ago.

The home location is important to understand an organizational population because is where the core product and process development take place as well as the organizational routines of the firm reside. So there exists some broad local attributes functioning as an evolving and dynamic system that has generated the specific conditions to enhance the competitive advantages of firms located there.

Competition is seen as an evolutionary process, where the competitive advantage is a temporal and relative component determining competitiveness. It may evaluate with time to not incur on the risk to stay obsolete and adapt constantly to change. The successful competitive advantage brings too imitators who develop adaptive imitative behaviours and respond with superior features, low prices and new ways to catch customers; so, the constant change and the increase of global competition, compelling executives and scholars to broaden their understanding of sustainable competitive advantage. Taking in account that the environment characterizes by significant uncertainty, with mechanisms that drive in a dynamic way the disequilibrium processes of change, valorising the creative choices and actions of individual entrepreneurs contributing to a certain invisible hand that aggregate it into a systematic order. Understanding the needs of environment and as its changes can be a key to competitive

advantage. The acquisition of relevant information to exploit opportunities for create new competitive positions that others either ignore is an important source to create and sustain competitive advantages contributing to creative destruction and firms competitiveness.

The ceramic industry in the Portuguese district of Aveiro, as a historic tradition sector with several centuries of evolution and learning, which jointly with the general specificities of ceramic as an ancestral industry increase the value contribution to contemporary research in industrial organization of evolutionary economics. The district of Aveiro assembles a set of peculiar features to ceramic activity that makes a favourable context to the ceramic industry development. Currently these features are no longer so stressed but still notable.

Nowadays, resulting from the empirical study covering 63% of the total of heterogeneous firms, the industrial ceramic are compose by small and medium enterprises, with a mean of 95 employers per firm, with 32% of the firms between 20 and 49 employers. In terms of age, the firms characterize for the maturity with 83 % of the firms with more that 10 years, 39% with more that 25 years and 10% with more that 50 years. Denoting in a heterogeneous sample of firms a long period of adaptation, heredity and market selection, corroborate by the great restructuring processes by the majority of the firms have passed for, as the association within groups or with other firms continuing with is local identity and majority of social capital. The international test market to competitiveness is also a proof of success which the volumes in Union European and in the rest of the world have been increasing. There exists a difference between the young firms and the mature ones, which as more that 10 years old. The mature ones characterize by social capital with familiar control, top managers with age superior to 40 years old with superior studies; for a decrease on generate employment and for a decrease on business volume, exception for the pavement and revetment ceramics.

The correlation with the analyse variables of the firms we observe that the firms' age is significantly correlated with the size, business volume, restructuring processes, associated firms, global investment; but not with positive profits. Firms' size is related with the age of firms, business volume, enterprise group, associated firms, and internationalization, decreasing in national sales, positive profits, investments and managers studies. Business volume, directly connected with organizational success and performance, is correlated with age, size, enterprise group, associated firms, internationalization, positive profits, investments and managers studies. Restructuring processes that may represent the adaptive evolution to complex environment is correlated with age, social capital, enterprise group and associated firms. Profits are correlated with size, business volume, social capital and enterprise group.

The principal sources of competitive advantage enumerated by the top managers of mature firms was related with market features and orientation, like quality, relations with clients,

competences of human resources, consumers satisfaction, good image and reputation, service to the client. There exists some advantages related to the market adaptation like knowledge and organizational learning, entrepreneurship and initiative of the managers, process and product innovations. On the less cited competitive advantages, unfortunately are marketing, benchmarking and organizational imitation behaviour and chance and luck, which Alchian (1950:214) cited as a substantial element to achieving success.

The analysed industry firms passed by a secular evolution process, being today in a maturation stadium, where the adaptation to more and more global, competitive, volatile and uncertain environment is a challenge still more with its own traditional industry characteristics that have to be “creative destruction” and create and sustain competitive advantages to be successful and survive in the actual global market promoting the rational maximization and efficiency. So, evolution could guides competitiveness.

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