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The effect of culture on the relationship between manufacturing strategy and manufacturing practices

by

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The effect of culture on the relationship between manufacturing strategy and manufacturing practices

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Abstract. The purpose of the article is to investigate the importance that differences in national culture characteristics have in explaining the relationship between competitive priorities and the investments in manufacturing practices. Several studies have investigated the role that national culture has in explaining the manufacturing practices effectiveness. The article provides an evaluation of how manufacturing investments decisions are put in place in different cultural settings coherently with the way through which companies have decided to compete. From this point of view the article contributes to the research stream of global manufacturing strategy.

Keywords: National culture, Manufacturing strategy, Manufacturing practices, GMRG

1. Introduction

In the last decades attention has been paid to the role of manufacturing in achieving competitive advantage. In the vast amount of literature generated on the topic of Manufacturing Strategy, attention has been paid on how companies decide to compete through manufacturing, thus on which elements influence their internal strategy. More recently, attention has also been paid to the role of culture in influencing this managerial area.

Literature in different managerial fields has paid attention to the role of culture in the definition of manager's behavior and in the structure of managerial process (Hope and Muehlemann, 2001; Hofstede, 1994). Culture has been analyzed under different perspectives, moving from the concept of "corporate culture" (Schein, 1984) to that of national culture (Hofstede, 1994). Nowadays, the global competitiveness has increased the necessity to undertake decisions that move beyond the national boundaries; managers, in order to put in place effective investments, should take into account that culture can affects the way through which people act, and, consequently, the way through which manufacturing practices are managed and goals are achieved. Attention has been paid, in the past, on the different aspects of culture i.e. corporate vs. national culture. Here attention is paid to "national culture" since "*cultural influences on management are most clearly recognizable at the national level*" (Hofstede, 1994, p.4). Moreover, literature has addressed in previous research streams the impact of national culture on operations, identifying relevant relationship.

Market globalization has conducted companies to work in a world context, increasing the interest to understand the way through which, globally, the OM decisions are carried out (Prasad and Babbar, 2000; Wiengarten *et al.*, 2011). Specifically, literature has addressed the issues concerning to the best practices effectiveness. Attention has been paid to the transferability of manufacturing practices from one country to another (Voss and Blackmon, 1996,1998; Rungutusanatham *et al*, 2005*;* Power *et al.,* 2010). The key question has been whether, and under which conditions, manufacturing practices are equally effective across different countries. One of the most known case where this research focus has been developed is the lean manufacturing case. Womack *et al.* (1990), in order to understand the characteristics of lean production, and whether these practices could be transferred, successfully, to other plants, compared the "Western" plants (i.e. General Motor's Framingham plant) to the Toyota's plants (i.e. Takaoka plant). One of the key results of this research was that, in the case of General Motor, adopting lean manufacturing practices was not easy; the environment (i.e. labor force, supplier relationship, market dynamics, but also national culture) was significantly different to the Japanese one requiring the "lean"

philosophy to adapt to the different context. Manufacturing practices cannot be transferred across countries as they are; the cultural setting should be taken into proper consideration when deciding to invest in a specific manufacturing practice. Literature has typically addressed the issue of transferability by considering whether best practices are universal (i.e. best practices adoption leads to increase performance, independently from the context in which they are applied) or contingent (i.e. best practices effectiveness depends upon the context in which the improvement programmes are applied) (Ketokivi and Schroeder, 2004a, 2004b).

In this work, attention is paid on national culture as a moderator of the relationship between competitive priorities and manufacturing practices. Specifically, we want to extend the results of Wiengarten *et al.* (2011) on the impact of national culture in best practices effectiveness by considering also the competitive goals that manufacturing companies define. Specifically, the research question we aim to explain is as follows: given a specific set of competitive priorities does national culture affect the extent through which companies decide to invest in manufacturing practices?

The paper is structured as follows. First of all a detailed literature review allows us to understand why the mentioned research question is relevant and thus justifies the described research. Then the research framework is discussed and the empirical methodology is described. Empirical results are then described and their implications are properly explained. Finally, we draw conclusions and highlight possible areas of future research.

2. Literature review

The concept of manufacturing strategy has attracted the attention of many scholars and researchers over time, leading to the development of several perspectives and approaches. Voss (1995; 2005), has clarified and linked together the different points of view and three main paradigms have emerged: competing through manufacturing (capabilities), strategic choices (fit) and best practices.

Competing through manufacturing refers to the role of manufacturing as a competitive weapon (Voss, 1995). As corporate strategy should be aligned with the marketplace in terms of competitive forces (Porter, 1980) so a proper manufacturing strategy should be defined in order to achieve a competitive advantage that is sustainable over time (Hayes and Pisano, 1994). Voss (1995), clearly points out the two key topics to consider: (i) key success factors, a firm should decide “how to compete” i.e. how to win orders within a market in terms of their competitive priorities such as cost, quality, delivery and flexibility; (ii) capabilities, a firm

should strategically choose its competitive priorities build them and align them with the market requirements in order to create manufacturing capabilities, intended as a stock of strategic assets (Ward *et al.*, 1996).

The strategic choice paradigm (fit) reflects the several choices that a company can make. The concept of fit, defined as "the consistency among contextual, structural, and strategic factors" (Doty *et al.*, 1993, p.1243) is rooted into the works provided by Drazin and Van de Ven (1985) and Venkatraman (1989). Specifically, Drazin and Van de Ven (1985) have proposed three types of fit: (i) *selection*, according to which "fit is the result of an evolutionary process of adaptation that ensures that only the best performing organizations survive" (Drazin and Van de Ven 1985, p.516); (ii) *interaction*, that take into account the effect of the context as well as the effect of the structure of an organization on performance; (iii) *system approach*, that encompasses the concept of equifinality according to which fit can be interpreted as a feasible set of equally effective alternative design.

Similarly, Venkatraman (1989) has proposed six types of fit: (i) *moderation*, according to which the level of a third variable (moderator) affects the impact that an explanatory variable has on a dependent one; (ii) *mediation*, according to which there is an indirect effect among the explanatory variable and the dependent variable; (iii) *matching*, according to which "fit is a theoretically defined match between two related variables" (Venkatraman 1989, p.430); (iv) *gestalts*, in which fit is seen in terms of internal coherence that can differ between high and low performance businesses among a set of theoretical attributes; (v) *profile deviations*, that evaluates the degree of fit to an external profile; (vi) *covariation*, according to which fit is seen in terms of internal consistency.

The strategic choice paradigm is related to the contingency theory "according to which internal and external consistency between manufacturing strategy choices increases performance" (Sousa and Voss, 2008, p.703). Moreover, according to De Meyer *et al.* (1993), contingency theory states that an organization adapts itself with the changing contextual conditions in order to maintain or achieve high performance (Donaldson, 2001; Sousa and Voss, 2008). Specifically, organizational studies and strategic management research have highlighted that internal/external fit and performance are related (Venkatraman and Prescott, 1990). Starting from the organizational and strategic management literature, this theory has been applied in many other fields such as new product development (McCarthy *et al.*,2006), human resource management (Delery and Doty, 1996) and demand forecasting (Kalchschmidt, 2012). In the OM literature Sousa and Voss (2008) have proposed a critical literature review. According to these authors, this theoretical lens has given rise to the

Operations Management Practice Contingency Research (OM PCR) addressed to analyze the effectiveness of the best practices adoption on operational performance.

Lastly the concept of best practice is considered. According to Voss *et al.* (1997), practices can be considered as an established process that firms have put in place in order to enhance their way to make business. Manufacturing practices refer to different areas of intervention and are often clustered into quality practices, plant and equipment practices, innovation - new product development practices, logistics and concurrent engineering (Voss *et al.*, 1995, 1998; Laugen *et al.*, 2005). In literature there is not a clear and unique definition concerning what best practices are. Two streams of research have arisen: the first defines best practices as those practices that lead to superior performance (Camp, 1989) and is related (Voss, 1995) to the concept of the World Class Manufacturing (Hayes and Wheelwright, 1984; Schonberger, 1986). The second suggests that best practices are those practices adopted by the best performing companies (Davies and Kochhar, 2002; Laugen *et al.*, 2005) and take into account the contingency theory approach.

The three perspectives (i.e. competing through manufacturing, strategic choices and best practices) are linked with each other (Voss, 1995): competing through manufacturing is related to strategic choice and best practice which, in turn, is tied with strategic choice. Voss (1995), suggests that the meaning of the relationship between competing through manufacturing and strategic choice is traceable in Hill (1993): in order to reach their competitive priorities (i.e. order winner) companies must choose the appropriate infrastructure and processes. Similarly, competing through manufacturing is tied to best practice: a firm must choose its improvement programmes in coherence with its competitive priorities (Hill, 1993; Voss, 1995). Lastly, the link between strategic choice and best practice reflects the question if best practices are universal or context dependent (Voss, 1995).

OM research has borrowed from the strategic management and organizational literature three theories under which the best practice paradigm could be analyzed: (i) universal, i.e. best practice have always a positive impact and should be adopted by all the organizations; (ii) contingency, i.e. the impact of best practices is not equal for all the organizations but it depends upon the specific context in which those practices are apply; (iii) configurational (Delery and Doty, 1996), i.e. there are several ways to achieve the organizational fit to the external or internal environment (Bozarth and McDermott, 1998). According to the strategic choice paradigm (fit) and to the contingency theory approach, several authors have suggested that best practices should be analyzed within the context in which the adopting firms are operating (Doty *et al.*, 1993; Laugen *et al.*, 2005; Davies and Kochhar, 2002; Ketokivi and

Schroeder, 2004; Powell, 1995). Contingency variables can be clustered into four broad categories (Sousa and Voss, 2008): (i) firm size, (ii) strategic context, (iii) context variables (iv) national context and culture. According to Sousa and Voss (2008), the effect of size on the best practice effectiveness varies according to the set of practices analyzed. In this sense, Cagliano *et al.* (2001) have focused on the firm size analyzing SMEs. Shah and Ward (2007) have conducted a study in order to examine how size, age and unionization status can influence the implementation of lean manufacturing practices, finding support for size as contextual factor. Similarly, studies addressing the strategic context are conducted in order to verify the contingency effects that variables such as type of production process, product complexity, product customization, product volume, have on the best practices effectiveness. Sousa and Voss (2001) have highlighted the importance of strategic context for what concern quality management. Lastly, variables such as industry, plant age, equipment age, are considered. Kim and Arnold (1993) have shown that industry plays a crucial role in the implementation, applicability and effectiveness of manufacturing practices.

Several studies have addressed the role of national culture in explaining differences in best practices effectiveness. Specifically, the importance of national culture is widely recognized within the OM literature and articles dealing with national culture are typically associated to the International Operations Management (IOM) literature. As suggest by Pagell *et al.* (2005), the IOM literature is increasing in the last years and three research perspectives have been identified: the first regards research dealing with single country studies, the second regards studies addressing comparison among countries and the third regards research dealing with comparison among regions (Prasad and Babbar, 2000). These articles are focused on geographical boundaries and do not take into account cultural differences among countries. Pagell *et al.* (2005) have criticized this aspect. Specifically, these authors have advocated the relevance of national culture as construct able to explain differences in how, globally, the operations management decisions are carried out. In the detail, according to these authors, the crossing of boundaries doesn't mean changes in business practices, decision-making strategy and outcomes. Moreover, countries in a region are not necessarily similar in terms of cultural values and level of industrialization, and the identification of a region is subject to personal judgmental (Pagell *et al*., 2005).

The role of national culture, within OM research, is relevant in studies dealing with the best practices effectiveness. The idea behind these studies is that what is "best" in one country might not be so in another. Several researches have investigated the role of national culture in explain this issue: Flynn and Saladin (2004) and Vecchi and Brennan (2011) concerning

quality practices and quality management, Kaasa and Vadi (2008) and Wacker and Sprague (1998) concerning, respectively, innovation and forecasting practices. Voss and Blackmon (1996; 1998) have analyzed differences among national contexts, strategic time orientation and parent ownership, Rungutusanatham *et al.* (2005) have shown how TQM adoption can differ across countries, Power *et al.* (2010) have compared Asiatic and Western countries in order to shed a light on the importance of national culture in explain investments in manufacturing practices and the related performance outcomes. Wiengarten *et al.* (2011) have conducted a study in which national culture act as moderating variable in explain the relationship between the investments in manufacturing practices and the operational performance. These researches have shown how the best practices effectiveness can differ according to the culture of the country in which they are applied.

A scarcely investigated topic is the relationship between competitive priorities and the investments in manufacturing practices. Some works have considered the role of competitive priorities in the best practices definition as well as the fit between manufacturing objectives and the investments in manufacturing practices. Moreover, some authors, have considered the role that competitive priorities have as contingent variables (Hayes and Wheelwright, 1984; Hill, 1993; Spring and Boaden, 1997; Flynn *et al.*, 1999; Dangayach and Deshmukh, 2001; Ketokivi and Schroeder 2004; Voss 2005; Peng *et al.* 2011). As Dangayach and Deshmukh (2001, p.908) have stated, in the era of globalization, manufacturing is "no longer concentrated in one country, but it's spread across the globe". In this sense, these authors have advocated the role of the research in order to compare manufacturing strategies and practices across countries with the aim to "indentify specific factors responsible for given competitive edge". Literature has highlighted how competitive priorities differ across countries (Noble, 1993) as well as the existence of differences in the managerial focus between countries (Dangayach and Deshmukh, 2001). Other authors have also considered the role of manufacturing strategy in relation with the organizational culture, highlighting the fit between these two dimensions (Bates et al., 1995).

Starting from these considerations, and according to the suggestion that national culture affects people's behavior and consequently the decision-making process, this article aims to contribute to OM PCR with a different point of view: we wish to take into account the relationship between manufacturing strategy and the investments in manufacturing practices. In doing this, we will adopt the contingency theory approach and we aim to analyze the impact that national culture has in moderating the relationship mentioned above.

Previous research (Flynn and Saladin, 2004; Kaasa and Vadi, 2008; Wacker and Sprague, 1998, Wiengarten *et al*., 2011) has assessed national culture through the Hofstede's model (1980). This author realized a scheme able to capture culture differences between countries and has defined culture as the collective programming of the mind, which distinguishes the members of one group, or category of people, from another. Specifically, national culture is assessed through four indexes: (i) power distance (PDI), (ii) individualism (IDV), (iii) masculinity (MAS), (iv) uncertainty avoidance (UAI). Each dimension is measured through a score. Power distance reflects the inequity within societies, individualism the attitude of people to act for their own interests, masculinity the degree to which, in societies, the gender characteristics are well defined and uncertainty avoidance the degree to which people perceive uncertainty situations.

Although several cultural models have been proposed, such as the GLOBE project (House *et al.*, 2004) and despite all the criticism (McSweeney, 2002), the replicability of the Hofstede's model for management research and its validity, compared to other cultural models, is still remarkable (Merrit, 2000; Magnusson *et al.*, 2008). Specifically, Hofstede's model mirrors the culture that permeates the organizations. Hofstede's model is been chosen for two reasons: we have decided to replicate Wiengarten *et al.* (2011) and it is commonly adopted in works concerning national culture comparisons (Merrit, 2000; Magnusson *et al.*, 2008).

3. Research objectives

Literature has highlighted several argumentations that might be translated into a research proposition. Specifically, the proposition we aim to test regards the moderating role exerted by national culture on the relationship between competitive priorities and manufacturing practices (Figure 1).

Manufacturing companies define how to compete and in order to achieve their priorities invest in manufacturing practices. However national culture might affect this relationship: the cultural traits of the countries in which companies are operating might influence how competitive priorities are defined and achieved, as well as the extent through which the investments in manufacturing practices are put in place. Moreover, literature has suggested how national culture has a link with the organizational culture, which in turn has a link both with the effectiveness and the way through which manufacturing practices are managed. The research proposition we formulated is the follow:

RP. *Given a set of competitive priorities and a set of manufacturing practices, the way through which companies have invested in manufacturing practices changes according to the cultural characteristics of the countries in which companies are operating.*

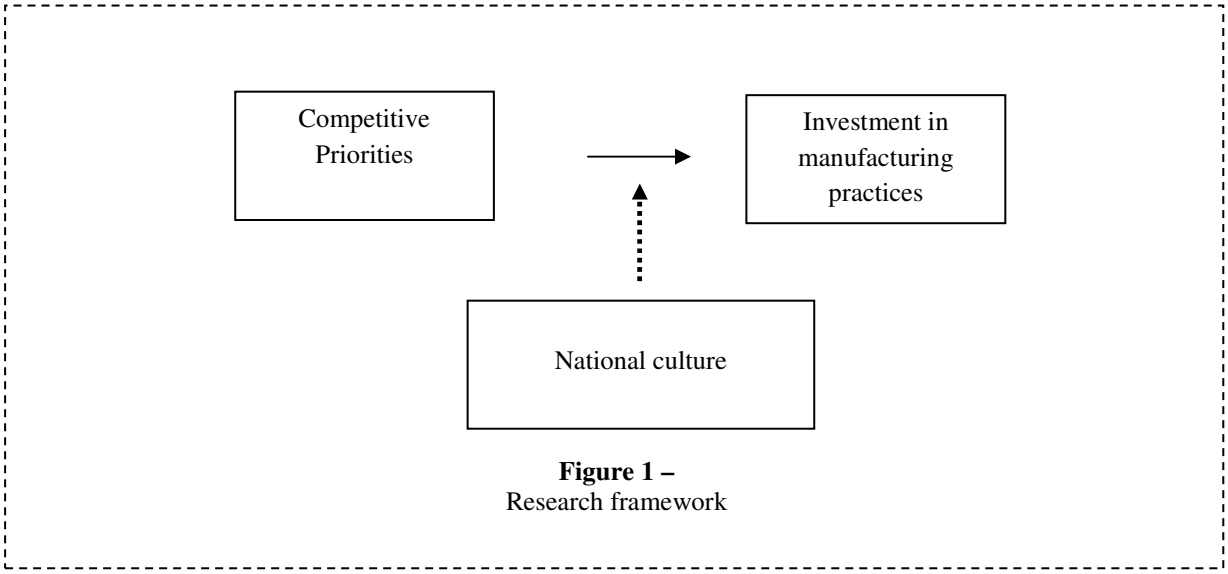

Figure 1 –
Research framework

In order to test the proposition mentioned above, we used data obtained from the IV round of the Global Manufacturing Research Group (GMRG) survey (conducted between 2006 and 2009). GMRG is a worldwide project carried out by OM researchers belonging to different countries in the world aimed to gather data about manufacturing practices. Data are collected through a questionnaire, properly translated from English into the foreign languages of each country where it's administrated. The local research groups distribute the questionnaire simultaneously in their respective countries and the answers are collected into a unique database.

The sample is limited to those companies whose answers were valid for our analysis and to those countries for which the Hofstede's indexes are available; data concerning countries such as Albania, Croatia, Fiji, Ghana, Korea, Macedonia and Nigeria were removed. Table I shows the sample description, listed by countries, and the related national culture Hofstede's dimensions used in the analysis. An amount of 845 items are available for our purposes. We refer to Whybark (1997) for what concerns the detail about the survey administration and the scale development.

Country	N	Number of plant employees	PDI	IDV	MAS	UAI
Australia	44	267	36	90	61	51
Austria	14	1181	11	55	79	70
Brazil	29	249	69	38	49	76
Canada	83	221	39	80	52	48
China	56	1433	80	20	66	30
Finland	138	126	33	63	26	59
Germany	54	324	35	67	66	65
Hungary	50	407	46	80	88	82
Ireland	49	140	28	70	68	35
Italy	49	164	50	76	70	75
Mexico	76	274	81	30	69	82
Poland	57	348	68	60	64	93
Sweden	24	421	31	71	5	29
Switzerland	30	468	34	68	70	58
Taiwan	47	1767	58	17	45	69
USA	45	230	40	91	62	46
Total	845					
Mean		428				

Table I –
Sample description

Relying on the existing literature, several questions have been built in the GMRG survey: coherently with the purpose of the article, the items concerning the competitive priorities and the investments in manufacturing practices are taken into consideration.

Competitive priorities were measured through the extent to which goals such as cost (price), quality (conformance to specifications), delivery timeless, product variety-volume, new product design-innovation and environment-safety, are evaluated by top management. Companies had to distribute a total score of 100 on these goals in order to describe the relative importance given to the different elements. Similarly, investments in manufacturing practices are evaluated through the extent to which a plant has invested resources such as money, time or people in improvement programmes over the last two years, coherently with the timeframe in which the survey was administered. Responses are assessed through a likert scale ranging from 1 (not at all) to 7 (to great extent); the improvement programmes (Table II) are chosen coherently with Wiengarten *et al.* (2011) that in turn relies on Voss *et al.* 1995, 1998 and Laugen *et al.* 2005. Wiengarten *et al.* (2011) have highlighted two latent factors named “manufacturing quality practices” and “manufacturing plant and equipment practices”

that are re-used in our analysis. Table II shows the factor analysis carried out in order to validate the latent factors indentified in Wiengarten *et al.* (2011).

Lastly, national culture was measured through the Hofstede's indexes and the size of company (logarithm of the total number of employees) and the percentage of international ownership have been added as control variables. Each variable is mean centered (Aiken and West, 1991; Preacher *et al.*, 2006).

Programmes-Practices	Manufacturing quality practices	Manufacturing plant and equipment practices
Investments in manufacturing plant and equipment (α=0.752)		
Cellular Manufacturing	0.299	0.532
Factory automation	0.110	0.666
Process redesign	0.05	0.738
Manufacturing throughput time reduction	0.168	0.761
set-up time reduction	0.287	0.707
Investments in manufacturing quality (α=0.790)		
Total Quality Management	0.594	0.354
ISO 9000 certification	0.779	0.000
Supplier certification	0.785	0.142
Statistical Process Control	0.743	0.241
Six Sigma	0.640	0.248

Table II –
Factor analysis on investments in manufacturing practices

Many articles have highlighted the importance that taxonomies have in order to classify firms and identify strategic groups (Miller and Roth, 1994; Bozarth and McDermott, 1998; Frohlich and Dixon, 2001; Zhao *et.al* 2006). According to Miller and Roth (1994), the best way to assess the consistency between business strategy and manufacturing strategy is to build a taxonomy using the competitive goals of each company. In order to classify companies we refer to the manufacturing strategic groups ("innovators", "caretakers" and "marketeers") identified in Miller and Roth (1994) and validated in Frohlich and Dixon (2011) and in Zhao *et al.* (2006). A cluster analysis based on the relative importance of competitive priorities was performed. A K-means algorithm was applied and Calinski-Harabasz rule was used in order to determine the appropriate number of clusters. In the end three manufacturing strategic groups have been identified. Table III shows the manufacturing strategic groups. The clusters seem to reflect the characteristics found in Miller and Roth (1994).

Competitive Priorities	INNOVATORS Customer – oriented **1 (n=439) 51.9%**	MARKETEERS Quality – oriented **2 (n=246) 29.11%**	CARETAKERS Efficiency - oriented **3 (n=160) 18.93%**	**F= value**	**P= probability**
Cost (Price)					
Mean*	18.88	22.45	**49.01 (2;3)**	795.19	0.0000
Rank**	2	2	1		
SE***	6.85	8.58	11.09		
Quality (conformance to specifications)					
Mean*	19.71	**35.8(1;3)**	18.56	409.77	0.0000
Rank**	1	1	2		
SE***	5.28	10.16	8.24		
Delivery timeliness					
Mean*	18.24	**18.89**	13.13(1;2)	25.46	0.0000
Rank**	3	3	3		
SE***	8.04	10.19	7.29		
Product Variety-Volume					
Mean*	**13.31 (2;3)**	6.94	6.95	91.05	0.0000
Rank**	6	6	4		
SE***	7.99	5.52	5.04		
New Product Design-Innovation					
Mean*	**15.82(2;3)**	7.54	6.48	141.42	0.0000
Rank**	4	5	5		
SE***	8.93	5.52	5.78		
Environment-Safety					
Mean*	**14.01(2;3)**	8.33(3)	5.84	112.51	0.0000
Rank**	5	4	6		
SE***	7.35	6.57	4.36		

Table III -
Manufacturing strategy groups

* Mean of each competitive priorities, within the group. The mean is indicates as percentage.

** Order of importance of each competitive priorities within the group.

** Standard error of the mean.

In **bold** is indicated the highest group mean value for each competitive priorities. F-statistics and P-value are related to one-way ANOVAs. In brackets are indicated the number of the group from which the reference group, as indicated by the Scheffe test differ (the significant level is set to 0.05).

Companies belonging to the first cluster are more customer-oriented and they pay great attention to product variety-volume, new product design-innovation and environment-safety. Members are flexible and aim to introduce new products quickly. We named them

"innovators", coherently with what suggested by Miller and Roth (1994). Companies belonging to the second group are more quality oriented. Quality has the highest score, compared to the other clusters; other priorities, such as cost and delivery, are also taken into account. We refer to this cluster as "marketeers". Companies belonging to the third group are more efficiency-oriented. Members put great attention to cost and the numerical score is the highest. Beside cost, companies show for each other competitive priority the lowest valuation: an exception is product variety-volume whose numerical score is similar to the value in the second group. We refer to this cluster as "caretakers".

The research proposition is tested through a set of OLS models. In order to perform the OLS analysis each companies has been assigned (through a dummy variable) to the relative manufacturing strategic group.

4. Empirical analysis and results

The empirical model is shown in Figure 2.

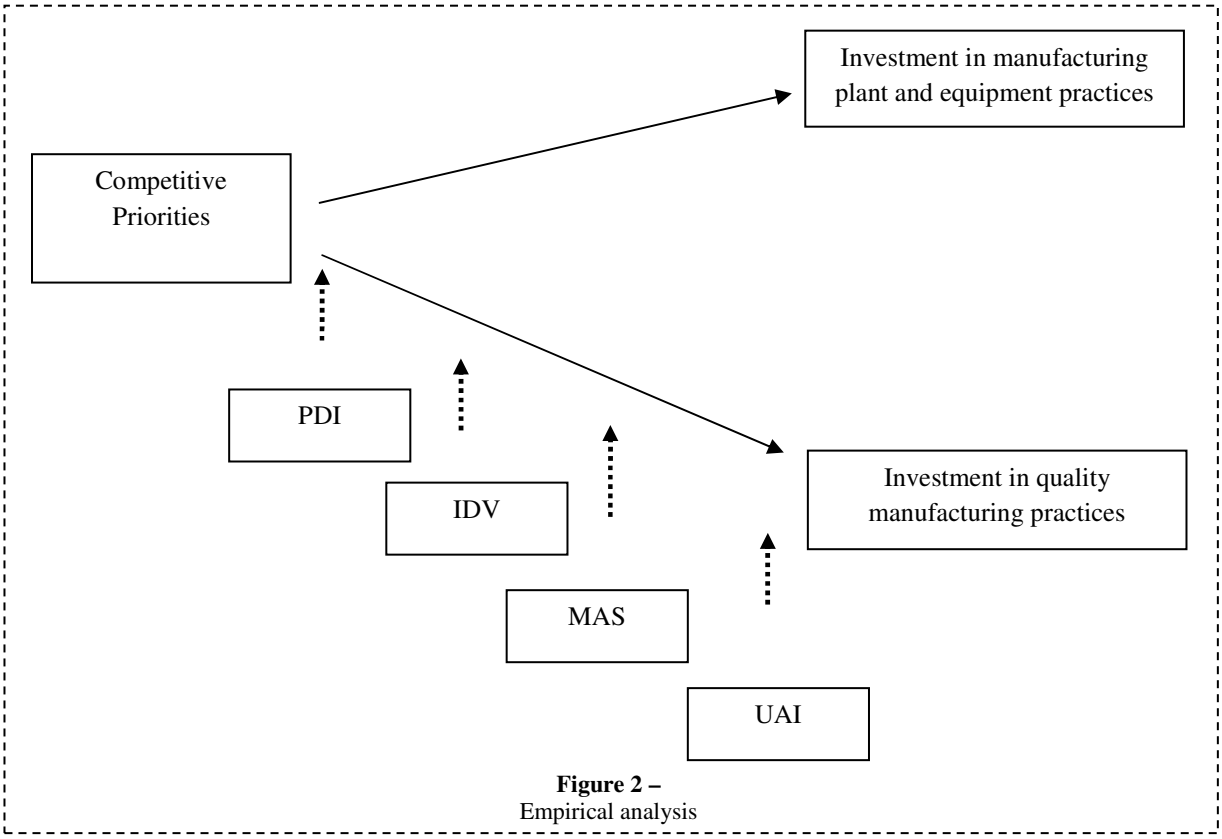

Figure 2 –
Empirical analysis

The manufacturing strategic groups are the independent variables ("caretakers" is the reference group) whilst the dependents one are the investments in manufacturing practices

latent factors (i.e. investments in manufacturing plant and equipment practices and in manufacturing quality practices).

The independent variables are added in block into the model: the entry sequence is: (i) control variables, (ii) strategic groups, (iii) moderators, (iv) interaction terms. The nested regression is used to assess the R-squared change in order to understand if the adding of the variables contributes to increase significantly the percentage of variance explained. Furthermore, a simple slope analyses is been implemented in order to understand the interaction effect; this methodology consists in compute the regions of significance of the slopes (Aiken and West, 1991; Preacher *et al.*, 2006) at low level of the moderator (one SD below the mean) and high level of the moderator (one SD above the mean).

We controlled each step of the procedure by evaluating the variance inflation factor and the condition indexes. The variance inflation factor is always lower than 4 on a cut-off point between 5 and 10 (Hair *et al*., 1998; Menard, 2002; Neter *et al*., 1989), whereas the condition index is, on average, below 6 (Belsey *et al.* 2004). Therefore, multicollinearity is not considered and issue for any model.

Table IV shows the correlation matrix; we applied the Bonferroni correction in order to give a more stringent cut-off concerning the statistical significance.

4.1 Investments in manufacturing plant and equipment practices

Table V shows the results concerning the analysis carried out considering the investments in manufacturing plant and equipment practices. In this table: model (1) considers the effect of control variables and model (2) implements the universal model in which the relationship between competitive priorities and the investments in manufacturing plant and equipment practices is tested. Model (3), model (5), model (7) and model (9) show the contingents models, in which the cultural traits are added to the model. Lastly, model (4), model (6), model (8) and model (10) consider the two-way interaction terms in order to estimate the existence of the national culture moderating effect.

The universal model shows that both “innovators” and “marketeers” companies (compared to “caretakers”) have significantly invested in manufacturing plant and equipment practices ($\beta_{\text{INNOVATORS VS CARETAKERS}} = 0.26$ $p<0.01$; $\beta_{\text{MARKETEERS VS CARETAKERS}} = 0.24$ $p<0.05$, adjusted R-squared 0.0992) in comparison with the efficiency-oriented (“caretakers”) organizations.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Size (1)	1									
Percentage of international ownership (2)	0.2445**	1								
Investments in plant and equipment practices (3)	0.2975**	0.1263*	1							
Investments in quality practices (4)	0.4245**	0.2345* *	0.4905**	1						
Innovators (5)	0.0163	0.0482	0.0562	-0.0486	1					
Marketeers (6)	0.0371	0.0118	0.0342	0.0757	-0.6664**	1				
PDI (7)	0.1406**	0.0144	0.0218	0.1995**	-0.1383**	0.1325**	1			
IDV (8)	-0.2301**	-0.0585	-0.1790**	-0.2868**	0.0046	-0.0678	-0.7263**	1		
MAS (9)	0.0408	0.0204	-0.0534	0.1550**	-0.3819**	0.2259**	0.3196**	0.0034	1	
UAI (10)	-0.1527**	-0.2480**	-0.1491**	-0.0953*	-0.1114*	0.041	0.4044**	-0.1993**	0.3440**	1

Table IV -
Correlation matrix,
correlation is significance at: *0.05 and ** 0.01 (Bonferroni correction was applied)

The contingents models show that both PDI and IDV exhibit a statistical significance for what concern the regression coefficients (β_{PDI} = -0.003 p<0.1, adjusted R-squared=0.1022; β_{IDV} = -0.004 p<0.01, adjusted R-squared=0.1091). The R-squared change is significant in both cases. The two-way interactions terms did not reveal moderation effects. Similarly, MAS and UAI exhibit a significant regression weight (β_{MAS} = -0.003 p<0.05, adjusted R-squared=0.1134; β_{UAI} = -0.007 p<0.01, adjusted R-squared=0.1029). The R-change is significant and the adding of these variables increases the percentage of variance explained. The two-way interaction term is significant for what concern MAS and "innovators" companies ($\beta_{MAS \times INNOVATORS}$ = 0.01, p<0.1). The result suggests a weak moderation effect. Figure 3 shows the simple slope analysis; the simple slop is significant for high level of masculinity ($\beta_{SLOPE\text{-}MAS}$= 0.3585, p-value=0.0149).

4.2 Investments in manufacturing quality practices

Table VI shows the results concerning the analysis carried out considering the investments in manufacturing quality practices. The universal model doesn't show a statistical significance for what concern the way through which both "innovators" and "marketeers" companies have invested in manufacturing quality practices, in comparison with the efficiency-oriented organizations ("caretakers"). The contingents models show that both PDI and IDV exhibit strong statistical significance: (β_{PDI} =0.009 p<0.01, adjusted R-squared=0.2314; β_{IDV} =-0.010, p<0.01, adjusted R-squared=0.2542) and in both cases the R-squared change is significant. Adding the two-way interaction terms significantly increases the percentage of variance explained: moreover the interaction concerning the "innovators" companies and PDI is significant ($\beta_{PDI \times INNOVATORS}$ = 0.017 p<0.01, adjusted R-squared=0.2463) as well as the interaction concerning the same companies and IDV ($\beta_{IDV \times INNOVATORS}$ = -0.01 p<0.01, adjusted R-squared=0.2587). Figure 4 and Figure 5 show that "innovators" companies have invested less in manufacturing quality practices when PDI is low ($\beta_{SLOPE\text{-}PDI}$ =-0.3463, p-value=0.0058) and when IDV is high ($\beta_{SLOPE\text{-}IDV}$ = -0.3109, p-value=0.0056). MAS exhibits a strong regression weight (β_{MAS} = 0.007, p-value <0.01, adjusted R-squared=0.2242). However, there is not statistical significance for what concern the two-way interaction terms. Otherwise the two-way interaction term is significant concerning UAI and "innovators" companies ($\beta_{UAI \times INNOVATORS}$ = 0.008, p-value<0.1).

Figure 6 shows the simple slope analysis. As UAI decreases, the simple slope becomes negative. Specifically, the simple slope when UAI is low is weakly significant ($\beta_{SLOPE\text{-}UAI}$ = -

0.2266, p-value=0.069); conversely the simple slope when UAI is high is not significant ($\beta_{SLOPE\text{-}UAI} = 0.0663$, p-value=0.5874).

Manufacturing plant and equipment practices	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Size	0.19***	0.18***	0.19***	0.20***	0.16***	0.16***	0.17***	0.18***	0.19***	0.18***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.025)	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)
% International ownership	0.16**	0.15*	0.14*	0.14*	0.15*	0.15*	0.08	0.07	0.15*	0.16**
	(0.082)	(0.082)	(0.082)	(0.082)	(0.082)	(0.082)	(0.084)	(0.084)	(0.082)	(0.082)
Innovators Vs Caretakers		0.26***	0.25***	0.26***	0.24***	0.22**	0.23***	0.23**	0.2**	0.14
		(0.092)	(0.092)	(0.093)	(0.094)	(0.094)	(0.092)	(0.092)	(0.097)	(0.103)
Marketeers Vs Caretakers		0.24**	0.25**	0.27***	0.21**	0.19**	0.23***	0.22**	0.23**	0.17
		(0.102)	(0.102)	(0.102)	(0.101)	(0.103)	(0.101)	(0.101)	(0.101)	(0.112)
PDI			-0.003*	-0.005						
			(0.002)	(0.005)						
IDV					- 0.004***	-0.009**				
					(0.001)	(0.003)				
UAI							-0.007***	-0.01**		
							(0.001)	(0.004)		
MAS									-0.003**	-0.012*
									(0.001)	(0.005)
PDI x Innovators				0.005						
				(0.005)						
PDI x Marketeers				-0.002						
				(0.006)						
IDV x Innovators						0.004				
						(0.004)				
IDV x Marketeers						0.006				
						(0.004)				
UAI x Innovators								0.0059		
								(0.005)		
UAI x Marketeers								0.0028		
								(0.005)		
MAS x Innovators										0.01*
										(0.005)
MAS x Marketeers										0.007
										(0.006)
Constant	-0.005	-0.21***	-0.22***	-0.22***	-0.19**	-0.16**	-0.20***	-0.19**	-0.18**	-0.113
	(0.034)	(0.070)	(0.079)	(0.079)	(0.070)	(0.082)	(0.079)	(0.079)	(0.081)	(0.089)
Number of Obs	763	763	763	763	763	763	763	763	763	763
R-squared	0.0936	0.1039	0.1080	0.1116	0.1149	0.1172	0.1192	0.1209	0.1088	0.1133
Adj R-squared	0.0912	0.0992	0.1022	0.1034	0.1091	0.109	0.1134	0.1127	0.1029	0.1051
Delta R-squared		0.0103**	0.0042*	0.0036	0.111***	0.0023	0.0153**	0.0017	0.0049**	0.0045

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table V –
Results: investments in manufacturing plant and equipment practices

Manufacturing quality practices	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Size	0.27***	0.26***	0.24***	0.24***	0.22***	0.22***	0.26***	0.27***	0.26***	0.25***
	(0.022)	(0.022)	(0.023)	(0.022)	(0.023)	(0.023)	(0.023)	(0.022)	(0.022)	(0.022)
% International ownership	0.35***	0.35***	0.36***	0.35***	0.35***	0.35***	0.35***	0.35***	0.34***	0.36***
	(0.078)	(0.078)	(0.077)	(0.077)	(0.076)	(0.076)	(0.080)	(0.080)	(0.077)	(0.077)
Innovators Vs Caretakers		-0.09	-0.05	-0.01	-0.12	-0.08	-0.09	-0.08	0.036	0.021
		(0.087)	(0.086)	(0.086)	(0.085)	(0.087)	(0.088)	(0.087)	(0.091)	(0.096)
Marketeers Vs Caretakers		0.05	0.02	0.05	-0.008	0.03	0.052	0.04	0.072	0.078
		(0.096)	(0.095)	(0.094)	(0.094)	(0.095)	(0.096)	(0.096)	(0.095)	(0.105)
PDI			0.009***	-0.001						
			(0.001)	(0.004)						
IDV					-0.010***	-0.003				
					(0.001)	(0.003)				
UAI							-0.0007	-0.002		
							(0.0018)	(0.004)		
MAS									0.007***	0.002
									(0.001)	(0.004)
PDI x Innovators				0.017***						
				(0.005)						
PDI x Marketeers				0.003						
				(0.005)						
IDV x Innovators						-0.01**				
						(0.004)				
IDV x Marketeers						-0.005				
						(0.004)				
UAI x Innovators								0.008*		
								(0.004)		
UAI x Marketeers								-0.005		
								(0.005)		
MAS x Innovators										0.008
										(0.005)
MAS x Marketeers										-0.003
										(0.006)
Constant	0.003	0.03	0.04	0.03	0.08	0.04	0.03	0.04	-0.025	0.016
	(0.032)	(0.075)	(0.074)	(0,074)	(0.073)	(0.075)	(0.075)	(0.0075)	(0.076)	(0.083)
Number of Obs	753	753	753	753	753	753	753	753	753	753
R-squared	0.2071	0.2112	0.2365	0.2533	0.2592	0.2656	0.2114	0.2227	0.2294	0.2376
Adj R-squared	0.2051	0.2070	0.2314	0.2463	0.2542	0.2587	0.2072	0.2154	0.2242	0.2295
Delta R-squared		0.0041	0.025***	0.0016***	0.047***	0.006**	0.0002	0.0112***	0.0181***	0.0073**

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table VI –
Results: investments manufacturing quality practices

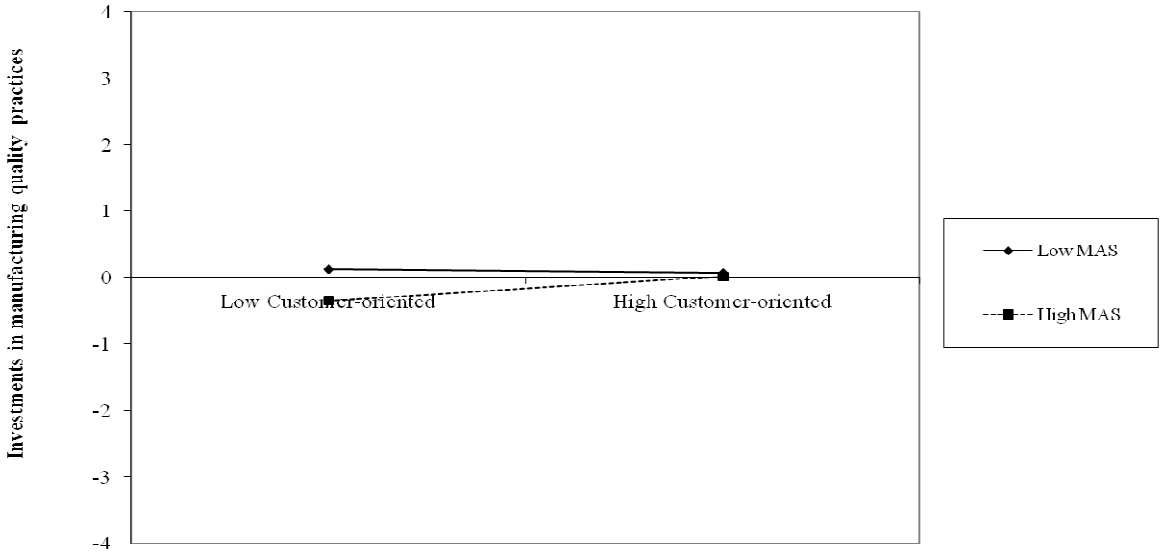

Figure 3 –
Interaction slopes: investments in manufacturing plant and equipment practices and MAS

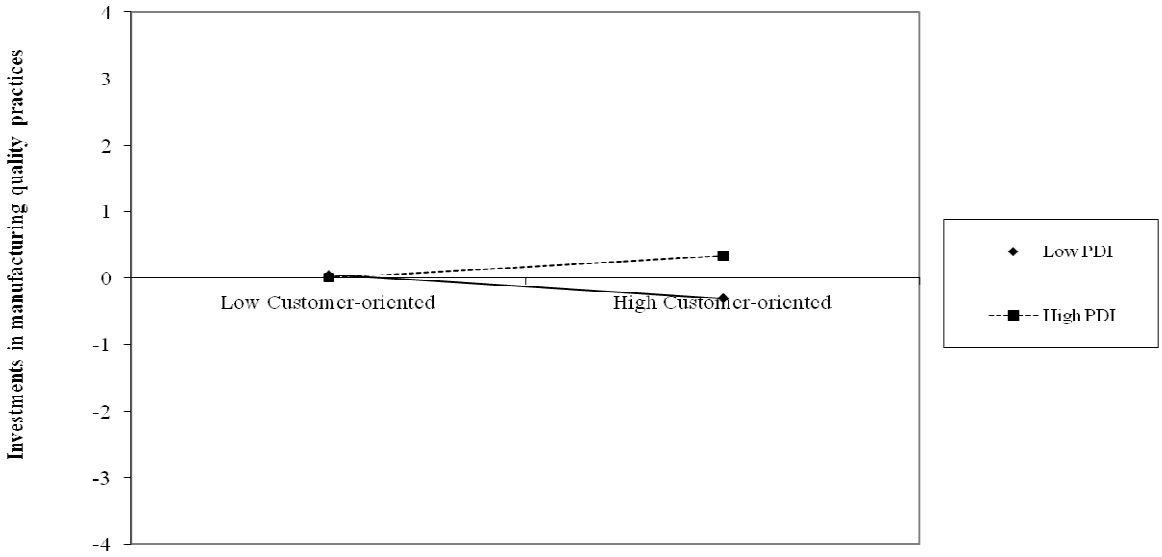

Figure 4 –
Interaction slopes: Investments in manufacturing quality practices and PDI

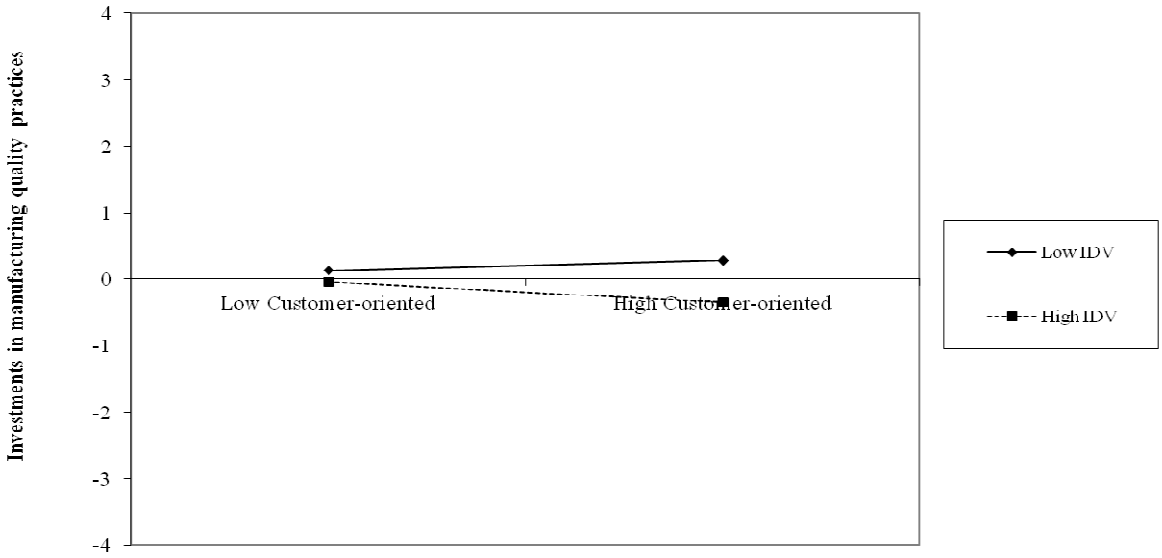

Figure 5 –
Interaction slopes: Investments in manufacturing quality practices and IDV

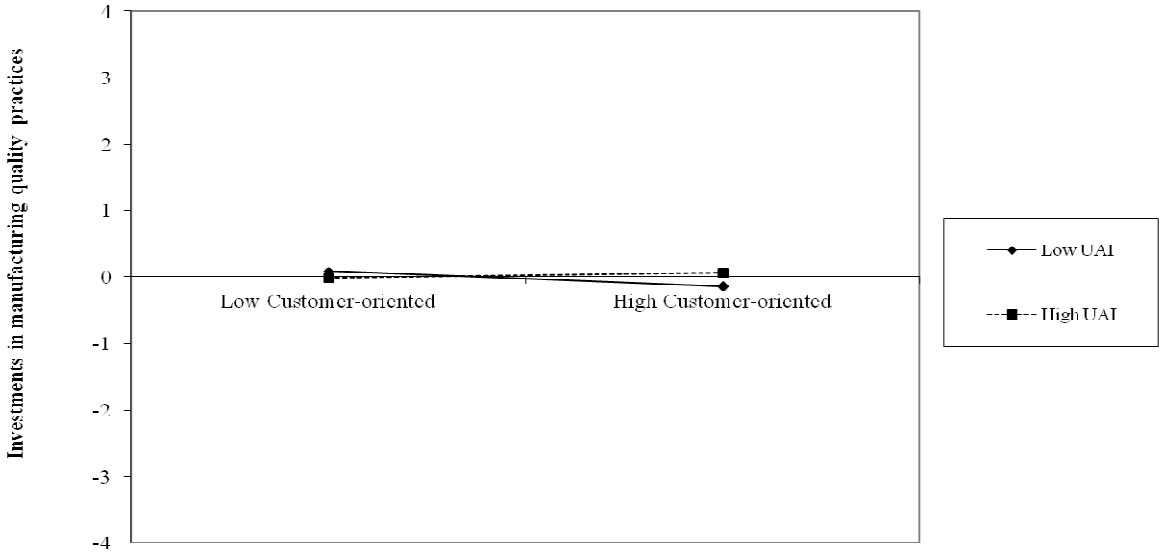

Figure 6 –
Interaction slopes: Investments in manufacturing quality practices and UAI

6. Discussion

Results have shown how national culture moderates the relationship between competitive priorities and the degree through which companies have invested in manufacturing practices. Specifically, the moderation effects indentified are shown in Figure 7: the levels (high and low) of the Hofstede's dimensions are reported, as well as the degree (high and low) through which "innovators" and "marketeers" companies (compared to the "caretakers") have invested in manufacturing practices.

Masculinity moderates the way through which companies have invested in manufacturing plant and equipment practices, whilst individualism, power distance and uncertainty avoidance moderate in manufacturing quality practices.

First of all, it is interesting to identify that there is no mediation effect that significantly distinguishes "marketeers" from "caretakers". This result means that even if competitive priorities are related to companies' practices (in fact "marketeers" adopt plant and equipment practices more extensively compared to "caretakers"), this relationship doesn't change in different cultural contexts. Specifically, this result suggests that quality priority is more related with the adoption of practices that are universal.

When "innovators" are considered the role of national culture seems to be more complex. The more a company aim to be an "innovator" the more the cultural characteristics should be taken into consideration. In fact we identify that the cultural dimensions moderate the relationship with both plant and equipment practices and quality practices. Specifically, the relationship with quality practices seems to be weaker when IDV is high, and PDI and UAI are low, while the relationship with plant and equipment practices seems to be stronger when MAS is high.

This result can be interpreted by considering the existence of a "compensation" mechanism (Vecchi and Brennan, 2011). According to this interpretation, companies might invest in manufacturing practices in the extent through which the effects exerted by the cultural characteristics of the countries in which companies are operating might be mitigated. National culture is hard to change and affects the organizational culture; moreover the cultural traits bring with them some issues that in a global contexts might inhibit the company's competitiveness.

When "innovators" are considered this consideration might be relevant. These companies aim to be customer-oriented and the achievement of this priority is strictly tied with the way through which people act.

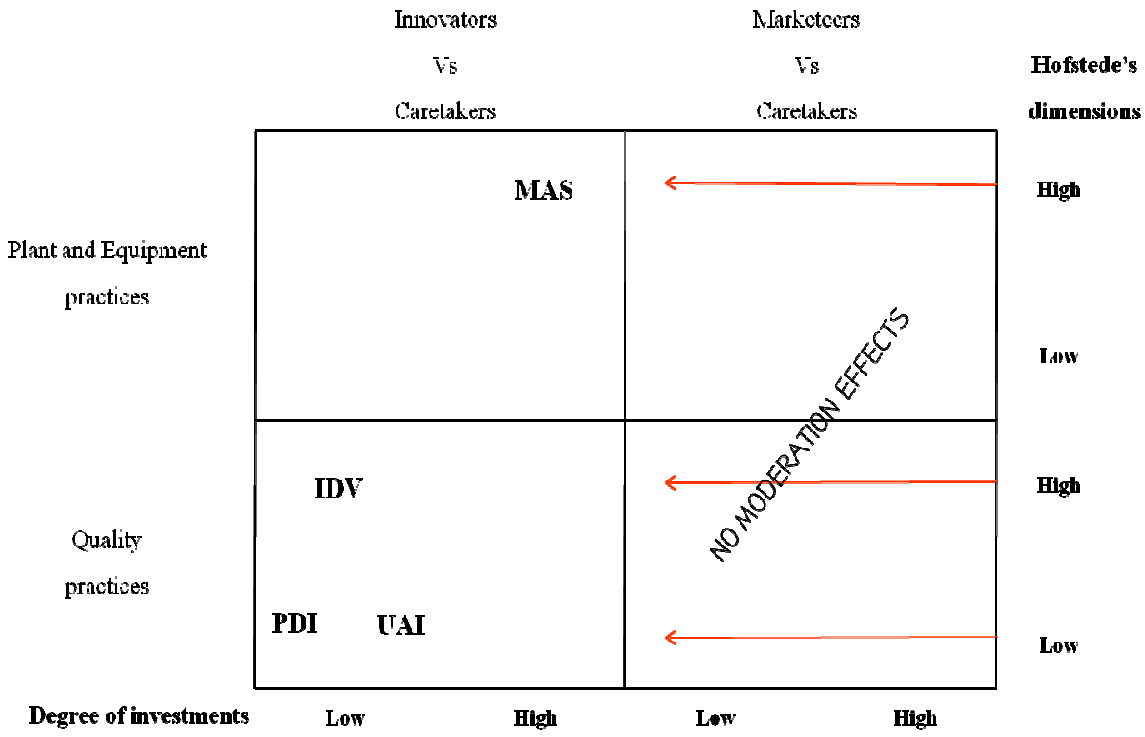

Figure 7 –
Moderation effects

Let's consider the investments in manufacturing plant and equipment practices. These companies may have invested more in manufacturing plant and equipment practices when MAS is high because in these contexts the level of competition is stronger (Hofstede, 1983a,b). This aspect may have conducted companies to invest to a greater extent in manufacturing plant and equipment practices in order to guarantee more flexibility and more attention to the customer's needs rather than to the competitors' behavior. Similarly, investing in quality programmes might be a strategy put in place with the purpose to reduce the issues concerning a highly centralized power as well as to invest in manufacturing practices might "compensate" the lack of clarity and certainty that high UAI country involves (Flynn and Saladin, 2006; Wiengarten *et al.*, 2011).

Vecchi and Brennan (2011), have advanced a suggestion: the inequality in the hierarchical levels contributes to make the power centralized and to make the subordinates in a dependence state; the complexity of the hierarchical level make employees not able to manage, independently and in a effective way, their job and the related processes. Invest in manufacturing quality programmes might be a strategy put in place with the aim to reduce the issues concerning a highly centralized power; emphasis on quality might enhance the degree to which employees perceive this priority as well as standardization might conduct employees to be more autonomous and to solve the issues on their own. Similarly, be comfortable with

uncertainty is necessary in order to engage an highly risky activity and "innovators" companies should be comfortable with uncertainty. Specifically, these companies have invested lower in manufacturing quality practices when UAI is low: to invest in manufacturing quality practices means to invest in standardization that might "compensate" the lack of clarity and certainty that an high UAI environments involves (Flynn and Saladin, 2006; Wiengarten *et al.*, 2011). Moreover, in more individualistic countries, "innovators" companies have invested less in manufacturing quality programmes and this result is consistent with what previous contributions have shown: the effectiveness of quality programmes is negative related to individualism (Flynn and Saladin, 2006; Anwar and Jabnoun, 2006).

Results have also shown that the investments in manufacturing practices are positive related to the size of the firms; more the size of the companies is high, more the companies have invested in manufacturing practices. Furthermore the investments in manufacturing practices depend upon the percentage of international ownership that companies have, and the investments in manufacturing quality practices are much more influenced. The cumulative competitive progression theory (Rosenzweig and Roth, 2004; Ferdows and De Meyer, 1990) might explain this finding. According to this theory quality is the first competitive priority that an organization must acquire; afterwards companies achieve capabilities concerning delivery, flexibility and, lastly, cost. Therefore companies may have decided to invest with great extent in quality practices rather than in manufacturing plant and equipment practices in order to achieve first of all this priority. Specifically, companies might have imposed to their subsidiaries this priority in order to be able to guarantee globally the conformance to the product specifications. Furthermore, this theory can explain another finding. To be an "innovators" or to be a "marketeers" (compared to the "caretakers") does not have influenced the degree through which the investments in manufacturing quality practices are carried out. Conversely to be an "innovators" or to be a "marketeers" (compared to the "caretakers") is positive related to the extent through which companies have invested in manufacturing plant and equipment practices. This result suggests the follow consideration: nowadays quality might be considered as an order-qualifies and not an order-winner and be able to satisfy the products specifications is essential in order to stay in the market and be competitive, especially in the context of the global competition.

7. Conclusion

An effective managerial decision cannot be undertaken, globally, without taking into account the culture of the countries in which companies are operating. National culture affects the way through which people act and, directly, or indirectly, the decision-making process, the emphasis through which the investments are put in place and the achievement of the goals.

The article has shown how national culture moderates the way through which companies have carried-out their investments in manufacturing practices, coherently with their competitive priorities. With regards to this, the article suggests that more companies aim to be customer-oriented ("innovators") the more the national culture characteristics should be taken into account. Conversely, the purpose to compete on quality is more related to universal practices. Manager should take into proper account this consideration when globally operations management decisions are undertaken. Our results contribute to strengthen the importance of national culture: managers need to be conscious of this aspect in order to invest in an effective way and be coherent with the achievement of the company goals.

We argue that this paper contributes to the research stream of best practices by providing empirical evidence of the complex relationship between competitive priorities and best practices and by highlighting the specific role of culture in mediating this relationship. From a managerial point of view, the paper provides clear indications of those elements to which companies should pay attention when investing globally on manufacturing practices.

The article is not exempt from limitations. First of all, beside being wide in terms of national coverage the data adopted doesn't allow us to understand the specific decision making process that companies in different cultures adopt, when deciding how to invest in manufacturing. Future studies could provide interesting insights by focusing specifically on this issue. Concerning the limitations of the article, we also agree with the constraints advanced in Wiengarten *et al.* (2011).

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