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THE EFECTS OF CAUSAL AMBIGUITY ON FIRM PERFORMANCE:

An empirical analysis of the Spanish manufacturing firms

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The resource-based view (RBV) has become the dominant paradigm in research in strategic management. According to this perspective, firms will achieve and sustain a position of competitive advantage over time only if their resources and capabilities are difficult to imitate. Traditionally, it has been recognised that causal ambiguity, by making it difficult for competitors to identify the capabilities on which a particular firm bases its competitive advantage, represents an effective protection mechanism helping the firm to obtain superior performance. Recently, researchers have unearthed evidence that the effects of causal ambiguity also could be extend to the interior of the firm itself, hampering the diffusion of its own capabilities among its managers. In this case, the existence of causal ambiguity will have a negative impact on firm performance. In this paper we study both effects using a sample of 258 Spanish manufacturing firms. With this in mind and on the basis of previous literature, we proposed a model that contains two hypothesis and we show that causal ambiguity exerts a double-edged influence on firm performance. On the positive side, in its effect on the firm's competitors, and on the negative, in its effect on the firm's managers, with this second effect being stronger.

KEY WORDS: Causal ambiguity, firm performance

The resource-based view (RBV) has become the dominant paradigm in research in strategic management (Peteraf, 1993). According to this perspective, variations in performance between firms from the same industry can be explained by the differences in their endowments of resources (Barney, 1986a, 1986b, 1991; Peteraf, 1993; Wernerfelt, 1984). Traditionally, it has been considered that firms with resources that are valuable, rare, non-substitutable and difficult to imitate can achieve and maintain over time a position of advantage with respect to their competitors (Barney, 1995: 56). Of these four characteristics, inimitability is the most important (Hoopes, Madsen & Walker, 2003: 890), and it is the most significant contribution of the RBV (Barney, 2001: 45).

In the framework of the RBV, resource characterization and identification plays a key role. In the academic literature on the issue researchers tend to distinguish between resources, in their narrower sense, and capabilities (Barney & Arikan, 2001:139). In this paper we take account of this distinction, despite the fact that we recognise that these terms are often used synonymously (Makadok, 2001), and that some authors feel this distinction to be irrelevant (e.g., Wernerfelt, 1984; Barney, 1991; Barney & Arikan, 2001: 139). Capabilities – also called competencies – pose different problems with regards the inimitability characteristic, and therefore we believe that they should be differentiated from resources.

Resources are assets, either tangible (e.g., machinery, buildings) or intangible (e.g., brands, reputation, licences) firm use to conceive of and implement their strategies (Barney & Arikan, 2001: 138). They are observable and can be easily valuated (Hoopes, Madsen & Walter, 2003: 890). Some researchers have pointed out that isolated resources cannot generate competitive advantages on their own; for that they need to be integrated and combined into groups forming capabilities (Hitt, Ireland & Hoskisson, 199: 22). According to this view, capabilities are “abilities of an organization to perform a coordinated set of tasks, utilizing organizational resource, for the purpose of achieving a particular end result” (Helfat & Peteraf, 2003: 999). Thus, they are intangible, they cannot be observed and are therefore difficult to evaluate. In general, the concept of capabilities is used to explain “how” firms do things better and it conveys the notion that a firm possesses a degree of expertise and excellence in one or more particular areas compared to its competitors that results in a competitive advantage. (De Carolis, 2003: 29).

An organisation’s capability can be classified into two types: *operational capabilities* or *dynamic capabilities*. Operational capability can be defined as “a high-level routine (or collection of routines), that, together with its implementing input flows,

confers upon an orgnization´s management outputs of a particular type" (Winter, 2000: 983). These capabilities comprise a series of routines enabling managers to execute and coordinate the group of tasks required to carry out an activity. In this context, the concept of routine should be understood in the sense used by Nelson & Winter (1982: 97) as a "repetitive pattern of activities". Dynamic capabilities build, integrate and reconfigure operational capabilities, and only affect indirectly, through the operational capabilities, the output of the firm (Teece, Pisano & Shuen, 1997). Managers use dynamic capabilities to administer the operational capabilities and to employ the resources of the organisation to generate new value-creating strategies (Grant, 1996; Pisano, 1994).

The RBV stresses that it is in both types of capabilities, and in the routines that make them up, that the potential resides for achieving competitive advantages (Eisenhardt & Martin, 2000; Grant, 1996; Teece et al. 1997). The stock of capabilities held by a particular firm will permit it to offer unique (and valuable) products, or achieve superior performance in such areas as quality, costs or time, and thereby be able to generate above-normal profits (Conner, 1991; Peteraf, 1993). In general, the duration of a particular advantage will depend on the degree to which the firm can protect the capabilities on which its advantage is based from imitation. In other words, the capabilities of a firm will lead to a competitive advantage when they are difficult to imitate. Thus, protecting capabilities against imitation becomes a crucial aspect to take into account for achieving a sustainable competitive advantage (Dierickx & Cool, 1989; Spender & Grant, 1996).

Capabilities tends to be protected by various isolating mechanisms. There is empirical evidence about the degree of use and the effectiveness of some of these mechanisms. Thus, scholars have verified that firms tend to protect their resources and capabilities with legal protection measures (such as patents), using secrecy, adopting leadership strategies (lead time), by moving quickly down the learning curve, or controlling certain complementary resources (complementary sales/service, complementary manufacturing) (Cohen, Nelson & Walsh, 2000; Geroski: 1995; Levin, , Klevorick, Nelson & Winter, 1987; Teece, 1987). These barriers to imitation protect firms from the actions of their competitors, and permit them to maintain their position of competitive advantage.

Moreover, researchers have found a positive relation between the level of protection of the capabilities and the existence of causal ambiguity (Lippman & Rumelt, 1982; Barney, 1986a; Dierickx & Cool, 1989; Reed & DeFillipi, 1990; Barney, 1991). In the literature, the concept of causal ambiguity is used to refer to the lack of knowledge

that economic agents have about the sources leading to a sustainable competitive advantage. As firms use their capabilities, these reinforce each other and become more complex, which increases the level of causal ambiguity and hampers competitors' attempts to understand and imitate them (Rumelt, Shendel & Teece, 1994: 31).

Causal ambiguity derives from the very nature of the capabilities, and derives from the essentially tacit character of the knowledge bound up in routines (Nelson & Winter, 1982). Indeed, the knowledge needed to carry out organisational routines tends to be tacit (Itami, 1987; Rumelt, 1987; Winter, 1987). Even if the knowledge bound up in each of the tasks making up a particular routine is explicit, the routine as a whole may be unknown to the majority of the participants, and hence be tacit (Winter, 1987).

It might in principle be thought that causal ambiguity, like the other isolating mechanisms, in protecting a firm's capabilities from imitation by competitors will produce a positive effect on performance. However, some authors point out that causal ambiguity can also hamper managers' attempts to identify the core capabilities on which their firm bases its competitive advantage (Reed & DeFillipi, 1990; King & Zeithaml, 2001). This ignorance will hinder the diffusion of routines inside the organisation (Szulanski, 1996) and in this case, causal ambiguity will have a negative effect on firm performance.

Which of the this two effects will exert a bigger influence on firm performance? It has been noted that a capability, in order for it to be a source of competitive advantage, "must not be so simple that it can be easily imitated, or so complex that it is difficult to use and control internally" (Schoemaker & Amit, 1994: 9). Causal ambiguity which hinders the comprehension of capabilities affects both competitors and the managers of the firm itself. While the first effect will positively impact firm performance, the second will have a negative impact.

The objective of this paper is to analyse how the causal ambiguity around capabilities influences firm performance. With this in mind, the rest of the article is structured as follows: in the next section, we establish the theoretical framework of the problem, based on a review of the main research on the phenomenon of causal ambiguity, and we advance the hypotheses to be tested; next, we describe the sample used and the empirical methodology followed; subsequently, in Part 4, we present our findings; finally, in Discussion and Conclusions, we advance a number of implications for management, at the same time as noting the main limitations of the study and suggesting some directions for future research.

THEORETICAL FRAMEWORK/EFFECTS OF CAUSAL AMBIGUITY

The concept of causal ambiguity was introduced by Lippman & Rumelt (1982) to reflect the basic ambiguity concerning the nature of the connections between actions and outcomes. Citing Demsetz (1972: 2), these authors describe this ambiguity in large and consolidated firms as follows: “it is not easy to ascertain just why GM or IBM perform better than their competitors. The complexity of these firms defies easy analysis, so that the inputs responsible for their success may be often undervalued by the market for some time”.

In this way, causal ambiguity reflects the inability of economic agents to understand fully the causes of efficiency differences between firms (Rumelt, 1984). Causal ambiguity is a consequence of the uncertainty of markets, and is therefore present in every process of competition between firms. There is ambiguity about what factors of production actually are and how they interact. In contrast to the assumption of neoclassical economics – whereby there is a finite and known group of factors of production – with causal ambiguity it is impossible to produce an unambiguos list of factors of production, much less measure their marginal contribution (Rumelt, 1984:562).

Subsequently, in a seminal work, Reed & DeFillipi (1990) analyse the relations between firm competencies, barriers to imitation and sustainable competitive advantage. They point out that certain characteristics of firm competencies, such as tacitness, complexity and specificity, generate – in isolation or in combination – causal ambiguity, and therefore create barriers to imitation. Thus, under conditions of causal ambiguity, firms that try to imitate others cannot identify precisely and use the resources which have led the first firm to obtain a competitive advantage (Reed & DeFillipi, 1990; Barney, 1991). Causal ambiguity has been seen to be the most efficient isolating mechanism that firms have to protect themselves from imitation by competitors (Rumelt, 1984; Mahoney & Pandian, 1992).

The effects of causal ambiguity are not only felt between competitive firms, but also affect organisations participating in cooperation agreements. Causal ambiguity, in hindering an understanding of the logical linkages between actions and outcomes, inputs and outputs and causes and effects that are related to technological or process know-how, will also hold up the transfer of knowledge between alliance partners (Simonin, 1999). Thus, it will be difficult for the partners to determine which competencies have led each of them respectively to succeed. If they are unable to

identify these resources, they will not be able to imitate and apply them in their own organisation either (Barney, 1991).

Traditionally, this reasoning has led scholars to assume that causal ambiguity is required for a sustainable competitive advantage, since it disincentivizes potential imitators, acting as a protective mechanism of firm competencies. Under this perspective, by impeding imitation, causal ambiguity enhances performance (Lippman & Rumelt, 1982; Rumelt, 1984; Dierickx & Cool, 1989; Reed & DeFillipi, 1990; Barney, 1991; Mahoney & Pandian, 1992).

Recently, however, some researchers have questioned the direction of the influence of causal ambiguity on firm performance (King & Zeithaml, 2001). They have pointed out that causal ambiguity, by hindering the identification of the competencies which lead firms to achieve superior performances, also restricts the transfer of the same competencies inside the organisation (Szulanski, 1996) and may block factor mobility (Lippman & Rumelt, 1982:420; Reed & DeFillipi, 1990:90-91). In this way, causal ambiguity will impede the internal diffusion of knowledge and reduce its level of creation inside the organisation (Lin, 2003). Hence, in this case causal ambiguity exerts an adverse influence on performance.

Thus, at present there is a debate in the literature about the influence exerted by causal ambiguity on firm performance, since although on the one hand this variable slows the diffusion of superior practices and technologies across firms, on the other hand it impedes the creation of new knowledge within the firm (Mcevily, Das & Mccabe, 2000).

In their contribution to this debate, King & Zeithaml (2001) consider that causal ambiguity has been adressed in the literature in two different ways: linkage ambiguity and characteristic ambiguity. The first refers to the ambiguity about the link between competencies and competitive advantage (e.g., Lippman & Rumelt, 1982). The second, to “the characteristics of the competencies…which can be simultaneous source of advantage and of ambiguity”. This paper will focus on the first of these forms, since its aim is to study the ambiguity that affects the relation between competencies and superior competitiveness, with the ultimate aim of determining the effect of ambiguity on firm performance. With this in mind, we distinguish between two types of causal ambiguity, depending on the economic agent which it affects.

First, *competitor ambiguity* refers to the causal ambiguity that a firm’s competitors face when they attempt to identify the competencies that have helped the firm to achieve its superior competitive status in the market. Following the literature on

the relation between causal ambiguity and imitation, the greater the causal ambiguity perceived by the competitors of a firm, the better the performance achieved by the firm, since the fact that the competitors do not know the causes of the firm's success protects it from potential imitators (Lippman & Rumelt, 1982; Barney, 1986; Dierickx & Cool, 1989; Reed & DeFillipi, 1990; Barney, 1991). On the basis of this reasoning, we advance the following hypothesis:

H1: Competitor ambiguity has a positive influence on firm performance

Second, *manager ambiguity* refers to the ambiguity perceived by the managers of a firm when attempting to determine the relation between their competencies and competitive advantage. For firms, it is desirable that managers know which internal capabilities lead to particular results, so that they are able to take rational decisions about them, with a view to obtaining a competitive advantage. As Reed & DeFillipi (1990: 90-91), suggest, "where ambiguity is so great that managers do not understand intra firms causal relationships, or factor immobility exists, it may be impossible to utilize competencies for advantage". Thus, the less ambiguity faced by the firm's management – i.e., the more they understand the resources and capabilities required to achieve certain outcomes – the better the firm performance. This idea leads to our second hypothesis:

H2: Manager ambiguity has a negative influence on firm performance

METHODOLOGY

Data and Sample

The sample of firms we have used to test our two hypotheses comes from a directory of the largest Spanish firms (*Duns 50.000,* edition 2001). The process of data selection and collection was as follows: first, we limited the sample to manufacturing firms (with SIC codes between 20 and 39), and large and medium-sized companies (with a turnover of at least €20m in 1999). These criteria were applied to guarantee that the firms had developed a certain number of complex capabilities that might potentially cause problems of identification and comprehension on the part of both competitors and the firm's managers. Initially the sample contained 1967 firms meeting these criteria.

Second, as the information provided by the above-mentioned directory was insufficient for the needs of our research, we sent a questionnaire to each of the 1967 firms. The questionnaire was directed at the chief executive (CEO), considered to be the person most qualified to respond to the questions and with easiest access to the

information required. We received 258 usable responses, which represents a sampling error of ±5.80% with a confidence level of 95%.

Variable measures

To make the variables included in this research operative, we used mainly subjective measures provided by the responses from the questionnaire on a series of indicators. A 7-point Likert-type scale was used, with 1 representing “totally disagree” and 7 “totally agree”. In Appendix 1 we present the indicators used to measure each of the variables considered in the research. We might mention that the indicators used to measure the competitor ambiguity were adapted from those used in the work of Simonin (1999) and Szulanski (1996); while the construct for manager ambiguity was especially built for this research.

With regards firm performance, this was made operative using a multidimensional subjective measure. This measure included economic-financial as well as socio-organisational indicators, since only considering these in combination allows us to evaluate the success of an organisation (Robbins, 1990). Consequently, and following Naman & Slevin (1993), we built two scales of items. The objective of the first scale was for the managers to evaluate the importance of the indicators proposed. With the second scale, the aim was for the managers to express their level of satisfaction with respect to their expectations about these indicators during the past trading year. Subsequently, we calculated a weighted average of the satisfaction scores of the managers on the nine indicators, with the importance scores acting as weights.

In order to get unbiased estimators of the impact of the two types of ambiguity on firm performance, we selected some control variables considered to be related to the dependent variable of the model as well as to one at least of the independent variables. The control variables were: the size of the firm, the age of the firm, the period of time the CEO had been in the company and the sector to which the firm belonged.

For firm size we used the natural logarithm of the number of employees. For firm age, a question in the questionnaire asked respondents for the year the firm was founded. The longevity of the CEO was also requested in the questionnaire.

The firm age was included as a control variable, since it has been considered in the literature as a measure of the ambiguity which competitors face (Mosakowski, 1997). Mosakowski believes that the longer the firm has been operating in the market, the better its competitors will know it, and hence the lower the degree of causal

ambiguity these agents will face. Similarly, the same argument applies to CEO longevity, so that this variable was also included as a control variable.

Moreover, it could be said that the performance of the firm will differ in function of the sector in which it operates, and the level of ambiguity of the competitors and managers may also differ between firms from different industries. Thus, we included in the model 17 dummy variables representing 18 different sectors to which the sample firms belonged according to their 2-digit SIC codes. The number of sectors to which the firms from the initial population belonged was 20, but this was reduced to 18 for the final sample, since it was not possible to obtain any response from firms belonging to the sectors with SIC codes 21 and 25.

Table 1 shows the means, standard deviations and correlations for all the dependent and independent variables considered in this study.

TABLE 1

Mean, Standard Deviations and Correlations

Variable	N	Mean	s.d.	1	2	3	4	5
1. Firm performance	236	4,00	1,99					
2. Competitor ambiguity	256	0,00	1,00	0,14*				
3. Manager ambiguity	256	0,00	1,00	-0,37**	0,000			
4. Firm size	253	5,68	1,31	0,06	-0,11	-0,17**		
5. Firm age	258	3,50	0,72	-0,01	-0,06	-0,04	0,18**	
6. CEO longevity	248	2,29	1,01	0,14**	-0,08	0,04	0,08	0,08

*p < 0,05 **p < 0,01

RESULTS

In order to analyse the data collected, initially we ran a factor analysis on the indicators used to measure competitor and manager ambiguity, with a view to summarising the original data with the least possible information loss. The analysis was carried out following the principal components method, and in order to obtain more easily interpretable results, we applied a factor rotation using the varimax method with Kaiser normalisation. In Table 2 we present the matrix of rotated components, the communalities, the initial eigenvalues, and the percentage of variance accounted for

each component. As can be seen, the analysis resulted in two factors, each of which grouped the indicators corresponding to one type of ambiguity. Once these factors corresponding to the two types of ambiguity were detected, the factor scores of all the firms were noted for each factor.

TABLE 2

Factorial Analysis: Types of ambiguity

ÍTEM	COMPONENTS		COMUNALITIES
	1	2	
MA1	**0,63**	0,01	0,39
MA2	**0,55**	0,02	0,30
MA3	**0,80**	-0,03	0,64
MA4	**0,82**	-0,02	0,68
MA5	**0,63**	0,07	0,40
MA6	**0,74**	-0,06	0,56
CA1	-0,04	**0,66**	0,45
CA2	0,05	**0,76**	0,58
CA3	0,12	**0,67**	0,46
CA4	-0,12	**0,73**	0,55
% of variance accounted for	30,07	50,28	
Eigenvalue	3,007	2,02	

Subsequently, with the scores obtained in the factor analysis we applied a regression analysis, with the aim of explaining the performance of the sample firms in function of the variables competitor ambiguity and manager ambiguity, once the effects of size, age, CEO longevity and sector had been controlled for. Table 3 shows the results of the hierarchical regression analysis carried out.

In the first model, only the control variables were included as independent variables. The second model added the ambiguity faced by the competitors. The third model added the ambiguity faced by the firm's managers as explicative variable to the above-mentioned variables.

With regards the control variables, some turned out to be marginally significant, indicating that they exert an influence on the dependent variable. Thus, the coefficient associated with CEO longevity was significant at the 95% level of confidence in the first model, and at 90% in the other two models. It was positive in the three models, indicating that the longer the CEO had been in the firm, the better the firm performance. On the other hand, the parameter for the age of the firm was positive and

significant in the third model at the 90% confidence level, indicating that the longer the firm had been operating in the market, the worse its performance. This may, according to Mosakowski (1997), be because the longer the firm had been operating, the more its competitors know it, and hence the less causal ambiguity they face. Its competitors can then appropriate its competencies, which will lead the firm to achieve worse results.

TABLE 3

Results of hierarchical regresion analysis for firm performance

Variables	Model 1		Model 2		Model 3	
	b	**s.e.**	**b**	**s.e.**	**b**	**s.e**
Intercept	4,11***	1,24	3,78***	1,23	4,04***	1,14
Firm size	0,15	0,13	0,18	0,12	0,13	0,12
Firm age	-0,25	0,20	-0,26	0,20	-0,31*	0,19
CEO longevity	0,27**	0,13	0,26*	0,13	0,22*	0,12
Sector sic20	-0,52	0,92	-0,29	0,91	-0,01	0,85
Sector sic22	0,53	1,10	0,78	1,09	1,30	1,02
Sector sic23	0,66	1,64	1,22	1,64	0,87	1,52
Sector sic24	-2,74*	1,61	-2,36	1,60	-1,08	1,50
Sector sic26	0,67	1,29	0,89	1,28	1,29	1,19
Sector sic27	-0,67	1,11	-0,39	1,11	-0,68	1,03
Sector sic28	-1,02	0,92	-0,75	0,92	-0,55	0,85
Sector sic29	-0,15	2,12	0,37	2,10	0,61	1,95
Sector sic30	-1,32	1,06	-1,24	1,04	-0,99	0,97
Sector sic31	0,17	1,63	0,54	1,62	1,09	1,50
Sector sic32	-0,70	0,98	-0,49	0,98	-0,15	0,91
Sector sic33	-2,13*	1,08	-1,84*	1,08	-1,29	1,00
Sector sic34	-0,31	1,02	0,03	1,01	0,32	0,94
Sector sic35	-0,29	0,95	-0,12	0,94	-0,07	0,88
Sector sic36	-1,10	0,97	-1,02	0,96	-0,69	0,90
Sector sic37	-1,08	0,97	-0,95	0,96	-0,60	0,89
Sector sic38	-0,26	1,17	-0,16	1,16	-0,28	1,07
Competitor ambiguity			0,33**	0,14	0,35***	0,13
Manager ambiguity					-0,77***	0,13
R^2	0,12		0,14		0,27	
F	1,33		1,56*		3,28***	
N	258		258		258	

*p < 0,10; **p < 0,05; ***p < 0,01

Hypothesis 1 proposes that the ambiguity perceived by the competitors of a firm will be positively related to the performance achieved by the firm. The significance and positive sign of the coefficient of this variable in both models 2 and 3 supports this hypothesis. Similarly, Hypothesis 2 predicts that the ambiguity faced by the firm's own managers is negatively related to the firm's performance. The negative sign of the coefficient of this variable in Model 3, along with its significance, supports this hypothesis too.

Moreover, in the third model it can be seen that the parameter associated with the manager ambiguity is greater in absolute terms than that of the competitor ambiguity, which means that the effect exerted on firm performance by manager ambiguity is greater than that exerted by competitor ambiguity.

DISCUSSION AND CONCLUSIONS

Our findings allow us to confirm that causal ambiguity exerts a double-edged influence on the performances of large and medium-sized Spanish manufacturing firms. Thus, we have shown, on the one hand, that causal ambiguity constitutes one of the mechanisms which firms can use to defend themselves from the actions of their rivals, since we have tested that there is a positive association between the causal ambiguity faced by a firm's competitors and the performance of the firm. Thus, and as is suggested by a number of previous studies, causal ambiguity protects firms from imitation, which contributes to the sustainability of their competitive advantage (Lippman & Rumelt, 1982; Barney, 1986; Dierickx & Cool, 1989; Reed & DeFillipi, 1990; Barney, 1991; King and Zeithaml, 2001).

On the other hand, we have demonstrated that the causal ambiguity which is faced by the firm's own managers has an adverse effect on firm performance. This finding is consistent with the authors that have questioned the effect of causal ambiguity on firm performance, arguing that although it impedes the diffusion of a firm's competencies outside the firm, thereby protecting the firm from the risk of imitation, it also blocks the transfer of these competencies inside the firm itself (Szulanski, 1996; Mcevily, Das and Mccabe, 2000; King and Zeithaml, 2001; Li, 2003).

Moreover, we have found that the effect on firm performance of manager ambiguity is greater than the effect of competitor ambiguity. This last finding contributes to resolving the debate in the literature, and is consistent with those studies stressing the need for knowledge to flow within organisations (Szulanski, 1996; O'Dell and Grayson, 1998; Hansen, 1999; Argote and Ingram, 2000; Li, 2003), since manager

ambiguity will only be reduced by the transfer of competencies within organisations. Only in this case will the firm be able to achieve superior performance.

Thus, and trying to summarise our findings, both competitor ambiguity and manager ambiguity determine firm performance, with the second effect being greater. Hence, the two types of causal ambiguity we have considered should be added to the list of factors that help firms achieve and sustain a competitive advantage.

We should point out that this work has some limitations. First, we have to recognise that there are clearly many other factors that can explain firm performance apart from causal ambiguity. However, as the main objective of the present work was to study the relations between causal ambiguity and firm performance, it did not seem wise, for operational reasons, to complicate the analysis by including other variables. Moreover, the measures of some of the variables used may be less precise than would be desirable, which may blunt some of the power of our tests on the two hypotheses proposed. In this context, it would have been desirable for the competitors themselves to evaluate the causal ambiguity that they face when attempting to imitate a firm. This was not possible as it proved impossible to determine which firms were rivals of which other firms.

Finally, from our findings we might advance two suggestions to help firms sustain a position of competitive advantage and obtain superior performances to their competitors. On the one hand, by protecting their capabilities from imitation by their rivals. One way of doing this is to attempt to project to the outside the greatest level of ambiguity possible. If a firm manages to hide its sources of competitive advantage from its competitors, these will not easily be able to imitate it. Additionally, the firm should make great efforts to identify the capabilities that contribute most to its success, and at the same time diffuse this knowledge to all the management, thereby reducing the level of causal ambiguity inside the organisation.

This poses a number of questions: What kinds of factor contribute to both types of ambiguity? Can firms effectively control these factors, and hence the effects of causal ambiguity, such that the causal ambiguity affects competitors more than the firm's managers? How can a firm protect its capabilities from a competitor's actions at the same time as spreading knowledge about them throughout the organisation? Research on various aspects of human resource management, focusing on the creation of a climate favouring the transfer of competencies within organisations and impeding imitation, may shed some light on these issues. All these are promising directions for future research.

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APPENDIX 1

Items included in questionnaire

VARIABLE	MEASURES
Manager ambiguity α=0.79	• Top and middle managers in our firm know what specific actions and decisions they should take to achieve a superior performance to our competitors (MA1) • Top and middle managers in our firm can determine the causes of failures of our firm (MA2) • Top and middle managers in our firm know the strategy adopted by the firm (MA3) • Top and middle managers in our firm are generally informed about any change in the strategy (MA4) • The majority of the top and middle managers in our firm know when a new product is going to be launched (MA5) • Our firm has the policy of explaining to top and middle managers the causes of rises or falls in profits (MA7)
Competitor ambiguity α=0.66	• Our competitors are unable to imitate immediately the knowledge and capabilities used by our firm (CA1) • Our competitors do not know the keys of our success (CA2) • Our competitors do not know the causes of rises or falls in the profits of our firm (CA3) • Our competitors find it difficult to establish the specific actions carried out by our firm to achieve a superior performance (CA4)
Results	• Operating profit • Sales growth • Growth in profits • Market share • Return on investment • New product development • Market development • Absence of conflict in firm • Productivity