"Signaling, spillover and learning effects of knowledge flows on division performance within related diversified firms"

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Signaling, spillover and learning effects of knowledge flows on division performance within related diversified firms

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<table>
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<tr>
<th>Purpose</th>
<th>This study addresses the performance consequences of knowledge transfer within related diversified firms by distinguishing between knowledge outflows and knowledge inflows at the business division level.</th>
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<td>Design/methodology/approach</td>
<td>Questionnaire data from a sample of 118 business divisions were analyzed using stepwise linear regression.</td>
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<td>Findings</td>
<td>The results from a three-effect model for the analysis of knowledge transfer indicate that knowledge outflow improves division performance, while knowledge inflow damages it when absorptive capacity is weak. The overall effect of knowledge transfer is therefore beneficial with the exception of the cases of receiving divisions with low levels of absorptive capacity.</td>
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<td>Practical implications</td>
<td>These results indicate that knowledge transfer contributes to overall corporate performance, since knowledge outflow impacts positively on division performance in all cases and knowledge inflow impacts negatively on division performance only in some cases. Setting aside the obvious task of promoting knowledge transfer within the firm, one important concern for corporate officers would be to prevent situations in which a division lacks the absorptive capacity to play its role within a corporate network.</td>
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<tr>
<td>Originality/value</td>
<td>This work contributes to existent literature by disentangling the effects of knowledge transfer according to different theoretical perspectives, and it provides an empirical examination in a setting which is intensive in knowledge transference, as is that of business divisions from related diversified firms.</td>
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Knowledge transfer, knowledge inflow, knowledge outflow, diversification, absorptive capacity.

Research paper
Signaling, spillover and learning effects of knowledge flows on division performance within related diversified firms

1. INTRODUCTION

The use of knowledge resources plays a key role in the competitiveness of firms, which use knowledge stocks through knowledge flows in order to support their strategies in the marketplace (Argote and Ingram 2000). The management of knowledge flows is particularly outstanding in the case of related diversified firms, inasmuch as this diversification strategy is based on the knowledge relatedness among the businesses in which the firm is present, and thus involves transferring knowledge to the various divisions of which the corporate network is formed (Breschi et al. 2003, Kor and Leblebici 2005, Miller 2006, Neffke and Henning 2013).

Knowledge transfer refers to the application and exploitation of existing knowledge for the firm’s purposes (Kumar and Ganesh 2009). Knowledge transfer processes play a key role in ensuring the use of specialized knowledge (and preserving the corresponding division of labor) within multi-business organizations, since it enables the knowledge created in the course of managing a business unit to be placed at the service of another business unit without incurring the costs that would be implied in accumulating that knowledge from scratch (Grant 1996). The type of knowledge to be transferred between business units can be either tacit knowledge bound to people (Neffke and Henning 2013) or explicit knowledge embedded in organizational routines (Tanriverdi and Venkatraman 2005).

However, the internal transfer of knowledge is neither easy nor cost free, since knowledge resources are sticky within business organizations (Szulanski and Jensen 2004), knowledge
transfer may facilitate imitation by competitors (Zander and Kogut 1995) and absorptive
capacity is not always sufficiently high (Zahra and George 2002). The overall effect of
knowledge flows on business performance therefore remains a controversial issue in which
different theoretical perspectives hold different positions, ranging from detrimental to
beneficial (Ding et al. 2013).

This work aims to shed light on this controversial issue by proposing a three-effect
framework rooted in the resource-, knowledge- and capability-based views of the firm in order
to identify the signaling, spillover and learning effects of knowledge flows. An empirical
analysis of the knowledge flows among 118 divisions of 38 large Spanish firms with a related
corporate strategy shows that knowledge outflow improves division performance, while
knowledge inflow damages it when absorptive capacity is weak. The work contributes to
existent literature by disentangling the effects of knowledge transfer according to different
theoretical perspectives, and provides an empirical examination in a setting that is intensive in
knowledge transference, as is that of business divisions in related diversified firms.

2. EFFECTS OF KNOWLEDGE FLOWS

The existence of diversified corporations may be attributed to excess resources developed
in some businesses and applied to other businesses in the presence of transaction costs (Teece
1980, 1982). If these resources are valuable, rare, imperfectly imitable and difficult to
substitute, then corporate diversification could yield a sustainable competitive advantage (Fang
et al. 2007). If it is assumed that these resources have been internally accumulated (Dierickx
and Cool 1989), are not under a perfectly competitive bidding process (Barney 1988) and there
are no powerful stakeholders (Coff 1999), then that competitive advantage would allow the
diversified corporation to earn abnormal returns or economic rent (Barney and Arikan 2001).
Knowledge assets are a type of intangible resource that is prone to complying with the criteria mentioned above, since they (a) have public goods proprieties and could thus be extended in use at near zero marginal cost (Chatterjee 1990), (b) provide sustainable competitive advantages owing to their path-dependent origin, causal ambiguity and social complexity (Grant 1996), and (c) may be appropriated by the corporation through codification and mobilized in order to fuel firm performance (Nonaka 1994), although codification would make knowledge assets more vulnerable to imitation and substitution (Kogut and Zander 1992).

Knowledge flows among divisions within related firms are an indication of corporate efforts to leverage its resource base with the purpose of gaining a competitive advantage (Zander and Kogut 1995). Successful divisions develop knowledge which may be applied to other divisions (Eisenhardt and Martin 2000). The corporation can thus be viewed as a network of knowledge flows, in which each division is both a user of the knowledge from the rest of the corporation and a provider of knowledge to the rest of the corporation (Gupta and Govindarajan 1991).

Like the calls made in knowledge management and intellectual capital management literature for a better understanding of how knowledge flows are connected to value creation from a network perspective (Allee 1999, 2000, 2008, 2009), this study distinguishes between knowledge inflows and knowledge outflows and analyzes the consequences of their performance. The principal point of this study is therefore that knowledge flows are subject to three effects: resource effects (signaling), knowledge effects (spillover) and dynamic effects (learning).

2.1 Signaling Effect of Knowledge Flows
From a resource-based view of the firm, the degree to which a division is engaged in knowledge flows with the rest of the related firm is an indirect indication of the resource base of that division. Following this reasoning, a division that is strong in knowledge outflows will have a rich resource base, while a division that is strong in knowledge inflows will have a poor resource base (Zhang and Sundaresan 2010). A division that is strong in knowledge outflows and knowledge inflows will have a rich resource base and the opportunity to improve it through combinative capabilities, while a division that is weak in both flows will have a poor resource base and will lose the opportunity to improve it (Sugheir et al. 2012).

Rather than directly observing the resource base of each division (assuming that this is feasible), we observe the knowledge flows that allow divisions to be interconnected within the related firm, and thus indirectly capture the rarity, value, imitability and substituibility of the divisions’ resources (Ndofor and Levitas 2004). Knowledge outflow and knowledge inflow respectively signal the presence or absence of these resources.

2.2 Spillover Effect of Knowledge Flows

From a knowledge-based view of the firm, division knowledge must be transferred in order to make it available to other divisions (Nonaka and Takeuchi 1995). The internal transfer of knowledge may take the form of systematization or personalization (Choi and Lee 2003), the former being based on the codification of knowledge in databases (Hansen 1999, Schulz and Jobe 2001), while the latter is based on the social interaction between individuals (Maurer et al. 2011, Wei et al. 2011). In either of the two cases, the internal transfer of knowledge may have the side effect of spilling that knowledge to competitors (Ding et al. 2013). Knowledge spillovers hamper the firm’s competitive position by making it possible for competitors to use that knowledge without the firm’s permission (Chang and Xu 2008, Knott et al. 2009).
The internal transfer of knowledge contributes to the removal of barriers to imitation, such as information asymmetry or causal ambiguity (see, Richter and Streb 2011), particularly in the case of systematization through codification (Kogut and Zander 1992), thus leading knowledge outflow and knowledge inflow to be sources of knowledge *spillovers* for competitors (Zander and Kogut 1995).

**2.3 Learning Effect of Knowledge Flows**

From a dynamic-capability view of the firm, the transfer of knowledge from one division to others does not take place without changes in the knowledge assets of the whole corporation (Helfat and Eisenhardt 2004). Firms are superior means by which knowledge is created (Nonaka 1994), combined (Kogut and Zander 1992, 1993), coordinated (Grant 1996) and integrated (Koch 2011). The multiple social interactions within organizations expose firms to planned or unplanned learning through an evolutionary path (Romme et al. 2010, Xie and O'Neill 2013, Zollo and Winter 2002).

In the context of diversified corporations, the knowledge amassed during the course of managing a business may be useful to manage another business (Eisenhardt and Brown 1999, Eisenhardt and Galunic 2000). Moreover, the interaction of old knowledge with a new business may give rise to new knowledge which could be used in the former business (Døving and Gooderham 2008, Markides and Williamson 1994, Teece et al. 1994). When a firm is able to manage this process of knowledge recombination among different businesses in a timely manner, it is said to have a dynamic capability (Eisenhardt and Martin 2000, Teece et al. 1997).

Setting aside the controversial issue of manageability of learning as exemplified by the distant positions of organizational learning scholars (Levinthal and March 1993) and knowledge management scholars (Hedlund 1994), knowledge outflow and knowledge inflow
determine organizational learning through the distribution and combination of knowledge within the firm (Schulz 2001).

2.4 Overall Effects of Knowledge Flows

Signaling, spillover and learning effects must be analyzed by taking into account the division’s receiving or provider role. From the perspective of the receiving division, knowledge inflow signals its poor resource base and devalues the knowledge received (as a result of spillovers to competitors), but boosts intra-division learning. From the perspective of the provider division, knowledge outflow signals its rich resource base and improves inter-division learning, but devalues the knowledge provided because of potential spillovers. The overall effect of knowledge outflow and knowledge inflow depends on the directions and prevalence of the partial effects (Table 1).

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Insert Table 1 about here
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Signaling and learning effects are predicted to be positive for knowledge outflow, while the spillover effect is negative. Previous studies have determined that the relationship between codification and imitation is not as straightforward as theory predicts (Kogut and Zander 1992). Zander and Kogut (1995) detect that the imitation of an innovation, which has been previously transferred within a multinational corporation, does not depend on codification. Schulz and Jobe (2001) conclude that those multinational corporations that decide to keep their knowledge tacit (or that abstain from codifying their knowledge) do not improve subunit performance. Given these findings on the spillover effect in the context of multinationals and the predicted positive signaling and learning effects on division performance, we propose the following hypothesis:
$H_1$: Division knowledge outflow to the rest of the corporation will impact positively on the focal division performance.

Signaling and spillover effects are predicted to be negative for knowledge inflow, while the learning effect is positive. As established previously, the evidence concerning the spillover effect suggests a weak negative effect (Schulz and Jobe 2001, Zander and Kogut 1995), but the learning effect is not predicted to be strong either. Division learning based on knowledge inflow from other divisions is affected by the receiving division’s absorptive capacity, that is to say, the division’s ability to recognize the value of new knowledge, assimilate it, and apply it to commercial ends (Cohen and Levinthal 1990, Zahra and George 2002). Gupta and Govindarajan (2000) and Minbaeva et al. (2003) conclude that knowledge transfer within multinational corporations is determined by the receiving subsidiary’s absorptive capacity, while Wong et al. (1999) detect that intra-firm technology transfer promotes organizational learning only when absorptive capacity is sufficiently high to permit it. Other authors have additionally highlighted intra-firm barriers to knowledge flows, which may hamper learning processes (Szulanski 1996, Szulanski and Jensen 2004, von Hippel 1994). Based on these findings and the predicted negative signaling and spillover effects, we propose the following hypothesis:

$H_2$: Division knowledge inflow from the rest of the corporation will impact negatively on the focal division performance.

3. METHODS

3.1 Sample
A Rumelt (1974) related corporate strategy was used to select the 100 largest Spanish firms, which resulted in a population of 46 firms organized around 214 product divisions.

The variables were measured by using secondary data for firms and survey data for divisions just prior to the financial crisis that hit the global economy in 2008. The field work began with a letter informing the firms’ corporate offices of the purpose of mailing questionnaires, which were addressed to their division general managers in order to increase the response rate and test the organization charts. A month later, the questionnaires were mailed to the general managers with a cover-letter informing them that the research project had been presented to the corporate officers and making it clear that their responses would be analyzed in the strictest confidence. After three mailing rounds, we obtained valid information for 118 divisions belonging to 38 firms. The response rate was 83 per cent for firms and 55 per cent for divisions. Given the remarkable response rate, no response biases were detected between respondents and non-respondents in archival variables such as division size or industry group.

3.2 Measures

The questionnaire that was to be mailed to the division general managers was refined and improved with a pilot study. The validity of the measures was analyzed using correlations, factor analysis, Cronbach’s α, inter-rater agreement rate and contingent analysis. The content validity was analyzed through the correlations between the measures and other variables in accordance with previously researched relationships. The reliability and unidimensionality analyses allowed us to assess internal validity. The inter-rater agreement rate in 10 questionnaires completed by the general manager and another manager from the same division
was used to study both convergent validity among respondents and the contingent analysis for the convergent validity of corporate strategy.

*Corporate strategy.* The Rumelt (1974) classification system was applied in order to obtain a categorical measure of corporate strategy. The system is based on the computation of the specialization, vertical and related ratios, and the information from annual reports was used as a starting point. This information consisted of the sales breakdown that Spanish firms must provide in the ‘Turnover & Expenses’ section of their notes to the consolidated financial statements.

A distinction was drawn between dominant, related and unrelated firms in accordance with the Rumelt (1974) typology. The application of this classification to the baseline population resulted in the detection of 43 dominant firms, 46 related firms, and 11 unrelated firms (Table 2). The low diversification level of the largest Spanish firms has been documented in others works (Merino and Rodríguez 1997).

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The correlations between corporate strategy and firm size, number of divisions, and division size were used to assess contend validity. The research on corporate strategy has detected a strong correlation between diversification and size (Keats and Hitt 1988). The classification is consistent with this pattern since the greater the diversification: (a) the higher the firm size in sales (n= 100 firms; r= 0.355; p< 0.001), workforce (n= 100 firms; r= 0.387; p< 0.001) and equity (n= 100 firms; r= 0.356; p< 0.001), (b) the higher the number of divisions (n= 100 firms; r= 0.401; p< 0.001), and (c) the higher the mean division size (n= 227 divisions; r= 0.213; p< 0.001). The convergent validity was analyzed using the origin of divisions as a
starting point in order to contrast whether the Rumelt (1974) classification used overlapped the (Pitts 1980) schema. Some works have documented that related diversifiers prefer organic growth through *ex novo* investments, while unrelated diversifiers tend to grow through acquisitions (Michel and Hambrick 1992). The classification obtained was again consistent with this pattern based on a contingent analysis (n= 227 divisions; chi-squared = 8.386; p< 0.015).

As previously pointed out, only those firms that have adopted a related corporate strategy were selected, while those firms with a dominant or unrelated corporate strategy were disregarded.

*Knowledge flows.* The level to which a division is involved in knowledge flows with peer divisions or the corporate office was measured using a multidimensional scale developed by Gupta and Govindarajan (2000) in the context of multinational corporations. This scale captures not only the intensity but also the pattern of knowledge flows. The general managers were asked to assess the degree to which their divisions are involved in knowledge inflows and knowledge outflows with sister divisions and the corporate office in different areas such as such as knowledge on marketing, distribution, product delivery, product design, operations, supply and management. This instrument is focused on knowledge flows (as opposed to knowledge stocks) in accordance with the theoretical framework, since the signaling, spillover and learning effects are associated with the exchange of knowledge within multi-business firms. Other researchers have applied a similar procedure to operationalize the level of knowledge transfer in multinational corporations (Ghoshal and Bartlett 1988). Two variables were created for the purposes of this article, and the knowledge flow patterns were used as the starting point. Knowledge inflow is the level to which a division receives knowledge from either the corporate
office or peer divisions, while knowledge outflow is the level to which a division provides knowledge to either the corporate office or peer divisions.

The internal validity of the knowledge outflow measure is strong (Cronbach’s α = 0.8933, n = 14 items), as is the knowledge inflow measure (Cronbach’s α = 0.9078, n = 14 items). Content validity was studied through the analysis of correlations between these measures and other variables in a manner consistent with previous findings. Gupta and Govindarajan (2000) showed that formal coordination improves knowledge transfer among subsidiaries from multinational corporations. The measurement obtained is consistent with these findings since the level of formal coordination correlates (a) positively with knowledge outflow (n = 118 divisions; r = 0.299; p < 0.001) and (b) positively with knowledge inflow (n = 118 divisions; r = 0.334; p < 0.001). These tests support the applicability of the measurement instrument developed for multinationals by Gupta and Govindarajan (2000) for multi-business corporations. The convergent validity based on 10 questionnaires was assessed using the inter-rater agreement rate. This rate was over 73 per cent for knowledge outflow and 76 per cent for knowledge inflow, which suggests that there were no interpretation problems among internal observers when these operationalizations were applied.

**Division performance.** Performance was not operationalized with the use of a conventional corporate-wide measurement, but rather with a relative performance measurement for each division. The division performance variable was based on an instrument developed by Gupta and Govindarajan (1986), which assesses the level to which a division is effective in attaining 10 objectives weighted by the importance of those objectives for the corporate office. The computation of this measurement involves two related scales. First, a 10-item scale which permits an overview of the division balanced scorecard. Second, a 10-item scale which provides
information concerning the division ability to do what is required in accordance with the balanced scorecard. The final measurement is a weighted mean to address the division’s effectiveness at performing its corporate-imposed role in the corporate business portfolio in areas such as rate of growth in sales, market share, operating profits, profit-to-sales ratio, cash flow from operation, return on investment, new product development, cost reduction programs, personnel development and political/public affairs (Gupta and Govindarajan 1986).

The relative character of this measure allows the comparison of inter-industry and inter-firm division performance with more confidence than when absolute measures are applied. Moreover, firms tend to review the objectives attached to each division in the event of environmental shocks not correctly predicted at the beginning of the year, thus controlling unpredicted inter-temporal jolts. Finally, the corporate officers approve division objectives with the purpose of attaining a corporate-wide optimum, and the divisions play therefore different roles within the business portfolio. The ability of each division to perform its role is a better measurement of the degree to which that division improves corporate performance than absolute measurements (Gupta and Govindarajan 1986).

The content validity of division performance was analyzed using correlations between this measure and two accounting measurements. Most Spanish firms do not disclose information for business units, but 31 exceptions were detected. The correlation between the division performance measurement used and ROA –return on assets– were high (n= 31 divisions; r= 0.529; p< 0.001), as were those between the division performance measurement and ROE –return on equity– (n= 31 divisions; r= 0.447; p< 0.001). These findings support the contend validity of the division performance measure. The reliability was high (Cronbach’s α=
and the convergent validity was strong since the inter-rater agreement rate based on 10 questionnaires was over 85 per cent.

Controls and other variables. Four variables were considered to control the division heterogeneity. The division size was measured as the natural logarithm of division workforce (Keats and Hitt 1988). The industry membership was operationalized by using three dummy variables to capture four industry groups—water, energy and telecoms; banking and insurance; construction and real estate; and manufacturing— (Dess et al. 1990). The prospector orientation gathered key issues concerning the strategy and organization of the divisions ranging from the defender profile to the prospector profile (Miles and Snow 1978), in accordance with the general manager self-typing regarding the degree to which the division tends to change products and markets (Shortell and Zajac 1990). The environmental uncertainty (Cronbach's α = 0.8083; n= 20 items) measured the general manager’s capacity to confront the division environment, which is made up of the degree to which the suppliers’, competitors’, financiers’, regulators’ and workers’ actions are unpredictable (Buchko 1994).

4. RESULTS

Colinearity is not an issue since no correlation is above 0.4, with the exception of the correlation between knowledge outflow and knowledge inflow (Table 3).

Although there is a strong relationship between knowledge outflow and knowledge inflow, knowledge inflow does not significantly correlate with division performance while knowledge outflow does. The prospector orientation is positively correlated with division
performance, in contrast with environmental uncertainty which is negatively correlated with it. Division size is positively correlated with division performance, but the relationship is not significant.

The first hypothesis contends that division knowledge outflow will impact positively on division performance, while the second hypothesis anticipates that division knowledge inflow will impact negatively on division performance. The linear regression analysis was applied to contrast these hypotheses. Division size, industry membership, prospector orientation and environmental uncertainty were used as covariates. Various models in which the control variables were entered first were estimated in a stepwise procedure (Table 4).

As predicted by the proposed hypotheses, knowledge outflow has a positive effect on division performance, while knowledge inflow has a negative effect on it. The model which includes only the knowledge inflow variable is not better than the baseline model with control variables. In contrast, the models which include the knowledge outflow variable gain explanatory power in terms of $R^2$. Knowledge inflow attains significance in the presence of knowledge outflow, which could be regarded as a symptom of a spurious relationship. Further analyses showed this was not a case of multicollinearity, but rather a case of interaction.

Knowledge inflow impacts negatively on division performance for low values of knowledge outflow, but this impact dissipates for high values of knowledge outflow. This result was derived by again fitting two regression analyses, one for divisions with a knowledge outflow of less than the median value ($R^2 = 0.385$, $n = 58$ divisions; knowledge inflow’s unstandardized coefficient = -0.246, $p < 0.019$) and another for divisions with a knowledge
outflow that was greater than the median value ($R^2 = 0.287$, $n = 60$ divisions; knowledge inflow’s unstandardized coefficient $= -0.104$, $p < 0.303$). The remaining coefficients do not change as compared with the full sample regression analysis.

5. DISCUSSION AND IMPLICATIONS

This article proposes that three effects determine the overall impact of knowledge outflow and knowledge inflow on division performance: (a) the signaling effect reflects the rich or poor resource base of the focal division (Barney 1991), (b) the spillover effect gathers the risk of imitation and substitution by competitors because of knowledge codification (Kogut and Zander 1992), and (c) the learning effect captures the intra-division and inter-division learning processes owing to the knowledge recombination within the firm (Teece et al. 1997). Resource-based, knowledge-based and dynamic-capability views and previous evidence have been used to put forward and test hypotheses concerning the impact of knowledge outflow and knowledge inflow on division performance.

The results show that knowledge outflow impacts positively on division performance, since the signaling and learning effects are greater than the spillover effect. Knowledge outflow signals the existence of a valuable, rare, imperfectly imitable and difficult to substitute division resource base (Barney 1991), which is pursued to transfer it to other parts of the firm in order to achieve corporate synergies (Bettis and Prahalad 1995). During the process of knowledge transfer to the rest of the corporation, the focal division may take advantage of inter-unit learning through the new knowledge developed both in the adaptation of the focal knowledge to the new applications (Chatterjee 1990) and as regards the feedback from the divisions receiving this knowledge (Markides and Williamson 1994). The spillover effect would appear to be weak or, at least, not sufficiently strong to mitigate signaling and learning effects (Kogut
and Zander 1992). This finding is consistent with previous research in the context of multinational corporations, such as the irrelevance of knowledge transfer in determining competitive imitation (Zander and Kogut 1995) or the negligible effects of abstaining from codifying on sub-unit performance (Schulz and Jobe 2001).

Knowledge inflow impacts negatively on division performance for low levels of knowledge outflow, but this impact dissipates for high values of knowledge outflow (Figure 3). Given that both the signaling and spillover effects are negative for knowledge inflow, knowledge outflow does influence the remaining learning effect. Divisions that are major providers of knowledge to the rest of the corporation learn more when they receive knowledge from the rest of the corporation as compared with divisions that are minor providers of knowledge. This finding is interesting in the light of the absorptive capacity perspective, since division knowledge outflow would appear to provide an adequate measurement of this concept (Zahra and George 2002). If the value of knowledge inflow is to be recognized, assimilated, and applied to commercial ends, then the receiving division must be a knowledge-creating unit that is able to integrate the new knowledge with its own knowledge, and it will thus have a high knowledge outflow (Bettis and Prahalad 1995). Otherwise, when a division has a low knowledge outflow, it lacks the absorptive capacity to learn on the basis of knowledge inflow (Cohen and Levinthal 1990). This finding is not only consistent with expanding evidence documenting the importance of absorptive capacity in intra-firm, inter-unit knowledge transfers (Gupta and Govindarajan 2000, Minbaeva et al. 2003, Sugheir et al. 2012, Wang and Han 2011), but also indicates a feasible measurement approach for the elusive concept of absorptive capacity (Lane et al. 2006, Zahra and George 2002).

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Insert Figure 1 about here
The research implications are threefold. First, rather than working on insolated versions of resource-based logic, this article shows the usefulness of simultaneously considering static, comparative static and dynamic arguments from the resource-based, knowledge-based and dynamic-capability views by, as far as possible, using integrated frameworks (Makadok 2001). Second, assuming that resource attributes are not observable and the direct measurement of firms’ resources is not feasible, ex ante testable predictions derived from the resource-based logic are necessary, which could be empirically examined ex post through indirect measurement approaches (Barney et al. 2011). This article contributes to this methodological strategy in that its objective is to elude tautology criticisms of resource-based logic (Priem and Butler 2001). Finally, this article adds to the growing research line that postulates a ‘bottom-up’ approach to the study of corporate strategy, in which the management of diversification at the business level is more important than the overall diversification strategy at the corporate level in the analysis of the diversification-performance linkage (Grant 2002, Markides 2002).

This work has several implications for managers. The most striking finding is the asymmetrical impact of knowledge flows on division performance. One would expect that knowledge transfer within related firms might be an important predictor of overall corporate competitiveness by improving the performance of any division, be it the receiving or the provider unit. This is not the case. As noted by Allee (1999), the simple exchange of knowledge is not always guarantee of value creation. Although there are winners and losers in the quest for corporate synergy, the results indicate that knowledge transfer contributes to overall corporate performance, since knowledge outflow impacts positively on division performance in all cases, while knowledge inflow impacts negatively on division performance only in some cases.
Setting aside the obvious task of promoting knowledge transfer within the firm, an important concern for corporate officers would be to prevent situations in which a division lacks the absorptive capacity to play its role within a corporate network. A division that lacks the absorptive capacity necessary to support knowledge inflows fails to fulfill its role within the internal knowledge network and threatens the overall distribution of specialized knowledge and the corresponding division of labor of the whole firm.

**6. LIMITATIONS AND FUTURE WORKS**

This article does not empirically discriminate against the relative importance of the signaling, spillover and learning effects underlying the division performance impact of knowledge outflow and knowledge inflow, since the intention of the deductive framework used is solely to integrate the three variations of the resource-based logic and formulate normative predictions concerning knowledge flows within related firms, which could be subsequently tested. Although remarkably complex, and probably beyond the scope of a single article, the development of specific scales with which to operationalize these three elusive effects would make it possible not only to confirm the findings presented herein but, more importantly, to provide an overall assessment of the relative importance of the resource-based, knowledge-based and dynamic-capability views of the firm in an empirical setting (for example, Argyres 1996).

Future works may extend the scope of the article in three ways. First, here the focus has been on the magnitude and directionality of knowledge flows within related firms. It might be possible to investigate the impact of other dimensions of knowledge flows on division performance, such as the lateral/vertical direction of knowledge flows, the internal/external nature of knowledge, the marketing/technological/administrative type of knowledge or the
explicit or tacit dimension of knowledge, in individual articles. For example, it may well be possible that inflows and outflows of explicit knowledge embedded in systems and procedures differ from those of tacit knowledge bound to people in ways that significantly alter the overall impact of the signaling, spillover and learning effects on division performance. Second, the division performance impact of knowledge outflow and knowledge inflow has been analyzed within related firms, but the implementation systems which may facilitate or inhibit them have not been studied. Many structural and process organizational variables may moderate the relationship between knowledge flows and division performance (Martín-Pérez et al. 2012). Finally, the study chose to focus on related firms, since knowledge flows are crucial if these firms are to gain corporate synergies, but there are many more determinants of knowledge flows within related firms. Future works may investigate the determinants of intra-firm flows of knowledge among product divisions by importing the existent research on geographical diversification (Blomkvist 2012, Gupta and Govindarajan 2000).
## TABLE 1

Signaling, Spillover and Learning Effects of Knowledge Flows

<table>
<thead>
<tr>
<th>Knowledge Flow</th>
<th>Signaling Effect</th>
<th>Spillover Effect</th>
<th>Learning Effect</th>
<th>Overall Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Outflow</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Knowledge Inflow</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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</tbody>
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# TABLE 2

**Corporate Strategies of 100 Largest Spanish Enterprises***

| Dominant (n=43) |  |  |  |  |
|-----------------|----------------|----------------|----------------|
| AYESA           | CEPSA          | GMV            | REE            |
| AZERTIA         | CLH            | GRUPO ANTOLIN  | REPSOL YPF     |
| AZKAR           | ELECNOR        | IBERDROLA      | RYMSA          |
| AZVI            | ENAGAS         | IBERMATICIA    | SANDO          |
| BANCO DE VALENCIA | ENCE    | INTECSA-INARSA | SNIACE         |
| BANCO GUIPUZCOANO | ENDESA  | IT DEUSTO      | TALGO          |
| BANCO PASTOR    | EUROPAC        | KUTXA          | TECNOCOM       |
| CAF             | FERTIBERIA     | LA SEDA        | TELDAT         |
| CAIXA GALICIA   | FICOSA         | LANDATA-PAYMA  | TUBACEX        |
| CARRERAS        | GAS NATURAL    | MIER           | TUBOS REUNIDOS |
| CATALANA OCCIDENTE | GESINAR | PAGE            |                |

| Related (n=46) |  |  |  |  |
|-----------------|----------------|----------------|----------------|
| ABERTIS         | CAMPOFRIO      | GAMESA         | REYAL          |
| ALTADIS         | CAIXA CATALUNYA | IKUSI       | ROCA           |
| AMPER           | CAJA MADRID    | INDRA          | SCH            |
| APEX            | CAM            | ISOLUX         | TAVEX          |
| AZKROYEN        | CEVASA         | IZAR           | TELEFONICA     |
| AUNA            | COLONIAL       | LA CAIXA       | TELEPIZZA      |
| BANC SABADELL   | COMSA          | LAR            | UNION FENOSA   |
| BANCAJA         | CORSAN-CORVIAM | MAPFRE         | URALITA        |
| BANCO POPULAR   | DURO FELGUERA  | METROVACESA    | URBIS          |
| BANESTO         | EBRO PULEVA    | NATRA          | ZELTIA         |
| BANKINTER       | ERCROS         | OHL            |                |
| BBVA            | FADESA         | REALIA BUSINESS |                |

| Unrelated (n=11) |  |  |  |  |
|-----------------|----------------|----------------|----------------|
| ABENGOA         | AGBAR          | FERROATLANTICA | SACYR-VALLEHERMOSO |
| ACCIONA         | DRAGADOS       | FERROVIAL      | UNIPAPEL       |
| ACS             | FCC            | MCC            |                |

* Product divisionalized. Classification based on the Rumelt’s (1974) system.
TABLE 3
Descriptive Statistics and Pearson Correlation Coefficients (n=118)

<table>
<thead>
<tr>
<th>Variable(^{(1)})</th>
<th>Descriptives</th>
<th>Pearson Correlation(^{(1)})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Division Performance</td>
<td>3.83</td>
<td>0.49</td>
</tr>
<tr>
<td>Division Size(^{(2)})</td>
<td>5.56</td>
<td>2.25</td>
</tr>
<tr>
<td>Prospector Orientation</td>
<td>4.71</td>
<td>1.15</td>
</tr>
<tr>
<td>Environmental Uncertainty</td>
<td>2.55</td>
<td>0.39</td>
</tr>
<tr>
<td>Knowledge Outflow</td>
<td>2.69</td>
<td>0.78</td>
</tr>
<tr>
<td>Knowledge Inflow</td>
<td>2.39</td>
<td>0.72</td>
</tr>
</tbody>
</table>

\* p < 0.05 (two-tailed); \*\* p < 0.01 (two-tailed); + p < 0.10 (two-tailed)
\(^{(1)}\) Industry membership (measured through dummy variables) is not shown owing to space restrictions.
\(^{(2)}\) Natural logarithm of number of employees.
<table>
<thead>
<tr>
<th>Effect Variable</th>
<th>Model 1 Controls</th>
<th>Model 2 Outflow</th>
<th>Model 3 Inflow</th>
<th>Model 4 Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Constant</strong></td>
<td>3.943</td>
<td>3.411</td>
<td>3.909</td>
<td>3.371</td>
</tr>
<tr>
<td></td>
<td>(0.374)</td>
<td>(0.371)</td>
<td>(0.381)</td>
<td>(0.363)</td>
</tr>
<tr>
<td><strong>Division Size</strong></td>
<td>0.012</td>
<td>0.011</td>
<td>0.011</td>
<td>0.019</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.019)</td>
<td>(0.021)</td>
<td>(0.019)</td>
</tr>
<tr>
<td><strong>Water, Energy &amp; Telecoms</strong></td>
<td>0.405*</td>
<td>0.254</td>
<td>0.381*</td>
<td>0.315+</td>
</tr>
<tr>
<td></td>
<td>(0.169)</td>
<td>(0.162)</td>
<td>(0.176)</td>
<td>(0.160)</td>
</tr>
<tr>
<td><strong>Banking &amp; Insurance</strong></td>
<td>0.292*</td>
<td>0.231*</td>
<td>0.285*</td>
<td>0.244*</td>
</tr>
<tr>
<td></td>
<td>(0.116)</td>
<td>(0.109)</td>
<td>(0.117)</td>
<td>(0.107)</td>
</tr>
<tr>
<td><strong>Construction &amp; Real Estate</strong></td>
<td>0.148</td>
<td>0.128</td>
<td>0.145</td>
<td>0.136</td>
</tr>
<tr>
<td></td>
<td>(0.133)</td>
<td>(0.124)</td>
<td>(0.134)</td>
<td>(0.122)</td>
</tr>
<tr>
<td><strong>Prospector Orientation</strong></td>
<td>0.078+</td>
<td>0.077+</td>
<td>0.077+</td>
<td>0.079*</td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td>(0.038)</td>
<td>(0.040)</td>
<td>(0.037)</td>
</tr>
<tr>
<td><strong>Environmental Uncertainty</strong></td>
<td>-0.295**</td>
<td>-0.298**</td>
<td>-0.307**</td>
<td>-0.241*</td>
</tr>
<tr>
<td></td>
<td>(0.109)</td>
<td>(0.102)</td>
<td>(0.112)</td>
<td>(0.103)</td>
</tr>
</tbody>
</table>

Main Knowledge Outflow  0.221** (0.053)  0.308** (0.064)
Knowledge Inflow        0.034          -0.169* (0.065) (0.072)

** Goodness of Fit **

<table>
<thead>
<tr>
<th>Goodness of Fit</th>
<th>Model 1 Controls</th>
<th>Model 2 Outflow</th>
<th>Model 3 Inflow</th>
<th>Model 4 Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F</strong></td>
<td>4.018**</td>
<td>6.461**</td>
<td>3.460**</td>
<td>6.581**</td>
</tr>
<tr>
<td><strong>R²</strong></td>
<td>0.185</td>
<td>0.301</td>
<td>0.187</td>
<td>0.336</td>
</tr>
<tr>
<td><strong>∆R²</strong></td>
<td>0.116**</td>
<td>0.002</td>
<td>0.151**</td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>118</td>
<td>118</td>
<td>118</td>
<td>118</td>
</tr>
</tbody>
</table>

** p < 0.01;  * p < 0.05;  + p < 0.10

(1) Industry membership; the effects must be interpreted in contrast with the omitted ‘Manufacturing’ group.
FIGURE 1
Knowledge Inflow Impact on Division Performance

Division Performance

Knowledge Inflow

Weak Absorptive Capacity

Strong Absorptive Capacity

High Knowledge Outflow

Low Knowledge Outflow
REFERENCES


