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## **Conduits of Innovation or Imitation? Assessing the Effect of Alliances on the Persistence of Profits in U.S. Firms**

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## Abstract

This paper examines if a firm's alliances affect the persistence of its financial performance. The literature suggests two conflicting views concerning this effect. In particular, access to resources and innovation and the risk of imitation from alliances can have different impacts on performance. In our empirical analysis, based on a panel of 509 firms covering the years 1992 to 2002, return on assets was regressed on the number of alliances and other control variables using hierarchical linear modeling. Results support the positive view of alliances as mechanisms to sustain competitive advantage and escape from competitive disadvantage through access to external, valuable resources held by other firms. Alliances also help firms to constantly innovate and buffer themselves from external shocks that erode existing advantages. Our results, however, may be specific to the period and the institutional context under consideration and we do not distinguish between types, purposes and "strength" of alliances. We contribute to the debate about profit persistence by examining one particular factor that has been neglected in the literature: the extent to which firms engage in alliances with other actors. From a managerial perspective, our study shows that alliances can be used as an effective tool to support superior performance or avoid lock-in into inferior performance.

**Key words:** alliances; persistence; sustainability; performance.

## Introduction

Starting with the trailblazing work by Mueller (1986), scholars have been increasingly interested in factors that may induce persistence of firm-specific, abnormal profits—profits that are consistently above the average of a given industry for a certain period of time. Indeed, much of what is said in the discipline of strategy has to do with how firms **sustain** their competitive advantage in the long run, usually measured by the way in which firms consistently outperform competitors. The resource-based view of the firm, for instance, emphasizes the role of valuable, rare and difficult-to-imitate resources as sources of sustained advantage (Barney, 1991). The profits of firms whose production chains rely on generic and imitable resources may rapidly converge to the industry norm because competitors will be able to develop similar or substitute products and fiercely compete in the marketplace. D’Aveni (1994) even proposes that competitive settings are becoming increasingly hypercompetitive. Strategic maneuvering by firms and rapid technological change create an environment where it becomes more and more difficult to avoid the dissipation of profits, as evidenced in the research by Wiggins and Ruefli (2005). Recognition of the central role of persistence in the strategic management field has triggered a stream of research examining factors that may increase or decrease the ability of firms to sustain their competitive advantage over time (*e.g.* Jacobsen, 1988; McGahan & Porter, 1999; Roberts, 1999; Waring, 1996).

In this paper, we contribute to this debate by examining one particular factor that has been neglected in that literature: the extent to which firms adopt a strategy to engage in **alliances** with other actors. As posited by Eisenhardt and Schoonhoven (1996), alliances provide access to resources and competencies held by other firms including new distribution channels, complementary knowledge to jointly develop new products, shared production platforms, and so forth. However, most empirical research has assessed how alliances **create** competitive advantage (see, for example, Anand & Khanna, 2000 and Chan, Wensinger, Keown, & Martin, 1997), instead of evaluating their effect on **sustainable** advantage. Scrutinizing this effect is particularly important not only because the use of alliances has apparently increased in recent years, as shown by Hagedoorn (2002) and Lavie (2007), but also because there are conflicting perspectives on how alliances might affect persistence. On the one hand, some scholars have observed that alliances might provide firms with access to **external** resources and competencies held by other firms, thereby allowing them to respond to shocks that would otherwise render their own resources obsolete and lock them out of external opportunities (Lee, 2007; Leonard-Barton, 1995; Liebeskind, Oliver, Zucker, & Brewer, 1996). Following this logic, alliances might **increase** the persistence of competitive advantage. On the other hand, widespread use of alliances may be negatively associated with an ability to protect and develop **internal** resources that could create sustainable advantages. Indeed, Hamel (1991) and Chesbrough and Teece (1996) have argued that alliances may become conduits of knowledge leakage, as partners (which are, in some cases, actual or potential competitors) learn from practices, client bases, and even technologies developed by the firm. Following this alternative logic, alliances may **reduce** the persistence of advantage. Therefore, judging from what is posited by received theory, the effect of alliances on sustainable competitive advantage is, *a priori*, ambiguous.

We begin by describing in detail the theoretical arguments that lead to the different predictions above. Given that previous studies have uncovered asymmetric persistence effects (Chacar & Vissa, 2005; Jacobsen, 1988; Villalonga, 2004), we present arguments implying distinct effects of alliances depending on whether the firm is exhibiting competitive advantage (*i.e.*, profits above the norm of their industry in a given period) or competitive disadvantage (profits below the norm). We then test those competing hypotheses using a sample of firms from the United States and combining two distinct datasets: financial data from COMPUSTAT and alliance data from Thomson’s SDC Platinum, which tracks the formation of alliances and joint ventures based on publicly available sources. Following past studies, we assess persistence by directly examining the coefficient of past, lagged performance (in our case, return on assets) when current performance is used as a dependent variable. The larger this coefficient, the longer profits will persist. We, however, innovate by employing a **hierarchical** structure on our model; that is, the coefficient of persistence itself is modeled as a

function of diverse variables, including the propensity of the firm to form alliances. After presenting and discussing our results, we conclude by pointing out implications for theory and practice, and suggesting an agenda for future research.

## Theory: Persistence of Profits and the Role of Alliances

### Persistence of profits

The issue of how profits persist over time has long interested both economists and strategic management scholars. The competitive market paradigm implies that escalating entry, imitation or price-based competition will promote an intra-industry convergence of profits. If, however, firms display an ability to sustain positive abnormal profits — defined here as profits that remain for a long time above the average of a given industry (Mueller, 1986; Waring, 1996) — then there will be a clear departure from perfect competition. As a matter of fact, the search for above-the-norm profits is at the core of much what is discussed in the strategic management field. Either through the development of specific market positions (Porter, 1985, 1996) or through the acquisition of valuable, rare and difficult-to-imitate resources (Barney, 1991; Peteraf, 1993), the goal of the strategist is clearly to **sustain** profits — or, more generally, competitive **advantage**: “the amount to which an industry incumbent outperforms the average for its industry” (McGahan, 1999, p. 378).

This fundamental issue has sparked a flurry of empirical research attempting to assess, based on actual data, whether firms display persistent profits or not, and what are the determinants of persistence. Building on Mueller’s (1977, 1986) pioneering work, empirical studies on persistence have adopted variants of the following regression:

$$R_{it} = \beta_0 + \beta_1 R_{it-1} + e_{it}, \quad (1)$$

where  $R_{it}$  is a measure of economic performance (usually, return on assets) of firm  $i$  at year  $t$ ,  $R_{it-1}$  is the firm’s lagged performance measure, and  $e_{it}$  is an error term. The coefficient  $\beta_1$  is the so-called **coefficient of persistence**. The larger this coefficient, the more current performance will depend on past performance and, hence, the longer firms will be able to sustain their profits.

In general, empirical research has found significantly positive persistence coefficients, which is consistent with the view that imperfect competition allows firms to sustain profits for some time (Connolly & Schwartz, 1985; McGahan & Porter, 1999; Mueller, 1986). More recent research also evaluated how the ability of firms to sustain performance has changed over the years. Here we have mixed results: while some have empirically observed declining persistence rates (Thomas & D’Aveni, 2009; Wiggins & Ruefli, 2005), which is consistent with the view that industries are becoming increasingly hypercompetitive, others have found no such effect (McNamara, Vaaler, & Devers, 2003). Furthermore, there is flagrant variability in coefficients of persistence both across and within industries (e.g. Cubbin & Geroski, 1987; McGahan, 1999). In other words, some firms will arguably be able to sustain profits in the long run, while others — perhaps the majority (Wiggins & Ruefli, 2002) — will not. A natural question then arises: what are the factors that allow firms to increase the persistence of their profits? Studies have uncovered several factors which significantly affect persistence, including industry structure (Geroski & Jacquemin, 1988; Mueller, 1986; Waring, 1996), firm size or market share (Jacobsen, 1988; Mueller, 1986; Wiggins & Ruefli, 2002), degree of vertical integration (Jacobsen, 1988), innovative propensity (Roberts, 1999), and intangibility of assets (Villalonga, 2004), among others.

We analyze in this study the effect of a firm-specific factor that, to our best knowledge, was not considered in previous studies: the extent to which the firm engages with **alliances** with other actors. As we discuss below, there are strong theoretical reasons why this factor may be an important

determinant of persistence, even though there is controversy regarding the nature of the effect (positive or negative).

## Alliances and profits

Interorganizational alliances are collaborative, interdependent efforts between two or more firms (see, for a general discussion, Contractor & Lorange, 1988; Gulati, 1998). They can have a variety of forms and purposes, including agreements to share markets or distribution channels, to engage in joint R&D efforts, and to develop and commercialize new products. We do not distinguish here between alternative types or specific purposes of alliances; instead, we adopt a resource-based approach (Das & Teng, 2000; Eisenhardt & Schoonhoven, 1996; Lavie, 2007) by considering that alliances involve, fundamentally, the use and articulation of other firms' resources. More specifically, we consider that alliances are "about creating the most value out of one's existing resources by combining these with others' resources, provided, of course, that this combination results in optimal returns" (Das & Teng, 2000, p. 37). For instance, a firm that decides to sign a sales agreement with another firm downstream in the value chain will attempt to benefit from tangible (*e.g.*, logistics infrastructure) and intangible resources (knowledge of local customers) to create a series of advantages such as increased market penetration, lower operational costs, etc. Similarly, firms engaged in an R&D alliance will combine their distinct knowledge sets to improve existing products or create new ones.

Eventually, these strategic efforts will lead to competitive advantage and the firm will generate profits above the industry norm. The critical issue that we address in this paper is whether alliances lead, or don't lead, to **sustainable** competitive advantage, defined as profits above the norm that persist in the long run. Additionally, we also explore the effect of alliances on the sustainability of competitive **disadvantage**, when firm profits are below the norm. Arguably, a firm may benefit from the resources of other firms to escape from disadvantaged market positions and more quickly converge to the mean of its industry. If this effort succeeds, the firm might begin to build firm-specific advantages in the future. For this reason, in the following discussion and in our empirical tests we distinguish between the effect of alliances in the persistence of competitive advantage and disadvantage. Indeed, research has found that persistence effects tend to be asymmetric depending on whether firms exhibit performance above or below the norm (Chacar & Vissa, 2005; Jacobsen, 1988; Villalonga, 2004). Within this perspective, Table 1 summarizes our theoretical arguments and hypotheses, which are detailed below.

Table 1

### Summary of Hypotheses

		Effect of alliances on persistence	
		Increase	Decrease
Persistence of...	Competitive advantage	(Hypothesis 1a) Alliances provide firms with access to <i>external</i> resources creating an ability to innovate and respond to <i>new</i> shocks that could erode an existing competitive advantage.	(Hypothesis 1b) Alliances provide partners with access to a firm's <i>internal</i> resources, thereby leading to imitation and erosion of existing advantages.
	Competitive disadvantage	(Hypothesis 2b) Alliances crowd out the development of <i>internal</i> resources necessary to create competitive advantage.	(Hypothesis 2a) Alliances provide firms with access to <i>external</i> resources creating an ability to respond to <i>past</i> shocks that induced competitive disadvantage.

## The positive effect of alliances: sustaining competitive advantage, escaping from competitive disadvantage

The positive effect of alliances on competitive advantage—either by sustaining an advantage or reversing a disadvantage—fundamentally rests on the idea that alliances provide firms with **external resources**, *i.e.*, resources held by other firms (Eisenhardt & Schoonhoven, 1996; Lee, 2007). Consider, for instance, a firm that has developed a successful product in the past, but the product faces the risk of becoming obsolete due to an emerging technological innovation developed by a competitor. Through an R&D alliance with a partner holding complementary knowledge, the firm may be able to anticipate and respond to the external innovation that could render its own product obsolete (Leonard-Barton, 1995; Liebeskind *et al.*, 1996; Sampson, 2007). Also, the R&D alliance may allow the firm to tap into other firms' knowledge and, consequently, modify existing products or processes and even develop new ones. Similarly, sale agreements allow firms to draw from other actors' local resources and gain new market share. In sum, access to external resources allows firms to anticipate and respond to **new** shocks that would otherwise erode profits and even create competitive disadvantage (Zaheer & Bell, 2005).

Therefore, alliances may provide firms with an ability to dynamically sustain competitive advantage precisely because improved access to external resources will allow them to frequently introduce modifications to existing products or processes and, as a result, continuously create new demand or reduce costs (Roberts, 1999). Following Teece, Pisano and Shuen (1997, p. 515), alliances may help create **dynamic capabilities**, *i.e.*, the ability of “appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources and functional competencies to match the requirements of a changing environment”. According to these authors, “increasingly, strategic advantage requires the integration of external activities and technologies” (p. 518) (see also Rothaermel & Hess, 2007). The development of dynamic capabilities should also involve a continuous learning process whereby firms refine their procedures to screen valuable partners and develop routines to manage interorganizational relationships (Anand & Khanna, 2000; Dyer & Nobeoka, 2000; Kale, Dyer, & Singh, 2002) — resources that themselves tend to be firm-specific and difficult to replicate. Dyer and Hatch (2006) find evidence that interfirm learning is relationship-specific and therefore difficult to transfer to other firms (see also Mesquita, Anand, & Brush, 2008).

Similar logic leads to the conclusion that, through alliances, firms may be able to escape from an existing competitive disadvantage. Thus, suppose that a firm is facing declining sales due to diminishing demand in its established markets. Through a sales or marketing agreement with a distributor, for instance, the firm may be able to reach new, growing markets. Similarly, a firm facing technology obsolescence may pursue licensing agreements with firms on the cutting edge. Even though these efforts may not necessarily create competitive advantage, they will likely induce convergence of performance from a negative situation (profits below the norm) to the mean of the industry in which the firm is located. In other words, alliances will reduce the persistence of competitive disadvantage.

We therefore conclude by presenting our first pair of hypotheses, predicting a positive effect of alliances on the temporal evolution of firm-specific performance:

Hypothesis 1a. The higher a firm's involvement in alliances with other firms, the higher the persistence of that firm's competitive advantage.

Hypothesis 2a. The higher a firm's involvement in alliances with other firms, the lower the persistence of that firm's competitive disadvantage.



### **The negative effect of alliances: undermining competitive advantage, sustaining competitive disadvantage**

While the positive effect of alliances is rooted in the benefits of accessing external resources, the negative effect stems from the idea that alliances will be negatively associated with an ability to protect and develop core, **internal** resources. Typically, partnering firms “directly or indirectly, consciously or unconsciously, exchange information about their respective markets, pricing policies, production processes and the like. They expose each other to their way of operating” (Nakamura, Shaver, & Yeung, 1996, p. 522). Given that a great deal of learning and transfer of skills will likely occur in the alliance (Hamel, 1991; Khanna, Gulati, & Nohria, 1998), imitation of products and processes for the private benefit of individual partners may be an intended or unintended outcome of the interfirm interaction — regardless of whether partnering firms are competitors or complementary actors in the value chain. If they are direct or potential competitors, the benefit of learning from one another and applying the acquired knowledge to their own activities will be a natural way to catch up and even outcompete industry peers (Menon & Pfeffer, 2003). Alliances may also be conduits of imitation even if firms are not direct competitors. Thus, crafting flexible production processes involving several partners for a broad range of activities in the value chain allows the firm to benefit from specialized actors but, at the same time, reduces the firm’s protection of core resources. For instance, a firm relying on outside partners to provide key components of a given product will face the risk that, in the future, those partners will supply similar components to actual or potential competitors of that firm. Chesbrough and Teece (1996) cite the example of IBM, which committed to an open architecture of the PC computer system but at the same time relied on external partners (Microsoft, Intel) that themselves stimulated entry by new manufacturers. Therefore, the mere act of creating a competitive advantage through alliances may mean that that advantage will be fundamentally temporary; alliances may thus reduce the persistence of profits above the norm.

On the other hand, in the case of firms facing competitive disadvantage, widespread use of alliances may substitute for **internal** resources that would otherwise create sustainable advantages. Thus, Porter (1990, p. 3) contends that “no company can rely on another outside, independent company for skills and assets that are central to its competitive advantage. Alliances are best used as a selective tool, employed on a temporary basis or involving noncore activities”. Given that interfirm relations will require time and effort to sustain joint activities, extensive focus on external partnerships may crowd out efforts to develop valuable, firm-specific resources internally. Even worse, the very process of alliance formation implies that firms without valuable internal resources may run out of valuable partnering opportunities, as players within and across industries will fiercely attempt to find instead potential partners with cutting-edge technology and advantaged market positions. Eventually, firms with competitive disadvantage will likely face what Gomes-Casseres (1994, p. 72) terms “strategic gridlock”: only a few, weaker partners will be available for a firm that is unable to attract more valuable partners at the outset. In other words, alliances will be associated with profits consistently below the norm.

This discussion leads to a competing pair of hypotheses, now predicting a negative effect of alliances on the temporal evolution of firm-specific performance:

Hypothesis 1b. The higher a firm’s involvement in alliances with other firms, the lower the persistence of that firm’s competitive advantage.

Hypothesis 2b. The higher a firm’s involvement in alliances with other firms, the higher the persistence of that firm’s competitive disadvantage.



## Data and Methods

### Data

We test our hypotheses using a sample of firms from the United States and combining two distinct datasets: financial data from COMPUSTAT (research database, with manufacturing firms only) and alliance data from Thomson's SDC Platinum (which, based on publicly available sources, records alliances formed by firms throughout the world). Following Waring (1996), we adopt a particular period to collect data on factors that might affect persistence, and then evaluate the persistence of performance after that period. Namely, we observe the formation of alliances in the 1988-1992 window, assign information on those formed alliances to a sample of COMPUSTAT firms, and then observe persistence of performance in a subsequent temporal window (1992-2002). Following the bulk of research on persistence, and given our focus on the long-term persistence of short-term profits, we employ ROA (return on assets) as our measure of economic performance. Given the goal of the research, the use of market-based measures (such as price-to-book ratios or Tobin's  $q$ ) would not capture our desire to assess the persistence of period-to-period profits. As Roberts (1999, p. 659) put it, "it is not desirable to have current and future returns confounded in the same profit measure. As such, ROA (defined as the ratio of net income to total assets) is preferred as the measure of firm profitability".

The following criteria were used to restrict our sample of firms. First, given our focus on U.S. firms, we consider only alliances for which there was at least one partner with headquarters in the United States. Second, using information from the U.S. Census Bureau, we pre-selected 30 industries (based on 3-digit SIC codes) with the highest aggregate revenues, to which we added some extra industries exhibiting a large number of alliances formed in the 1988-1992 window, and from which we eliminated some industries in which no alliance was found in the SDC database. Third, we kept only firms for which complete financial data for the 1992-2002 period were available, and eliminated firms with extreme ROA figures (which we defined as inferior to -50% or superior to 50%). We ended up with 509 firms (5,520 observations), distributed across 22 industries. Overall, 18.8% of our firms were observed with at least one alliance formed in the 1988-1992 period.

Also following past research (*e.g.* Chacar & Vissa, 2005; Mueller, 1977; Roberts, 1999), ROA was normalized by industry. That is, for each period (year) and for each industry, we subtracted a firm's ROA for the industry mean in that particular period. This transformation provides a direct measure of profits above (or below) the norm. Focusing on the three years preceding the profit observation window (*i.e.*, 1990-1992), we computed the average normalized ROA for each firm and then created sub-samples of firms to explore the differential effect of alliances on persistence depending on whether the firm exhibited competitive advantage or disadvantage at the outset. For robustness, we employed two distinct procedures to create sub-samples. In the first procedure, we simply split the original dataset into firms that had a positive average normalized ROA (279 firms) and those that exhibited a negative average normalized ROA (230 firms). In the second procedure, we eliminated firms that had a middle ground performance, and considered that firms exhibited competitive advantage if they had an average normalized ROA 0.5 standard deviation above the mean of the entire dataset (137 firms). Similarly, firms with an average normalized ROA of -0.5 standard deviation or lower (98 firms) were considered as firms exhibiting competitive disadvantage.

Our variable measuring the alliance activity of a given firm, *Alliances<sub>*i*</sub>*, measures the number of alliances (joint ventures included) formed by each firm  $i$  within the 1988-1992 observation window. To be sure, the SDC Platinum database focuses on publicly announced alliances and therefore ignores alliances that were privately formed by firms. This is an important limitation of the database, which is explicitly recognized by previous authors who used it (*e.g.* Anand & Khanna, 2000). However, our measure can be understood as a proxy for the **intensity of use** of alliances by a particular firm. Firms more willing to adopt alliances should be more inclined to not only pursue, but also announce those deals. Thus, we believe that this measure captures, albeit imperfectly, the essence of the effect that we

are intent on measuring. In creating this variable, we did not distinguish between different types (equity or non-equity) or purposes (marketing, production, R&D, etc.) of alliances. Following our theoretical discussion, we are basically interested in the extent to which firms are inclined to form alliances **in general** as a way to tap into external resources, either tangible or intangible.

## Methods

The literature on persistence has employed different techniques to model firm performance along the lines of equation (1). The initial studies (Cubbin & Geroski, 1987; Mueller, 1977; Waring, 1996) estimated an average persistence coefficient for different groups of firms. Waring (1996), specifically, analyzed factors that could explain the variability of this persistence coefficient according to aggregate industry characteristics. McGahan and Porter (1999) decomposed returns into several components (segment, corporate parent, and industry) and calculated segment- (or firm-) specific persistence. However, in their final analysis, they used weighed averages of these estimates. When examining the effects of variables affecting persistence, researchers have usually interacted these variables with lagged returns (*e.g.* Jacobsen, 1988; Roberts, 1999; Villalonga, 2004).

While retaining the original concept involving equation (1), we adopt in this paper a **hierarchical linear modeling** (HLM) approach, which is well suited for the purposes of our study for several reasons. First, HLM accounts for the natural hierarchical structure of data. In our case, several observations of firm returns are nested within specific firms which, in turn, are nested within industries. HLM explicitly addresses the lack of independence across these levels. The method also allows us to use explanatory variables simultaneously at different levels of analysis (Hofmann, 1997; Misangyi, Elms, Greckhamer, & Lepine, 2006). Second, the technique allows us to model firm-specific persistence coefficients, recognizing that firms are essentially different and that our objective is to explore and explain these differences in persistence. Third, HLM assumes that these firm-specific persistence coefficients are a realization of a probability distribution and provides estimates of the relevant parameters. Thus, the persistence coefficient is itself treated as a random variable, affected by variables such as the extent to which firms engage in alliances. Instead of employing interactions with the lagged dependent variable, the HLM method allows us to directly model the determinants of heterogeneous, firm-specific persistence coefficients. To compute our estimates, we used the HLM 6.02 (Hierarchical Linear Model) software, which implements a maximum likelihood algorithm to fit HLM models.

To facilitate comprehension, we employ a sequence of models with increasing complexity (Singer & Willet, 2002). The simplest model (A), the so-called empty model, displays no explanatory variables and is just designed to demonstrate the hierarchical structure of the data. The equations for such a model, using the notation by Raudenbush and Bryk (2002) and  $R_{it}$  (the normalized ROA of firm  $i$  at year  $t$ ) as the central performance variable, are:

$$R_{it} = \pi_{0i} + e_{it} \quad \text{Level 1 (firm performance observations)} \quad (2)$$

$$\pi_{0i} = \beta_{00} + r_{0i} \quad \text{Level 2 (firm)} \quad (3)$$

$$\beta_{00} = \gamma_{000} + u_{00} \quad \text{Level 3 (industry)} \quad (4)$$

The terms  $\pi_{0i}$ ,  $\beta_{00}$ , and  $\gamma_{000}$  all have the same average (the average performance for all firms) but display different variance components associated with each level. The term  $u_{00}$  represents the effect of industry effects on performance, the term  $r_{0i}$  captures firm-specific effects, and the term  $e_{it}$  represents yearly performance effects for each firm. Given that we use a performance variable normalized by industry, the third level becomes irrelevant. We present these models with the third (industry) level for completeness, but omit it in the presentation and discussion of our empirical results

The second model (B) introduces the lagged performance variable and the firm-specific persistence coefficient in the first level.

$$R_{it} = \pi_{0i} + \pi_{1i}R_{it-1} + e_{it} \quad \text{Level 1} \quad (5)$$

$$\pi_{0i} = \beta_{00} + r_{0i} \quad \text{Level 2} \quad (6)$$

$$\pi_{1i} = \beta_{10} + r_{1i} \quad \text{Level 2} \quad (7)$$

$$\beta_{00} = \gamma_{000} + u_{00} \quad \text{Level 3} \quad (8)$$

$$\beta_{10} = \gamma_{100} \quad \text{Level 3} \quad (9)$$

This model introduces the term  $\pi_{1i}$ , which is equivalent to the persistence coefficient presented in equation (1). This persistence coefficient, however, is now modeled differently for each firm, as can be seen in equation (7). The term  $\beta_{10}$  is the mean estimate for the persistence coefficient for all firms. In this model, we did not consider a variance component addressing the variability of the persistence across industries. Exploratory tests proved it to be very small relative to the other sources of variability, justifying a more parsimonious model. The introduction of the persistence coefficient should alter the parameters calculated in model (A). Thus, one could expect that the variance associated with the terms  $e_{it}$  (in equation 5) and  $r_{0i}$  (in equation 6) should be reduced compared to its equivalents in equations (2) and (3). This variance reduction can be taken as an additional explanatory power of the model (Singer & Willet, 2002).

The third model (C) introduces explanatory variables at the firm level. We include two variables. The first variable,  $Size_i$ , is used as a control and represents the logarithm of total revenues averaged within the 1992-2002 window. The second variable,  $Alliances_i$ , is our key explanatory variable: the extent to which firm  $i$  engages in alliances with other firms (as discussed before). The model thus becomes:

$$R_{it} = \pi_{0i} + \pi_{1i}R_{it-1} + e_{it} \quad \text{Level 1} \quad (10)$$

$$\pi_{0i} = \beta_{00} + \beta_{01}Size_i + r_{0i} \quad \text{Level 2} \quad (11)$$

$$\pi_{1i} = \beta_{10} + \beta_{11}Size_i + \beta_{12}Alliances_i + r_{1i} \quad \text{Level 2} \quad (12)$$

$$\beta_{00} = \gamma_{000} + u_{00} \quad \text{Level 3} \quad (13)$$

$$\beta_{01} = \gamma_{010} \quad \text{Level 3} \quad (14)$$

$$\beta_{10} = \gamma_{100} \quad \text{Level 3} \quad (15)$$

$$\beta_{11} = \gamma_{110} \quad \text{Level 3} \quad (16)$$

$$\beta_{12} = \gamma_{120} \quad \text{Level 3} \quad (17)$$

The coefficients  $\beta_{11}$ ,  $\beta_{12}$  now represent the effect of size and number of alliances on the persistence coefficient. The term  $\beta_{01}$  is the effect of size on performance directly. Again, we kept the third level with no variance and no explanatory variables.

## Results and Discussion

Our results are presented in Table 2 below. The first column presents the results for the total sample, while the other four columns present the results for subsets of this sample using the two methods to determine competitive advantage and disadvantage. Columns 2 and 4 represents subsets where firms had superior performance in the reference period – an indication of competitive advantage – while columns 3 and 5 represent subsets of firms with inferior performance in the reference period – an indication of competitive disadvantage. Following the sequence of models described before, we

begin by fitting Model (A) to our data, thus allowing for an examination of the baseline variance structure. In general terms, the variance associated with interfirm differences corresponds to approximately a third of total variance, which is roughly in line with most variance decomposition studies (*e.g.* McGahan & Porter, 1997; Misangyi *et al.*, 2006; Rumelt, 1991). In other words, this result corroborates the view that firm-specific factors are the major factor to explain performance variability. Our data also indicate that groups of firms with competitive disadvantage present larger performance variance than groups of firms with competitive advantage, regardless of the way in which we split our sample. This result supports the view that competitive advantage and disadvantage can imply different performance dynamics and that analyses made for top performers may not necessarily hold for poor performers. The objective of fitting model (A) is, however, only meant to serve as a baseline to assess the other models.

Table 2

**Results: Comparison of Models**

	Total sample (1)	Split sample: normalized ROA above or below zero		Split sample: normalized ROA 0.5 std. deviation above or below the mean	
		Advantage (2)	Disadvantage (3)	Advantage (4)	Disadvantage (5)
<b>Model A – Empty Model</b>					
Number of firms	509	279	230	137	98
Variance between firms (associated with $r_{0i}$ in eq (3))	0.00423	0.00252	0.00337	0.00251	0.00589
Variance within firms (associated with $e_{it}$ in eq (2))	0.00812	0.00609	0.01065	0.00628	0.01718
Total variance (sum of the above)	0.01235	0.00861	0.01399	0.00879	0.02307
<b>Model B – Persistence</b>					
Persistence coefficient mean ( $\beta_{10}$ )	0.41006	0.49067	0.30581	0.50696	0.32389
Persistence coefficient variance	0.04657	0.03959	0.03434	0.04938	0.02801
Variance between firms	0.00065	0.00016	0.00086	0.00008	0.00194
Variance within firms	0.00731	0.00541	0.00965	0.00541	0.01515
Explained variance between firms	84.63%	93.65%	74.48%	96.81%	67.06%
Total explained variance	35.55%	35.31%	25.04%	37.54%	25.92%
<b>Model C – Explanatory variables</b>					
Persistence coefficient mean ( $\beta_{10}$ )	0.40317	0.47752	0.28119	0.48381	0.30452
Effect of <i>Alliances</i> on persistence ( $\beta_{12}$ )	-0.00199	0.00581	-0.00640***	0.01450***	-0.01599***
Effect of <i>Size</i> on persistence ( $\beta_{11}$ )	0.02893**	0.02303	-0.04268*	-0.02963	-0.02332
Effect of <i>Size</i> on base performance ( $\beta_{01}$ )	0.01329***	0.00821***	0.00907***	0.00744***	0.02024**
Persistence coefficient variance (residual)	0.04278	0.03878	0.03060	0.04589	0.02453
Variance between firms	0.00058	0.00011	0.00087	0.00007	0.00189
Variance within firms	0.00728	0.00541	0.00963	0.00540	0.01510
Explained variance between firms	10.77%	31.25%	-1.16%	12.50%	2.58%
Explained variance of the persistence coefficient	8.13%	2.06%	10.89%	7.08%	12.40%

**Note.** \*\*\*  $p < 0.01$  \*\*  $p < 0.05$  \*  $p < 0.10$  (one-tailed tests for hypothesized effects)

Model (B) introduces the persistence coefficient, which is allowed to vary by firm, assuming a different value for each firm during the analysis period. The model also estimates the variance of the persistence coefficient across firms. The first aspect to note is the mean of the coefficient. The overall

figure of 0.41 for the persistence coefficient of the entire sample is comparable to the 0.39 estimate found by Chacar and Vissa (2005) for a larger sample of U.S. firms in a roughly similar period. Our results also confirm the finding by those authors that superior performance exhibits higher persistence than poor performance. The sub-samples with firms exhibiting competitive advantage presented persistence coefficients close to 0.5, while in the case of firms with competitive disadvantage coefficients were close to 0.3. We have again another indication that top and poor performers have different profit dynamics. We also observe that the variability of the persistence coefficient is quite relevant. While the mean for the complete sample is 0.41, the estimated variance of 0.0457 (0.2138 when expressed as a standard deviation) indicates a wide distribution of persistence values. The limits of two standard deviations above and below the mean indicate that there will be firms with zero persistence alongside firms with persistence above 0.8. That is, this result suggests firms do vary widely in their ability to sustain competitive advantage (or disadvantage).

Model (B) significantly reduced the residual variance as compared to model (A). Most of the firm-level variance was explained, showing that the specification with lagged return as an explanatory variable is an effective model to represent performance. In the case of firms with competitive advantage, in particular, more than 90% of the firm-level variance was explained by the persistence modeling.

Model (C) introduced the explanatory variables in order to test the proposed hypotheses. In this model,  $Size_i$  was introduced as group centered, so as to avoid affecting the interpretation of the intercept (which then corresponds to the persistence of a firm of average size in its industry). The  $Alliances_i$  variable, however, was used with no centering, so the intercept is now the persistence of a firm with zero alliances. The negative and statistically significant effect of alliances on profit persistence shown in the subsets of firms presenting competitive disadvantage lend strong support for Hypothesis 2a: a larger number of alliances facilitates a firm in recovering from a previous situation of competitive disadvantage ( $p < 0.01$ ). Probably the additional, external resources that alliances provide, even if generic and easy to imitate, can allow firms to catch up with rivals and thus move towards at least competitive parity, lowering their persistence values. The magnitude of the coefficient is also interesting. For the sub-sample of firms with competitive disadvantage, defined as 0.5 standard deviation below the mean in terms of normalized ROA (column 5), estimates indicate that each additional alliance is expected to reduce the coefficient of persistence by -0.016.

The effect of alliances of firms with competitive advantage showed less clear results. Our estimates for the sub-sample of firms with normalized ROA 0.5 standard deviation above the mean (a more rigorous assessment of competitive advantage – column 4) lend support for Hypothesis 1a: each additional alliance is expected to increase the coefficient of persistence by 0.014 ( $p < 0.01$ ). However, no significant effect is found for the sub-sample of firms where competitive advantage is operationalized as a positive average normalized ROA at the outset. Apparently, alliances sustain performance especially in the case of firms that are really top performers. These industry top performers appear to be able to leverage their internal resources with alliances while mitigating the negative leakage effects from such alliance activity. Hypothesis 1b and 2b are rejected by our data: we do not have support for the view that alliances either reduce the persistence of superior performance (probably by facilitating imitation) or increase the persistence of poor performance (probably by crowding out the development of internal, valuable resources).

$Size_i$  proved to be a relevant, direct correlate with performance. Its coefficient was significantly positive in all samples, indicating that larger firms do enjoy benefits probably due to market power or economies of scale and scope. This result is very much in line with previous empirical studies of profit persistence. The effect of size on the persistence coefficient, however, is unclear. In three of the five samples it was not statistically significant and showed opposite results in the other two. It appears that size does have an effect on performance, but does not have such an influence on the sustainability of high (or low) performance.

It is also worth noting that, although our variables do play a role in explaining the persistence coefficient, we are able to explain at most 12.4% of the variance of that coefficient (column 5). A great



deal of heterogeneity in the persistence coefficients remains unexplained. This result indicates the need to address additional variables that could explain firm-specific persistence of performance in future studies.

## Concluding Remarks

Our study contributes to the growing literature on performance sustainability by examining a firm-specific factor that has been neglected in previous research: the extent to which the firm engages in strategic alliances. Surprisingly, although studies have attempted to examine whether firms **create** value through alliances (*e.g.* Anand & Khanna, 2000; Chan *et al.*, 1997; Hagedoorn & Schakenraad, 1994), the literature has been silent about whether alliances allow firms to **sustain** value over time. Moreover, as we show in this paper, distinct theoretical arguments point to distinct effects of alliances on sustainable advantage. Michael Porter summarizes the state of this discussion by saying that “there’s little evidence that I’m aware of showing that extensive partnering and alliances are associated with superior performance. And I can think of lots of case studies where partnering has been directly associated with poor performance” (Argyres & McGahan, 2002, p. 48).

Our results support the positive view of alliances for performance. Specifically, we find that engaging in a larger number of alliances both increases the persistence of superior performance and decreases the persistence of inferior performance. Alliances can be beneficial for firms that enjoy competitive advantage and superior performance, but are even more critical to firms facing competitive disadvantage and subpar performance. For firms with competitive disadvantage, alliances can contribute through improved access to external, valuable resources held by other firms, allowing the firm to leave the position of disadvantage and move to at least parity. For firms with clear competitive advantage alliances are also beneficial, probably providing mechanisms through which firms can constantly innovate and buffer themselves from external shocks that would otherwise erode existing advantages.

From a managerial point of view, our study also shows that alliances can be used as an effective tool to either support superior performance or avoid entrapment into inferior performance. Therefore, at least judging from our results, the growing use of alliances in management practice is apparently warranted.

To be sure, our study is associated with important limitations, which suggest potential avenues for future research. First, we observe alliances in a narrow temporal window and examine the persistence of performance in a relatively short period of time, at least compared to other studies (Thomas & D’Aveni, 2009). For this reason, our results may be specific to the period under consideration. It would be interesting for future research to consider larger periods and even observe alliances in multiple periods of time. Second, given our focus on the effect of alliances **in general**, we do not distinguish between types and purposes of alliances. Future research could examine, for instance, whether alliances between competitors or between firms with more complementary positions in the value chain have distinct effects on persistence. In the same vein, scholars could also attempt to examine the effects of national versus cross-border and vertical versus horizontal alliances. Also, future research could examine how the **strength** or **intensity** of the alliance could affect the degree to which firms are able to sustain profits. Thus, longer-term ties may induce the creation of relationship-specific knowledge, which will typically be less prone to interfirm transfer than more generic knowledge generated by shorter-term ties (Dyer & Hatch, 2006). Lastly, our focus on a single country prevents generalization to other institutional contexts. Chacar and Vissa (2005), for instance, show that persistence differs across countries, as well as the effect of organizational choices (in their case, affiliation to business groups). There are reasons to believe that the institutional context of countries will affect the value of forming alliances (*e.g.* Xin & Pearce, 1996). Similarly, distinct institutions (such as legal protection against technological leakage) should affect the degree to which firms are able to sustain advantages created through interorganizational connections.

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