THE ALLOCATION OF CAPITAL WITHIN FIRMS:

A REVIEW AND INTEGRATION TOWARD A RESEARCH REVIVAL

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The allocation of capital within firms is a core managerial function, yet a topic that only recently has resurged in management research. We review research across disciplines dealing with how firms allocate capital, with an emphasis on the relevant research in strategy and management. We integrate relevant research across multiple disciplines and theoretical perspectives to bring forth a theoretically-grounded conceptualization of capital allocation within a firm as (i) a process of determination, comparison and selection among multiple investment alternatives, (ii) taking place across organizational levels of the firm, and (iii) influenced and constrained by the external context in which the firm is situated. We conclude by discussing some important implications for future research.

Keywords: Internal capital markets, resource allocation, capital budgeting

Capital allocation is a core managerial function because potentially value-enhancing investments —such as capacity additions, market or industry entries, new product development, R&D, and advertising— cannot be made without the necessary financial resources. Most often, the allocation of capital (especially of free cash flow) between investment alternatives poses a conundrum to top management: allocating more capital to an investment alternative typically means allocating less to others. This conundrum is further reinforced by the fact that external financing tends to be costly, leading firms to finance their investments, to a large extent, with cash generated internally (Myers & Majluf, 1984; Froot, Scharfstein, & Stein, 1993). Consequently, how to allocate limited capital across investment alternatives is deemed to be one of the most important managerial decisions (e.g., Chandler, 1977; Burgelman, 1994; Bardolet, Lovallo, & Rumelt, 2010; Hall, Lovallo, & Musters, 2012).

At the onset of strategy and management as fields of study, in the 1960s and 1970s, capital allocation was one of the most central constructs (e.g., Aharoni, 1966; Ansoff, 1965; Bower, 1970; Chandler, 1962). However, after a long hiatus in research interest since the 1980s, only in recent years a new stream of research on capital allocation within firms has resurged in strategy and management. The timing, nature, and magnitude of this resurgence reflect both theoretical and methodological developments that have occurred, and an increased awareness of the shortcomings of financial markets as both capital sources and allocation devices in the aftermath of the global financial crisis of 2008-2009.

In this paper, we provide a structured review of research exploring the allocation of capital within firms, with an emphasis on strategy and management. To date, existing overviews of research on intra-firm capital allocation take a specific theoretical or disciplinary angle and do not cover many of the studies that form the basis of our review (e.g., Bower & Gilbert, 2005;

Maksimovic & Phillips, 2007). Besides strategy and management research, we cover relevant research across other disciplines —including accounting, operations, and in particular corporate finance and financial economics— that have often evolved in isolation from mainstream strategy and management literature and from one another. We cast a wide net in our literature review, going back to the 1960s, and focus particularly on those studies published after an instructive essay on internal capital markets by Liebeskind (2000), which coincides with the recent resurgence of relevant research on intra-firm capital allocation in strategy and management.

Given the cross-cutting nature of intra-firm capital allocation, we would like to start by clarifying the conceptual boundaries of our study. Firm strategy choices, like those pertaining to which businesses to be in (the 'configuration' dimension of corporate strategy), or to whether and how much to invest in increasing the perceived quality or reducing the cost of a given product ('value creation' in competitive strategy), are often substantiated through capital allocation decisions. Thus, it is impossible to dissociate capital allocation decisions from a firm's strategy. Taking this into account, we depict and conceptualize how firms allocate capital within a given set of businesses, and leave decisions pertaining to the scope or breadth of a firm's business portfolio *per se* out of the scope of this review (for a recent review highlighting the link between capital allocation and diversification, see Busenbark et al., 2017).

In the remainder of this paper, we first depict how research and academic thinking on intra-firm capital allocation have evolved over time. In doing so, we spotlight the recent strategy and management literature. Next, we provide a detailed account of capital allocation within firms. Specifically, we build on complementary perspectives on how capital allocation processes unfold within firms —from portfolio management, to the resource allocation process literature, to the internal capital markets literature in finance—, and introduce a theoretically-grounded

descriptive framework founded on three pillars: (i) the determination, comparison and selection of relevant investment alternatives (the horizontal dimension of capital allocation); (ii) the interaction of multiple hierarchical levels of management in the capital allocation process (the vertical dimension of capital allocation); and (iii) the interface between the firm and its environment (the external dimension of capital allocation). We close by discussing resulting implications and future research opportunities for strategy and management, the broad literature on capital allocation within firms, and other related research streams.

Evolution of Thinking on Capital Allocation

Early Research: Capital Budgeting, Resource Allocation Process, and Portfolio Management

In strategy and management, scholarly work on capital allocation within firms goes back to the 1960s and 1970s. This early work mainly explored two aspects of capital allocation: (i) how the allocation process unfolds in large firms; and (ii) which businesses should be favored in diversified firms' capital allocation decisions.

The capital budgeting systems literature explored the decision-making processes involved in the allocation of resources to capital expenditures. Building on accounting research on capital budgeting that started in 1950s (e.g., Norton, 1955), research in management highlighted that capital budgeting entails not only pure economic problems of efficient resource allocation to be solved, but also inherently administrative and political dimensions (Pondy, 1962; see also Chandler, 1977; Cyert, DeGroot, & Holt, 1979). For example, Pondy (1962) documented that the budgets defined at the corporate-management level were less detailed than those made by lower-level managers, but by implicitly defining overarching strategic priorities of the firm conditioned

the latter. Also, units that were perceived to be more reliable and/or smaller typically faced less scrutiny in the central budgeting committee for their proposals and got disproportionally more funds faster and with relatively lower requirements, drawing resentment from other units. Expanding this research to the international context, Aharoni (1966) depicted the process of foreign direct investment and Lorange (1972) explored whether and to what extent capital budgeting practices varied across business contexts. Early authors, including Pondy, Aharoni and Lorange, adopted a behavioral perspective (Simon, 1947; Cyert and March, 1963), which also became central to Bromiley's (1986) subsequent study of planning and implementation of capital investments in large corporations.

In parallel, the resource allocation process (RAP) literature also sought to address how the allocation process unfolds in large firms. The point of departure of the RAP literature was the recognition that scholarly approaches to capital allocation within firms that do not consider the role of organizational processes and structure will necessarily be incomplete. Accordingly, like the capital budgeting systems literature, typical contributions in the RAP literature harnessed field studies to inductively make sense of the capital allocation processes at work in firms (e.g., Bower, 1970; Burgelman, 1983b; for a review, see Bower & Gilbert, 2005).

The landmark piece in the RAP literature is Bower's (1970) eponymous book "Managing the resource allocation process." Studying the corporate capital allocation process within a large diversified firm, Bower (1970) depicted the RAP as occurring at multiple levels of an organization, through different sub-processes, and being influenced by the diverse (and often conflicting) interests of individuals, subunits, and the corporation. The decisions of subordinates were considered crucial to define the investment proposals that were presented and available to organizational superiors. The influence of top management (i.e., the corporate level) on capital

allocation, in contrast, stemmed mainly from setting up the 'structural context' —a firm's administrative mechanisms, such as project approval procedures and control systems— to condition the investment proposals generated by lower-level managers and ultimately approved for funding.

Burgelman's ensuing work had a significant impact on the RAP literature, mainly by attributing a greater importance to the actions of top management. Essentially, Burgelman (1983a) added the setting up of the 'strategic context' —the definition of a firm's corporate strategy— to the role of top management. He proposed that strategic context (along with the structural context) can influence actions and strategic behaviors of subordinates, but also that autonomous strategic behavior by those subordinates can lead to changes to corporate strategy. These dynamics were particularly salient in the generation of new ventures within large diversified firms (Burgelman, 1983b; 1983c). Building on these studies, subsequent contributions within this literature generally underscored the role of path dependencies in the RAP and its connection to technology and industry changes (e.g., Burgelman, 1994; Noda & Bower, 1996; Christensen & Bower, 1996; Sull, 1999; Gilbert, 2005). Notwithstanding the notable impact of the RAP literature in strategy and management, it has lost some momentum in recent years.

In contrast to the capital budgeting and RAP literatures, the portfolio management literature focused on to which of their businesses should diversified firms allocate more capital, if at all (Henderson, 1970, 1979; Haspeslagh, 1982; see also Seeger, 1984). In essence, a firm pursuing portfolio management can create value in two main ways (Porter, 1987). First, it can use its expertise and analytical resources to cherry-pick attractive investment opportunities better than individual financial investors. Second, it can fund profitable investment opportunities in its cash-constrained businesses by (re)allocating capital from its cash-rich businesses, enabling

valuable investments that would otherwise not happen. The basic idea underlying this perspective is that available capital generated by a firm's businesses is less costly than external financing obtained through debt and equity markets.[1]

Unsurprisingly, the heydays of portfolio management rationales in strategy and management can be pinned down to the 1960s and 1970s, when conglomerate expansion in the U.S. was arguably at its peak. At the time, influential frameworks created by top consultancy firms, such as the Boston Consulting Group's (BCG) growth-share matrix and the McKinsey & Company/General Electric framework, became references by providing some guidance as to how a firm should allocate capital across its different businesses. With some nuances, the basic idea shared by these frameworks is that a firm's businesses can be classified according to two broad criteria: the attractiveness of the industries or markets where they compete, and their relative competitive positions therein. Accordingly, the general prescription of these frameworks is that businesses with strong competitive positions in relatively unattractive industries ("cash cows" in the BCG matrix) should work as cash generators to subsidize investment opportunities in businesses competing in attractive industries —both those with strong competitive positions already ("stars"), and those that have not yet established strong competitive positions ("question marks")—; and that businesses with weak competitive positions in relatively unattractive industries should be divested ("dogs"). By 1979, 75 percent of Fortune 1000 corporations had adopted some form of portfolio planning process (Haspeslagh, 1982).

[1] Stein's (2003) remarkable survey points out three reasons for this: (i) asymmetric information between the firm and potential external investors, who do not know a firm's investment prospects as well as firm insiders, and thus *a priori* might not provide capital on favorable terms (e.g., they may charge higher interest rates or provide less capital than requested); (ii) the existence of substantial debt in a firm's balance sheet (debt overhang), which may discourage new potential debt and equity holders, whose claims would typically be junior to the existing debt; and (iii) the fact that external financing entails sizable monitoring costs faced by debt and equity holders to ensure that the actions of firm managers serve their interests.

Diversification, Financial Synergies, and Firm Performance

Throughout the 1980s and 1990s, the focus of attention in research relevant to capital allocation was on the performance implications of different types of diversification strategies and, incidentally, on the role of financial synergies therein. The main theoretical argument supporting diversification on the basis of financial synergies was that the pooling of cash flows from different sources would give firms a greater degree of financial flexibility in (re)allocating capital and minimize financial risks. The finance literature (in particular the capital-asset pricing model, CAPM) suggested that an imperfect correlation between the cash flows of a diversified firm's businesses could lead to decreases in the systematic risk of a firm (i.e., the extent to which a firm's returns vary with the broader capital market) by lowering the bankruptcy risk of its businesses (and associated bankruptcy costs). As a result of this "co-insurance" effect, lower risk levels could enable diversified firms to access debt markets on relatively more favorable terms (Lewellen, 1971; Higgins & Schall, 1975; Myers 1977; Stein, 2003).

In the same vein, management research highlighted that diversification could enable reductions in systematic risk levels through the sharing of tangible (e.g., cash, production facilities) and intangible (e.g., brand name, know-how, information) resources across a firm's businesses, and through collusion with competitors across markets (e.g., Helfat & Teece, 1987; Lubatkin & O'Neill, 1987; Chatterjee, Lubatkin, & Schoenecker, 1992). Departing from the CAPM, the management literature also highlighted that reductions in unsystematic risk (i.e., the risk that is specific to a firm's businesses) could be a valid corporate strategy goal (Bettis, 1983). In theory, financial investors may be able to reduce their exposure to unsystematic risk more effectively than firms, by diversifying their own individual investment portfolios according to their risk-return preferences. Yet, reductions in a firm's unsystematic risk levels by firm

managers could be justified and valuable to financial investors since, in reality, investors' portfolios are not as diversified (and markets are not as perfect) as assumed by the CAPM (Chatterjee, Lubatkin, & Schulze, 1999).

Since financial synergies rest on the availability and stability of a common pool of capital generated by a diversified firm's businesses, they can arguably be enhanced with a lower correlation between the cash flows of those businesses. Thus, the more unrelated a firm's businesses are (i.e., the fewer operational connections between them), arguably the higher will be the potential for financial synergies. Accordingly, in the strategy and management literature initial empirical evidence of the existence of financial synergies came from studies that showed superior stock market returns for unrelated diversification strategies when compared to related diversification strategies. For instance, Chatterjee (1986) found that unrelated acquisitions were associated with positive cumulative abnormal returns. Similarly, Lubatkin (1987) found that unrelated mergers increased stockholder value for both acquiring and acquired firms.

In spite of these initial empirical findings, the plausibility of rationales for (unrelated) diversification purely based on financial synergies soon faded, along with academic interest in financial synergies. In the broader field of strategy and management, the theoretical emphasis shifted to positioning and activity systems (e.g., Porter, 1985, 1987) and, through the emergence of the resource-based view (RBV) (e.g., Wernerfelt, 1984; Dierickx & Cool, 1989; Barney, 1991; Peteraf, 1993), to unique non-financial resources and capabilities, as sources of competitive advantage and superior performance. As a result, synergistic operational connections between related businesses —through the sharing of activities and non-financial resources and capabilities— became the dominant argument for successful diversification, and management scholars exhorted firms to refocus and return to their core (e.g., Prahalad & Hamel, 1990).

Arguably, this shift in perspective was motivated by the development of external capital markets and especially by the widespread corporate-refocusing and de-conglomeration wave that happened throughout the 1980s in the U.S. and some Western economies (Bhagat, Shleifer, & Vishny, 1990; Davis, Diekmann, & Tinsley, 1994).

Concurrently, and in accordance with initial findings by Rumelt (1974), empirical results supporting the benefits of relatedness for firm performance started to surface. Unrelated diversification was shown to be associated not only with more stable cash flows (Amit & Livnat, 1988), but also with higher levels of systematic risk (Montgomery & Singh, 1984) and lower profitability (Amit & Livnat, 1988). In parallel, related diversification was shown to be associated with lower levels of systematic risk (Lubatkin & Rogers, 1989; Chatterjee & Lubatkin, 1990), higher cash flows (Chatterjee & Lubatkin, 1990), and greater total shareholder value (Singh & Montgomery, 1987; Lubatkin & Rogers, 1989). Chatterjee and Lubatkin (1990) argued that the apparent superiority of related diversification was due to the enhanced ability of related diversifiers to leverage operational synergies between businesses, to pursue increased opportunities for differentiation, and to exploit market imperfections.

Furthermore, against the theoretical backdrop of the RBV, the diversification-performance relationship was linked to firm resources and capabilities. For example, Montgomery and Wernerfelt (1988) found a negative relationship between the extent of diversification and average firm rents as measured by a firm's Tobin's Q. In explaining this finding, Montgomery and Wernerfelt (1988) argued that, compared to firms with excess capacity in more specific or unique resources, firms with excess capacity in less specific or more generic resources (capital being one of them) would have lower rents in existing markets, and more (but less profitable) diversification opportunities in unrelated markets. In line with Montgomery and

Wernerfelt's conjectures, Chatterjee and Wernerfelt (1991) found that whereas excess financial resources were associated with more unrelated diversification, excess capacity in other types of resources was associated with more related diversification.

On the whole, the general conclusion of the studies that examined the diversification-performance relationship in strategy and management during the 1970-2000 period was that (i) moderate levels of diversification were on average associated with higher levels of firm performance than either limited or extensive diversification; (ii) related diversification increased performance of previously undiversified firms; and (iii) related diversifiers experienced lower performance if they became unrelated diversifiers (Palich, Cardinal, & Miller, 2000). The emerging evidence, together with the development of external capital markets in the 1980s and 1990s, painted a very bleak picture of unrelated diversification and its greater reliance on financial synergies as sources of value. As a consequence, portfolio management rationales lost popularity among strategy and management scholars. Porter (1987: 51) stated that the days of portfolio managers were past because, since a sound strategy can be easily funded in external capital markets, "simply contributing capital isn't contributing much." Teece, Rumelt, Dosi, and Winter (1994) dismissed organizational forms that simply worked as financial vehicles to multiple businesses, and labelled widely-diversified conglomerates as both "transitional forms" and "hopeful monsters." In spite of the general importance of capital allocation for management theory and practice, few studies in the strategy and management literature focused on intra-firm capital allocation during the 1990s.

Nonetheless, around the late 1990s and early 2000s, there was a resurgence of financial synergies —and portfolio management rationales— for a specific type of firms: business groups in emerging economies. This resurgence was motivated by the observation that unrelated

diversification was (and still is) very prevalent and successful in emerging economies, often in the form of business groups (e.g., Khanna & Yafeh, 2007). Khanna and Palepu (1997; 2010) explained this observation on the basis of "institutional voids" —which refer to the absence of developed and well-functioning external capital markets, labor markets, and product markets; and to inadequate government regulation and weak judicial systems— in emerging economies. In these contexts, unrelated diversification strategies can be advantageous to firms, by helping them substitute the missing and inadequate external capital market institutions with a large internal capital market.[2] In line with this argument, several studies have shown that business groups and their affiliate firms have superior performance in these contexts (e.g., Khanna & Palepu, 1997; 2000a; 2000b; Khanna & Rivkin, 2001; Chang & Hong, 2002; Chang, Chung, & Mahmood, 2006).

The Emergence of the Internal Capital Markets Literature in Finance

In the mid-1990s, a major development that significantly influenced capital allocation research in strategy and management was the emergence of the internal capital markets literature in finance (for reviews, see Stein, 2003; Maksimovic & Phillips, 2007; 2013; Gertner & Scharfstein, 2013). The emergence of this literature had conceptual roots in studies that assessed the relative merits of internal and external capital markets as capital allocation devices, following the footsteps of seminal discussions by Alchian (1969) and Williamson (1975). Gertner, Scharfstein, and Stein (1994), for example, highlighted that, compared to bank lending, internal capital markets have information and control advantages, which reside mainly in the ability of

[2] But see also more recent work by Chittoor, Kale, and Puranam (2015) who, in the context of Indian business group affiliates, argued that a large internal capital market and the scrutiny of maturing external capital markets can have a complementary positive influence on firm performance.

corporate headquarters to closely monitor managers and project prospects and to shift assets and capital across projects. They mentioned that internal capital markets also have potential disadvantages in terms of managerial incentives, as managers are more vulnerable to opportunistic behavior by corporate headquarters and thus may be less incentivized to exert effort. Elaborating on the potential informational and control advantages of internal capital markets, Stein (1997) used a formal model to show that the ability of corporate headquarters to compare the prospects of different projects and shift capital between them —engaging in "winner-picking" of the most promising projects— could create value for a firm even if overall firm-wide credit constraints were not relaxed.

Nonetheless, the true spark that triggered the development of the internal capital markets literature was the finding of a stock-market valuation discount for diversified firms —dubbed diversification or conglomerate discount— by both Lang and Stulz (1994) and Berger and Ofek (1995) in two concurrent empirical studies (Maksimovic & Phillips, 2007). Using U.S. data, these papers decomposed conglomerate firms into their different individual business segments and imputed stock-market valuations for those individual business segments using comparable single-business firms as benchmarks. Both papers found that the sum of imputed valuations was on average higher than the stock-market valuation for the whole of a diversified firm. Of particular importance to subsequent research on internal capital markets, Berger and Ofek (1995) also found that a relative overinvestment in businesses whose industries had low prospects (as measured by a low median Tobin's Q of single-segment firms therein) was associated with a higher stock-market valuation discount of diversified firms. This resonated with Lamont's (1997) and Shin and Stulz's (1998) subsequent studies, which showed that the capital expenditures of

diversified firms were less responsive to industry opportunities than the capital expenditures of more focused firms.

Thereafter, most of the literature on internal capital markets in finance revolved around the link between the diversification discount and capital (mis)allocation in diversified firms. Most theoretical and empirical work in this area used managerial agency problems (e.g., shirking, rent-seeking) and political conflicts between divisions to explain diversified firms' overinvestment in (and cross-subsidization of) businesses with poor prospects, their underinvestment in businesses with good prospects, and their resulting valuation discount —the "dark side" of internal capital markets (e.g., Scharfstein, 1998; Scharfstein & Stein, 2000; Rajan, Servaes, & Zingales, 2000; Matsusaka, & Nanda, 2002; Wulf, 2009; Ozbas & Scharfstein, 2010).[3]

In spite of the initial thrust of the evidence and arguments pointing to the inefficiency of internal capital markets —and firm diversification as a whole—, dissenting voices started to be heard within the finance literature. Whited (2001), for example, showed that using the Tobin's Q of single-segment firms to proxy for investment opportunities in a diversified firm's business segments is subject to measurement error and, because of that, previous findings of inefficient capital allocations in diversified firms might be due to biased estimates. Maksimovic and Phillips (2002) showed that a diversification discount is consistent with profit-maximizing entry and expansion of firms with heterogeneous capabilities, and hence can be observed in the absence of agency problems and inefficiencies in capital allocation. Chevalier (2004) found that the allegedly inefficient investment patterns of some firms' acquired business segments existed

[3] The tendency of diversified firms to be less responsive than what would be deemed ideal in allocating capital to the investment opportunities faced by their businesses or divisions —underfunding those businesses or divisions with the strongest prospects and overfunding those with the weakest prospects— is sometimes called 'corporate socialism' in the internal capital markets literature (e.g., Scharfstein & Stein, 2000).

before their acquisition, and thus were not an artifact of internal capital markets. In parallel, studies started to display empirical evidence suggesting that the internal capital markets of diversifiers are efficient in (re)allocating capital, in line with Stein's (1997) original arguments (e.g., Khanna & Tice, 2001; Campello, 2002; Billett & Mauer, 2003; Guedj & Scharfstein, 2004).[4]

The above debate and findings stimulated more nuanced approaches to evaluate firms' capital allocation decisions. One stream of work took a closer look at competitive interactions. These studies highlighted that the inherent (re)allocation flexibility (and deep pockets) of internal capital markets may make diversified firms stronger competitors, while at the same time weakening their ability to make strategic commitments (e.g., Khanna & Tice, 2001; Cestone & Fumagalli, 2005; Lyandres, 2007; Matthews & Robinson, 2008; Boutin et al., 2013). Another stream of work sought to explore connections with external capital markets, a particularly salient aspect in the aftermath of the credit crunch of the 2008-2009 financial crisis. These studies highlighted the role of internal capital markets in both lowering a diversified firm's expected costs of financial distress and favoring its access to external capital (e.g., Hann, Ogneva, & Ozbas, 2013; Matvos & Seru, 2014; Kuppuswamy & Villalonga, 2015). Furthermore, as in management research, there has been an increasing interest in the capital allocation patterns of business groups in emerging economies; in their sensitivity to business opportunities and economic conditions; and in the resulting performance implications for business groups as a

[4] The solidity of the general empirical finding of a diversification discount became hotly contested, as well. Arguments and evidence contesting the existence (and causal interpretation) of a diversification discount were manifold: from the endogenous (and self-selected) nature of firms' diversification decisions (Campa & Kedia, 2002; Villalonga, 2004b; Graham, Lemmon, & Wolf, 2002); to the sensitivity of prior results to specific segment or industry classifications (Villalonga, 2004a); to the contrasting effects of industry and geographic diversification (Denis, Denis, & Yost, 2002); to the role of weighting and matching processes in determining valuation premia or discounts (Hund, Monk, & Tice, 2012); and to the importance of taking into account the uniqueness of a firm's products when assessing its stock-market valuation (Hoberg & Phillips, 2014).

whole, for their affiliates, and for different types of shareholders (e.g., Shin & Park, 1999; Bertrand, Mehta, & Mullainathan, 2002; Almeida & Wolfenzon, 2006; Gopalan, Nanda, & Seru, 2007; Almeida, Kim, & Kim, 2015).

In parallel, the influence of firm structure and decision-making processes on capital allocation has been examined by finance scholars. Using formal models, several studies have assessed the optimality of the (de)centralization of a firm's capital allocation decisions as a function of the relevant type of information needed for those decisions; and the connections between capital allocation decisions and the incentives of lower-level managers (e.g., Stein, 2002; de Motta, 2003; Brusco & Panunzi, 2005; Marino & Matsusaka, 2005; Ozbas, 2005). More recently, leveraging increasingly-detailed archival and survey data, empirical papers have looked at the link between firms' capital allocation decisions and a multitude of organizational characteristics such as delegation, organizational politics, ties between managers, and managerial backgrounds (e.g., Xuan, 2009; Glaser, Lopez-de-Silanes, & Sautner, 2013; Duchin & Sosyura, 2013; Graham, Harvey, & Puri, 2013; 2015). These developments were driven by —and have also led to— a greater convergence and integration between the internal capital markets literature and organizational economics (Bolton & Scharfstein, 1998; Gertner & Scharfstein, 2013).

The Resurgence Intra-Firm Capital Allocation in of Strategy and Management Research

Spurred by the reconsideration of financial synergies as legitimate sources of value and by the emergence of the internal capital markets literature in finance, the topic of capital allocation within firms slowly started to regain traction with strategy and management scholars. From the turn of the millennium, there has been a progressive accumulation of a body of work related to capital allocation in strategy and management.

Liebeskind's (2000) review essay is symptomatic of in this resurgence. Centering her arguments at the level of the line of business, Liebeskind brought to the fore factors that are central to the strategy and management research but were previously mostly overlooked in the intra-firm capital allocation literature, such as the characteristics of each line of business (e.g., the industry-specificity and firm-specificity of the required investments) and the role of different organizational arrangements in influencing the efficiency of a firm's internal capital market (e.g., centralization of funds, specialized internal lending functions, partial ownership of certain lines of business). As such, Liebeskind's arguments helped (re)connect research on capital allocation with contemporary strategy and management literature.

The link between capital allocation and non-financial resources and capabilities has been a major area of interest within this emerging body of work. Compared to the relevant research in accounting, finance, and operations, strategy and management research attributes a much greater importance to unique non-financial resources and capabilities (such as brand, know-how, and managerial talent) when assessing organizational outcomes. Yet, the relevant prior research in strategy and management was mostly concerned with path-dependencies in capital allocation processes that can lead to the accumulation of non-financial resources and capabilities (e.g., Baldwin & Clark, 1992; 1994; Christensen & Bower, 1996; Noda & Bower, 1996; Helfat, 1997). In contrast, the emerging strategy and management research over the past two decades has focused more on the ways in which firms can actively manage capital allocation to bolster existing unique and superior non-financial resources and capabilities, or to obtain new ones (e.g., Tripsas & Gavetti, 2000; Maritan, 2001; Maritan & Lee, 2017; Riley, Michael, & Mahoney, 2017). Naturally, a firm's ability to do so depends on whether non-financial resources and

capabilities can be developed internally through investment or externally acquired.[5] In this vein, Maritan's (2001) inductive field study of a pulp and paper manufacturer, for instance, uncovered differences in capital allocation processes, depending on whether capital expenditures were aimed at maintaining or adding to the stock of an existing organizational capability, or aimed at building a new one.

In parallel, since financial slack can facilitate a firm's investments to develop or acquire critical non-financial resources and capabilities, the emerging literature sees it as a fundamental enabler of both a firm's adaptability to the environment and competitive advantage (e.g., Kim & Bettis, 2014; Kim, Kim, & Lee, 2008; Natividad, 2013a). Kim and Bettis (2014), for example, found in a large sample study that slack financial resources could lead to superior firm performance. They conjectured that this was because slack provided adaptability advantages to firms in uncertain and complex environments (making it easier to invest in R&D or to place bets in different technologies, for example). Similar arguments were also put forward by O'Brien and Folta (2009) and by Deb et al. (2017), who both found that R&D intensity can enhance firms' returns from holding cash. Furthermore, the value of flexibility in (re)allocating slack financial resources is increasingly deemed to be contingent on a firm's ability to flexibly (re)allocate its non-financial resources and capabilities (e.g., Belezon & Tsolmon, 2016; Morandi, Santaló, & Giarratana, 2017). Belenzon and Tsolmon (2016), for example, showed that an advantage of business-group affiliates over standalone firms is the ability of the former to more flexibly change labor inputs (leveraging a common employment pool with other business-group affiliates) and potentially substitute those labor inputs with capital investment.

[5] Some of these connections were already *implicit* in some of the founding contributions to the RBV. This can be seen in arguments about how unique and superior non-financial resources and capabilities may be acquired in strategic factor markets (Barney, 1986), or developed through path-dependent processes involving consistent and cumulative capital allocation decisions over time (Dierickx & Cool, 1989).

The salience of the link between capital allocation and non-financial resources and capabilities has also led to a growing emphasis on the selection and assessment of specific investment alternatives. In contrast to the dominant focus of much of the prior literature on headquarters' overall capital allocation across businesses, recent research has devoted more attention to the allocation of capital to specific value-creating investment alternatives —such as capacity additions, entry into new markets, R&D, and new product development (e.g., Klingebiel & Joseph, 2016; Ahuja & Novelli, 2017; Ref & Shapira, 2017; Souder & Bromiley, 2017). Distinguishing between different types of investment alternatives enables researchers to go beyond expected risk-adjusted returns as the sole relevant criterion to select among investment alternatives. Specifically, it allows the examination of other relevant metrics such as the uncertainty, the scope, and the temporal orientation of those potential investments (e.g., Souder & Bromiley, 2012; Klingebiel & Joseph, 2016; Reilly, Souder, & Ranucci, 2016). In addition, it also prompted researchers to more directly discuss the demands placed by different investment alternatives on a firm, not only in terms of the required capital, but also in terms of organizational structure and processes (e.g., Helfat, 1997; Sengul & Gimeno, 2013; Morandi, Santaló, & Giarratana, 2017; Maritan & Lee, 2017).

Moreover, the uncertainty and complexity of specific investment alternatives is increasingly envisioned as a direct manifestation of the uncertain and complex environments on which firms dwell (Kim & Betis, 2014; Deb, David, & O'Brien, 2017; Ahuja & Novelli, 2017). In these environments, capital allocation decisions are, in and of themselves, a means through which firms can iteratively search and learn from feedback (e.g., Adner & Levinthal, 2004; Natividad, 2013a; Klingebiel & Rammer, 2014). However, due to their very nature, it is hard for managers to forecast the returns to capital allocation in such uncertain and complex

environments. As a result, there is greater room for managers' subjective interpretations, which are prone to distortive cognitive biases. Such distortions may arise from the application of simplifying heuristics (for example, egalitarianism or realized performance against aspirations) to allocate capital (e.g., Bardolet, Fox, & Lovallo, 2011; Arrfelt, Wiseman, & Hult, 2013; Shapira & Shaver, 2014). This goes beyond prior discussions on allocative inefficiency in the broader capital allocation literature, which focused either on difficulties by headquarters in comparing some given investment alternatives (due to bounded rationality and asymmetric information); or on moral hazard in agency (e.g., shirking, rent-seeking behavior, and politicking by managers).

As a consequence of the two aforementioned research developments —a growing interest in capital allocation to specific investment alternatives, and in its link to non-financial resources and capabilities— intra-firm capital allocation has emerged as a relevant topic in the field of competitive strategy. Overall, there is an increasing awareness that the availability and (re)allocative flexibility of capital can help shape a firm's competitive profile, and thus be a crucial determinant of competitive interactions. For instance, some studies have shown that a greater availability of capital from internal sources may improve the ability of a (diversified) firm to perform investments in a timely (and perhaps contrarian) way, and therefore to undertake pre-emptive strategic commitments in competitive contexts (e.g., Navarro, Bromiley, & Sottile, 2010; Sengul & Gimeno, 2013; Ayyagari, Dau, & Spencer, 2015).[6]

In parallel, other studies have also shown that firms' realized capital allocation decisions are affected by their organizational characteristics (e.g., ownership, authority structure, incentives) (e.g., Eisenmann, 2002; Kim, Hoskisson, & Wan, 2004; Walker, 2005; de Motta &

[6] As mentioned before, in the finance literature, there is also the recognition that the (re)allocative flexibility that characterizes many diversified firms' internal allocation processes can impair the realization of those strategic commitments (e.g., Khanna & Tice, 2001; Cestone & Fumagalli, 2005; Matthews & Robinson, 2008).

Ortega, 2013; Sengul & Gimeno, 2013). More broadly, the relationship of firms with stakeholders in the external environment (e.g., investors, analysts, regulators) has received a renewed emphasis in the study of intra-firm capital allocation (e.g., Henderson & Cool, 2003a; Benner & Ranganathan, 2012; Inoue, Lazzarini, & Musacchio, 2013; Feldman, Amit, & Villalonga, 2016).

Taken together, recent strategy and management research has offered novel perspectives on capital allocation within firms by: (i) exploring different levels of analysis (in particular, specific projects and investment alternatives); (ii) different mechanisms (e.g., behavioral biases, ties to external capital market actors); and (iii) different phenomena (e.g., link to non-financial resources and capabilities). In doing so, it laid a foundation for a renewed understanding of how capital allocation unfolds within firms.

Understanding Capital Allocation within Firms

Whereas the traditional literature of capital allocation focused on corporate-level issues such as financial synergies from diversification, portfolio management, or corporate resource allocation processes, the preceding historical overview highlights a shift in the locus of attention toward researching the impact of capital allocation on specific business units or investment projects and organizational aspects in capital allocation. These observations lead to a view of capital allocation within firms as a process in which the flow of capital to a business unit or investment project is influenced by the determination, comparison and selection processes relative to relevant investment alternatives (what we refer to as the *horizontal* dimension of capital allocation), and by the interaction among multiple hierarchical levels of management in the capital allocation process (the *vertical* dimension of capital allocation).

In addition, the current emphasis on capital allocation to specific business units or investment projects is aligned with Porter's (1987) dictum that "successful corporate strategy must grow out and reinforce competitive strategy" (p. 46). Returns on investments in business units or projects are influenced by the specific context (e.g., market opportunities, industry conditions, competitors, institutional constraints) in which firms operate (the *external* dimension of capital allocation). In this sense, capital allocation is related to classic strategy considerations about fit with the external environment.

Accordingly, these three dimensions —horizontal, vertical, and external— constitute the three pillars of our understanding of capital allocation within firms, and the basis of a descriptive framework. We see the realized allocation of capital within a firm as a joint-product of these three pillars. Figure 1 presents the framework schematically, while Table 1 lists representative studies that pertain to each of the dimensions. We present below the framework in detail, by reviewing the main theoretical arguments and evidence around each its three pillars.

Insert Figure 1 and Table 1 about Here

Horizontal Dimension of Capital Allocation:

Determination, Comparison and Selection of Relevant Investment Alternatives

The first pillar, the horizontal dimension, refers to the determination, comparison and selection of a set of relevant investment alternatives. Thus, this dimension implicitly incorporates the idea of competition for capital among a set of investment alternatives being considered. This key notion is present in transaction-cost economics (e.g., Williamson, 1975; Jones & Hill, 1988;

Liebeskind, 2000), classical portfolio management (e.g., Haspeslagh, 1982; Henderson, 1979), the internal capital markets literature in finance (e.g., Stein, 1997; Rajan et al., 2000), R&D project management in operations (e.g., Childs & Triantis, 1999; Girotra, Terwiesch, & Ulrich, 2007), and recent strategy and management research on capital allocation (e.g., Bardolet et al., 2010; Arrfelt et al., 2015).

We partition our discussion of the horizontal dimension of capital allocation in three subsections that deal, respectively, with: (i) the determination of investment alternatives; (ii) the comparison and selection of investment alternatives; and (iii) connections to a firm's non-financial resources and capabilities. Nonetheless, as will become apparent, the different aspects of the horizontal dimension are deeply intertwined.

Determination. The determination of a set of relevant investment alternatives is a crucial element of a firm's capital allocation decisions. Managers can compare investment alternatives and select among them, as we will discuss in the next section, when a full set of investment alternatives and their characteristics are known. But this is seldom, if ever, the case. Further, even when investment alternatives are known, their characteristics may not be easily quantifiable or measurable due to inherent complexity and uncertainty (beyond risk).[7] Thus, as boundedly-rational decision-makers operating in uncertain and complex environments, managers face non-trivial informational and computational problems in determining a set of relevant investment alternatives.

The behavioral theory of the firm (BTF), through its emphasis on uncertainty, search, and bounded rationality of organizational members, provides a potentially useful theoretical

[7] Knight (1921) stressed the importance of distinguishing the notions of 'risk' and 'uncertainty.' The notion of risk relates to "a quantity susceptible of measurement" —for example, through a known probability distribution over all possible outcomes—; whereas the notion of uncertainty relates to an unmeasurable quantity, wherein neither all possible outcomes nor the probability distribution over those outcomes are known.

departure point to understand and address these issues. The BTF states that, when problems are identified by organizational members, firms initiate 'problemistic' search of their environments to find possible solutions (Cyert & March, 1963; Greve, 1998). Search processes eliminate *a priori* inappropriate solutions, enable a firm to learn about potential solutions, and typically follow a 'satisficing' approach —that is, they continue until realized performance meets certain aspiration levels. This represents a common pattern across 'problemistic' search processes, although they can vary in their intensity. Search is more intense for non-routine, more uncertain and complex problems (Cyert & March, 1963; Bromiley, 1986). More recent behavioral treatments highlight a broader notion of search (beyond the arguably restrictive ´problemistic´ type) as a means through which firms generally pursue intelligence and adapt to the environment, by learning from feedback (e.g., Levitt & March, 1988; March, 2006).[8]

This rationale is directly echoed in the search for investment alternatives. Search allows the firm not only to find a set of alternatives —in some sense, potential solutions to capital allocation problems—, but also to learn more about each of those alternatives. Cyert and March (1963) postulated a model of the capital allocation process in which organizational members iteratively gather information and learn about different investment alternatives over time. Search and learning are viewed as co-evolving with both the relevant evaluation criteria considered for investment alternatives and the aspirations of the firm (and its subunits) on those criteria.

A key variable for capital allocation processes, and for search in general, is the level of slack (financial and non-financial) resources of a firm (Cyert & March, 1963; Bourgeois, 1981). On the one hand, the intensity of search is typically higher when slack is lower. Firms with lower levels of slack have more binding constraints, with different investment alternatives competing

[8] For adaptive processes to be sustained over time, it is sometimes desirable to preserve some imperviousness to feedback in learning, something that is often called "technology of foolishness" (March, 1988; 1991; 2006).

for scarcer resources. As a result, those competing alternatives would need to be more intensively searched to ensure more accurate comparisons. On the other hand, slack creates a cushion of resources that may allow a firm to adapt successfully to internal and external pressures. Thus, somewhat paradoxically, search is also enabled by the existence of slack (e.g., Kim & Bettis, 2014; Deb, David, & O'Brien, 2017).[9]

Comparison and selection. Comparison and selection processes are those through which organizational members rank a relevant set of investment alternatives, and select to which alternatives capital is to be allocated. These processes appear prominently in capital allocation research, starting with the initial contributions. For example, both transaction cost economics (Williamson, 1975; Liebeskind, 2000) and portfolio management (Henderson, 1979; Haspeslagh, 1982) highlighted that diversified firms can potentially benefit from having corporate headquarters pooling capital from its different businesses and, through privileged access to critical information, reallocating that capital to those businesses with the best investment prospects. To date, comparison and selection processes have arguably received the greatest degree of research interest across academic disciplines.

In particular, comparison and selection processes are the focus of the internal capital markets literature in finance (see Stein, 2003; Maksimovic & Phillips, 2007; 2013; Gertner & Scharfstein, 2013 for reviews). The conceptual focus of this literature is mostly placed on the comparison and selection of a 'given' set of investment alternatives at the level of corporate headquarters, rather than on the search for what those alternatives might be. Furthermore, rather than specific investment projects, empirical studies in the internal capital markets literature

[9] Beyond slack, prior firm commitment to certain courses of action also influences the intensity of search activity. Cyert and March (1963) documented multiple instances in which firm commitment to a given decision was made before search activity proceeded very far, only for search to become narrower and more intensive as the decision approached implementation.

typically analyze diversified firms' broad capital allocation decisions across different businesses (e.g., Rajan et al., 2000; Billett & Mauer, 2003).[10]

The dominant prescriptive logic of textbook finance for the comparison and selection of investment alternatives is a straightforward one, which uses net present value (NPV) —i.e., the expected stream of cash flows from an investment, discounted for their timing and risk— and NPV-based valuation techniques (such as discounted cash flow, discounted earnings, and economic value-added) as the commanding criteria. In the absence of budget constraints, funding should be awarded to an investment whenever its NPV is positive. In the presence of budget constraints, investments with the highest NPV should be privileged over others.[11] Notably, NPV and associated valuation techniques are frequently used in practice. In a survey of over one thousand CEOs and CFOs, Graham, Harvey, and Puri (2015) found that the NPV-based ranking of investment alternatives was the most important criterion for the comparison and selection of investment alternatives within firms: 79 percent of U.S. CEOs reported that NPV rankings were important or very important when deciding how to allocate capital.[12] Furthermore, the use of NPV-based valuation techniques is also widespread among external capital market actors, such as stock analysts, venture capitalists, and investment bankers.

At the same time, the robustness of NPV-based techniques for comparing and selecting among investment alternatives is severely impaired under environmental uncertainty and

[10] There are studies within the internal capital markets literature that diverge from this broad characterization. For example, Guedj and Scharfstein's (2004) empirical study examines the drug development strategies of biopharmaceutical firms.

[11] Abel, Dixit, Eberly, and Pindyck (1996) also highlight that real options valuation techniques can be considered a special case of NPV.

[12] Nonetheless, in the presence of informational and agency problems in capital budgeting, a simple NPV criterion for internal capital allocation to projects may be dominated by other criteria like the internal rate of return and the profitability index (Berkovitch & Israel, 2004).

complexity (e.g., Alessandri et al., 2004; Christensen, Kaufman, & Shih, 2008; Bettis, 2017).[13] This is an especially salient issue in capital allocation decisions to R&D (e.g., Hoskisson & Hitt, 1988; Baysinger & Hoskisson, 1989) and new product development (e.g., Klingebiel & Rammer, 2014; Klingebiel & Joseph, 2016). In these cases, given uncertain outcomes and complex learning feedback loops, it is *a priori* extremely challenging (if not impossible) for managers to accurately evaluate investment alternatives using quantitative techniques (Liberatore & Titus, 1983; Adner & Levinthal, 2004; Ahuja & Novelli, 2017).

Hence, under environmental uncertainty and complexity there is greater room for more subjective and qualitative —and, in some sense, less deductive and rational— approaches to the comparison and selection of investment alternatives by managers (Alessandri et al., 2004; Levinthal, 2011). Accordingly, the identification and funding of investment opportunities were shown to be influenced by beliefs and threat perceptions (e.g., Christensen & Bower, 1996; Gilbert, 2005) and by dominant general management logics (e.g., Tripsas & Gavetti, 2000; Mishina, Pollock, & Porac, 2004). Interpretive processes —cognitive behavioral mechanisms through which boundedly-rational actors form different simplified representations of an inherently uncertain and complex reality (e.g., Simon, 1955; Levinthal, 2011)— are potential determinants of firm policies and, incidentally, of capital allocation patterns (e.g., Barr, Stimpert, & Huff, 1992; Barr, 1998; Lovallo & Kahneman, 2003).

Cognitive behavioral mechanisms have been broadly associated with distortive biases in comparison and selection processes. These biases include a tendency toward egalitarian

[13] Beyond environmental uncertainty and complexity, another limitation of NPV as a criterion for internal capital allocations is that it resorts to the capital asset pricing model (CAPM) as the source of opportunity costs (and thus, hurdle rates) for capital to be allocated to internal investment projects. This constitutes a problem since, in addition to capital, firms use inseparable and non-tradable assets in those projects (Robins, 1992); and it is in general challenging to define opportunity costs when there are important interdependencies between a firm's portfolio of investment projects (Girotra et al., 2007; Gamha & Fusari, 2009).

allocations across businesses (Bardolet, Fox, & Lovallo, 2011); drawing inferences about the prospects of a given project from a sample of previously implemented projects (Jehiel, 2018); succumbing to the sunk cost fallacy when evaluating investment alternatives in distinct products, markets, or technological trajectories (Gilbert, 2005); or an excessively short-sighted focus on current customers and their needs when delineating long-term investment plans (Christensen & Bower, 1996).

A particularly salient cognitive behavioral mechanism in capital allocation is the use of heuristics. Commonly known as 'rules of thumb', heuristics are often used by boundedly-rational organizational members to solve uncertain and complex problems, for which rational analytical techniques cannot be used (Bettis, 2017). Some of the heuristics that are relevant to comparison and selection of investment alternatives include sequential attention to (and elimination by) different aspects of those alternatives (Tversky, 1972), the reputation and confidence inspired by the managers backing each of those alternatives (Graham et al., 2015), and rule-based, standardized behaviors (Cyert & March, 1963).[14]

The BTF also highlights the use of satisficing rules as a heuristic for comparing and selecting among investment alternatives.[15] Relevant manifestations of satisficing rules include the explicit use of only a few criteria (such as costs in dollars, dollar savings, quality, speed and accuracy, etc.), the simple availability of funds for an investment, and the comparison of realized performance against an aspirational benchmark (Cyert & March, 1963). If performance falls

[14] Cyert & March (1963) state that rule-based, standardized behaviors constitute one of the key dimensions where capital allocation to organizational subunits differs from capital allocation to standalone projects, with the former following more routinized patterns. The distinction between capital allocation across organizational subunits or projects also shows up prominently in Bromiley's (1986) work on corporate capital investment.

[15] According to the BTF, stricter and more diligent evaluations of the prospects of investment alternatives (their assumptions and estimated outcomes) are expected when capital rationing is needed. In these specific situations, there is also a tendency to use arbitrary allocative rules based on politics and bargaining between organizational members; and a tendency to re-evaluate estimates that are less defensible in terms of standard organizational or accounting practices, or in terms of immediate tangible returns (Cyert & March, 1963: 270).

below the considered benchmark, organizational members interpret it as a failure and engage in the aforementioned 'problemistic' search processes to find solutions to the performance shortfall. Search processes that are triggered by lower-than-expected performance have been shown to lead firms to alter the temporal orientation of their investments (Souder & Shaver, 2010; Souder & Bromiley, 2012), to overinvest in particular subunits (Arrfelt et al., 2013), to enter different markets (Ref & Shapira, 2017), and to generally select riskier strategies (Bromiley, 1991).

As might be already apparent from the foregoing arguments, search activities are central, not only to determination, but to comparison and selection processes as well. This is because search activities inherently use financial (and non-financial) resources, and there needs to be a prior commitment for an investment alternative to be searched. In the strategy and management literature, for example, there is great emphasis placed on strategic bets made by firms in different product-markets (e.g., Natividad, 2013a; Ross, Fisch, & Varga, forthcoming) or technologies (e.g., Eggers, 2012; Klingebiel & Joseph, 2016) under substantial environmental uncertainty; circumstances in which different search parameters and available slack resources for search are deemed crucial. Similarly, in the operations literature, connections between firms' search processes and their ultimate capital allocation decisions have been central to research dealing with innovation and R&D (Childs & Triantis, 1999; Pfeiffer & Schneider, 2007), new product development portfolios (Girotra et al., 2007; Chao & Kavadias, 2008), and the design of information systems (and their associated slack levels) (Arya et al., 2000). A critical implication of search and learning as described here is that the determination process cannot, in fact, be taken as independent of processes of comparison and selection of investment alternatives. The interdependence of determination, comparison, and selection is readily visible in many studies dealing with capital allocation within firms.

Connections to non-financial resources and capabilities. Strategy and management research, and in particular the resource-based view (RBV), attributes great importance to firms' unique non-financial resources and capabilities (such as store locations, technology, brand, know-how, and managerial talent) as sources of firm distinctiveness and greater value creation relative to competitors. The connection between a firm's capital allocation processes and its non-financial resources and capabilities has been hinted at in various foundational treatments of the RBV (e.g., Barney, 1986; Dierickx & Cool, 1989; Peteraf, 1993), which have underscored the salience of both internal development processes (through cumulative investments) and acquisitions as means of obtaining non-financial resources and capabilities. Hence, it is important to establish a connection between capital allocation processes and the development and (re)deployment of non-financial resources and capabilities (Maritan & Lee, 2017).[16]

Accordingly, the relationship between capital allocation processes and firms' ability to develop or acquire non-financial resources and capabilities has been scrutinized in the literature. For instance, Baldwin and Clark (1992; 1994) documented that the adoption of decentralized financial capital budgeting systems by diversified U.S. firms after World War II led them to neglect investments in organizational capabilities and to their subsequent loss of competitiveness. In another example, Helfat (1994) established a direct link between the degree of firm-specificity in applied R&D expenditures and firms' ability to both differentiate themselves and earn returns on their R&D investments. Also recall the aforementioned inductive study by Maritan (2001) in a pulp and paper company.

[16] In and of itself, the allocation and (re)deployment of non-financial resources and capabilities by a firm is a complex topic (e.g., Helfat & Eisenhardt, 2004; Levinthal & Wu, 2010; Sakhartov & Folta, 2014; Lieberman, Lee, & Folta, 2017) that falls outside of the scope of this review.

A key question in this overall domain is whether capital allocation decisions and non-financial resources and capabilities are complements or substitutes. They will be complements if a greater stock of non-financial resources and capabilities enhances the value of certain investment alternatives for a firm, and hence makes it more worthwhile to allocate capital to those alternatives. Several studies support this notion. Helfat's (1997) empirical investigation of the U.S. petroleum industry during the 1970s and early 1980s (i.e., the period surrounding the two oil crises), for example, highlighted the role of complementary technological knowledge and physical assets in enabling larger amounts of R&D expenditures on coal conversion technologies (synthetic fuels processes aimed at substituting for oil and gas) in the face of rising oil prices. Relatedly, in the finance literature, Giroud and Mueller (2015) presented empirical evidence indicating a complementary relationship between a firm's decisions to reallocate capital and labor. More specifically, they showed that a positive shock to the investment opportunities of a focal plant led a firm to withdraw capital and labor from its other plants to provide the focal plant with resources, but that this relationship was observed only in financially-constrained firms. In a recent example within the strategy and management literature, Riley, Michael, and Mahoney (2017) showed that investments in human capital and training matter for firm value, and that the positive impact of these investments is greater when combined with complementary investments (and assets) in R&D, physical capital, and advertising.

Yet, capital allocation decisions and non-financial resources and capabilities can also be substitutes. Belenzon and Tsolmon (2016), as mentioned before, highlighted the potentially substitute relationship between flexibility in capital allocation and flexibility in changing labor inputs within business groups. In parallel, Morandi et al. (2017) highlighted that when there are substantial intra-temporal operational synergies between a firm's businesses, the reallocation of

capital across those businesses could be detrimental to the realization of those synergies. Specifically, they found that the degree of technological knowledge shared between a firm's business units negatively moderated the positive effect of competitive shocks (tariff cuts) on the amount of capital that was reallocated to a given business unit.

Vertical Dimension of Capital Allocation:

Interaction of Multiple Levels of Management in the Capital Allocation Process

The second pillar, the vertical dimension, refers to the interaction of multiple levels of management in the capital allocation process. In essence, the vertical dimension adds the organization and its associated elements (e.g., corporate capital budgeting, resource allocation processes, the definition of strategic priorities, and the delegation of decision-making authority) to the horizontal dimension. Both theory and practice of organization design prescribe that firms should be structured in a way that will optimize internal resource allocation. Designing an effective organization can contribute to a better allocation of resources, more effective coordination of activities, and thereby enhance a firm's ability to create and capture value (Mintzberg, 1979; Galbraith & Kazanjian, 1986; Nadler & Tushman, 1997; see Sengul, forthcoming for an overview).

In particular, the notion that organizational characteristics play a role in a firm's capital allocation decisions can be traced back to early contributions to the literature on intra-firm capital allocation (e.g., Pondy, 1962; Aharoni, 1966; Bower, 1970), and ties it to a relevant body of work in organization design (e.g., Eisenmann & Bower, 2000; Sengul & Gimeno, 2013; Joseph & Wilson, 2018) and organizational economics (e.g., Bolton & Scharfstein, 1998; Alonso, Dessein, & Matouschek, 2008; Gertner & Scharfstein, 2013). We partition our discussion of the vertical

dimension of capital allocation in the following three subsections that deal, respectively, with: (i) organizational structure, including intra-firm ownership ties; (ii) systems and processes; and (iii) decision-makers. Nonetheless, like in the horizontal dimension, the different aspects of the vertical dimension are deeply intertwined.

Organizational structure. Williamson (1975) argued that one of the advantages of diversified multidivisional firms is their ability to foster a 'miniature capital market' inside a firm. This 'miniature capital market' would provide two benefits to corporate headquarters: (i) a greater effectiveness in monitoring a firm's different business units (organized as more-or-less autonomous divisions with profit-and-loss responsibilities) relative to external investors; and (ii) a greater ability to promote internal competition for capital between business units and assign cash flows to high-yield uses. Thus, according to Williamson's (1975) arguments, multidivisional firms may be expected to perform better among diversified firms. In line with this rationale, several empirical studies found evidence of diversified multidivisional firms' superior profitability (e.g., Armour & Teece, 1978; Burton & Obel, 1980; Cable & Dirrheimer, 1983; Hill, 1988). For example, in a recent study of the U.S. film distribution industry, Natividad (2013c) found that multidivisional strategies have positive effects on investment returns, more so when divisions share key resources.

The extent of divisionalization or departmentalization within an organizational structure influences the allocation of capital within a firm primarily through its effect on how information is processed for coordination and control. In large diversified firms, adopting a multidivisional structure shifts operational business decisions from corporate management to divisions. The effect of this shift is twofold (Chandler, 1962; Williamson, 1975, 1985). First, given that operational decision-making authority is closer to market frontlines, a multidivisional structure

may increase the specialization of businesses and their adaptability to the environment. Second, a multidivisional structure may reduce the information overload of corporate management, allowing it to focus on broad strategic issues and long-range planning (such as diversification and growth).

A firm's hierarchical structure can be an additional influence on its capital allocation decisions. The effectiveness of control tends to decrease with the number of hierarchical levels in an organization because information transfers across those layers are prone to errors and delays (Galbraith, 1977; Poppo, 1995; Rajan & Wulf, 2006). By implication, such inefficiencies tend to be lower in flatter hierarchies, which may help firms respond faster to market changes (McAfee & McMillan, 1995; Thesmar & Thoenig, 2000).[17] Thus, holding everything else constant, one may expect that internal capital allocation processes in firms with flatter hierarchies will be more responsive to market opportunities.

For firms that have subsidiaries (i.e., units with a separate legal identity), ownership ties are salient characteristic of (inter-organizational) hierarchies. Business groups in many developed and developing countries are the most visible example of such organizational forms (Morck, 2009). The potential presence of minority shareholders along the ownership chain between a parent firm and its subsidiaries opens up the possibility that the parent's control rights and cash flow rights over a given subsidiary may diverge. Although high cash flow rights cannot exist without high control rights, pyramidal structures allow parents to have high control rights without necessarily having high cash flow rights (see, for example, Claessens et al., 2000).

[17] Likewise, firms can change their organizations to better fit their environments. In this context, Wang (2009) has shown that private and listed firms may differ in how they adapt their organizational structures to their own changes in size.

This divergence has potentially significant effects on capital allocation processes. In addition to tunneling concerns (see Johnson et al., 2000), this is because parents have an incentive to prioritize investments in subsidiaries from where they can collect a higher share of returns. By implication, parents are less likely to channel cash to subsidiaries that are placed at lower levels of the pyramid and in which they have high control but low cash flow rights. This rationale resonates with findings on both ownership structures and realized capital flows between parents and subsidiaries. Almeida et al. (2011) showed that Korean chaebols were more likely to directly control high NPV firms, while placing low NPV firms in pyramids. Similarly, Sengul (2018) found that French groups were more likely to indirectly own subsidiaries that were restrained in their growth prospects (due to multimarket competition considerations), thereby reducing the parent's financial exposure to the subsidiaries' returns without losing *de facto* control over them. In parallel, using detailed data on intra-group loans from Chile, Buchuk et al. (2014) found that parent firms had higher cash flow rights in borrowing group affiliates than in lending ones.

One overall characteristic of organizational structures that is particularly relevant to intra-firm capital allocation is complexity. Zhou (2011) found that a firm is less likely to diversify into new businesses when its existing ones are complex. She argues that this is due to underlying coordination costs. The greater a firm's existing needs for coordination, "the less coordination capacity will be spared for a new activity, and the greater will be the marginal coordination cost if the new activity is integrated" (p. 627). This resonates with Klein and Saidenberg (2010), who found that banking holding companies (BHCs) with many subsidiaries had lower profits and lower market valuations than similar BHCs with fewer subsidiaries.

Finally, the formal organizational structure of a firm also plays an attention-directing role, a fact that has been acknowledged for a long time by the organization theory literature (Simon, 1947). Indeed, by shaping which issues and answers organizational decision-makers focus on, a given organizational structure will influence how those decision-makers channel and distribute their attention, and ultimately firm behavior (Ocasio, 1997). In diversified firms, given the competing demands of different businesses, constraints on managerial attention are potentially very high. As a result, in the specific context of diversified multidivisional firms, organizational structure segments the attention of decision-makers at different hierarchical levels (Gaba & Joseph, 2013); and the role of corporate management is mostly circumscribed to interventions that amplify and stabilize the attention focus of divisional managers (Joseph & Wilson, 2018: see also Ocasio & Joseph, 2005). Furthermore, besides directing decision-makers' attention, a firm's organizational structure also influences how those decision-makers uncover, encode, and focus on new opportunities (Joseph & Wilson, 2018). Thus, given that the pursuit of new opportunities by a firm is a function of how managers interpret their environment, structure will likely have a significant influence on capital allocation decisions.

Systems and processes. Against the backdrop of the overarching organizational structure, a set of systems and processes influences realized capital allocation decisions. Top-down processes, in particular those pertaining to capital budgeting and the setting of strategic priorities by top management, are ubiquitous across firms: Top management sets tentative objectives and guidelines (based on past years, specific return expectations, etc.), which are then transmitted down to the rest of the organization. Ultimately, a committee typically allocates the approved budget to proposed projects and organizational subunits. As foreshadowed in our discussion of the capital budgeting and the RAP literatures, these processes are fairly complex in

practice because capital budgeting not only entails the resolution of pure economic problems of efficient resource allocation, but also deals with inherently administrative and political issues (Pondy, 1962; Aharoni, 1966; Lorange, 1972; Cyert et al., 1979; Bromiley, 1986).

Furthermore, top-down processes are typically coupled with bottom-up ones. Lower- and mid-level managers play an active role in determining, comparing, and selecting investment proposals for funding. Specifically, within the RAP literature, Bower (1970) presented two main sub-processes governing the resource allocation process, working mostly bottom-up in an organization: definition and impetus. Definition is the cognitive process of determination of the technical and economic content of investment proposals by lower-level managers to be submitted for approval. Impetus (or selection) is the reputational and political process by which investment proposals, upon being submitted, fight for corporate attention and resources with each other, and end up being approved (or disapproved) for funding. On their part, middle managers are crucial for the functioning of these two sub-processes, not only because they channel investment proposals from lower levels of the organization to the corporate level, but also because they translate the technical content of those proposals into financial metrics that are assessable and comparable by corporate headquarters. Corporate headquarters, in turn, set up both the 'structural context' and the 'strategic context' —the multiple organizational control systems and administrative mechanisms, and the definition of a firm's corporate strategy, respectively—, to influence the actions and behaviors of subordinates (Bower, 1970; Burgelman, 1983a; 1983c).

The resource allocation process, as described in the RAP literature, is path dependent and intimately connected to technology and industry changes (e.g., Burgelman, 1994; Christensen & Bower, 1996; Gilbert, 2005). Noda and Bower (1996), for instance, studied the regional Bell operating companies' ("Baby Bells") historical resource allocation processes. They uncovered

that initial differences in strategic context and initial successes or failures of business development initiatives led to profound differences in firms' realized strategies, due to iterated processes of (de)escalation in resource allocation. In a similar vein, Sull's (1999) study explained the decline of Firestone with the arrival of radial tires and foreign competition on the basis of Firestone's resource allocation process promoting the escalation of activities that had contributed to its past success.

Evidently, besides resource allocation processes, several other systems and processes are in use in organizations to facilitate value creation and to contain value diversion (see Galbraith & Kazanjian, 1986; Simons, 1995). Information and communication systems are particularly important to intra-firm capital allocation because accurate and timely bottom-up, top-down, and lateral information flows are essential for effective capital allocation processes. As Doz and Kosonen (2007) argue, strategic agility —a firm's ability to continuously adjust and adapt the strategic direction of its core businesses— results in part from a firm's proficiency in mobilizing and redeploying resources fast and efficiently. Advances in information technology have reduced the cost of access to information and knowledge, but are unlikely to yield benefits without the appropriate accompanying organizational changes (Garicano, 2000, 2010). This rationale justifies why firms with tall hierarchical structures typically invest in vertical communication systems to adequately process information (Galbraith, 1977).

Interactions within and between governance channels are also influential in intra-firm capital allocation processes because governance channels are the means through which corporate managers impose their strategic priorities on a firm's organization, by directing managerial attention (Ocasio & Joseph, 2005). In this domain, through an inductive analysis of General Electric's governance system from 1951 and 2001, Joseph and Ocasio (2012) showed that

interactions within and between cross-level governance channels helped General Electric integrate the loci of corporate and business-unit attention, and take adaptive action. In this way, governance channels can be consequential for innovation outcomes (Joseph & Ocasio, 2012; Wilson & Joseph, 2015).

Empirical evidence (albeit indirect) linking managerial attention to capital allocation is provided by Feldman (2016). In her study of corporate spin-offs, she showed that inefficiencies in capital allocation within multi-business firms may be compounded by the inability of managers to devote enough attention to their businesses. Specifically, Feldman (2016) showed that the capital expenditures made by firms in their non-divested divisions were misaligned with investment opportunities before spin-offs were undertaken, but that those misalignments were resolved after the completion of those deals. The fact that these effects were especially pronounced within firms operating in a moderate number of business segments lends support to the idea that consequential decreases in managerial attention burdens drive Feldman's findings.

Decision-makers. Even when well-designed systems and processes are in place, their functioning can be encumbered by potential agency problems and divisional rent-seeking. Many arguments about the "dark side" of internal capital markets are related to these concerns (e.g., Rajan et al., 2000; Scharfstein & Stein, 2000; Wulf, 2009; Gaspar & Massa, 2011; Glaser, Lopez-de-Silanes, & Sautner, 2013). This is because, in most cases, the allocation of capital within firms involves delegated decision-making: shareholders delegate allocation decisions to the top management of a corporation, who may further delegate allocation decisions to business unit managers, and so forth.

Hence, the allocation of decision rights matters greatly for the intra-firm capital allocation process. For example, Stein (2002) contrasted capital allocation by small, single-manager firms

that choose between a few projects, with capital allocation by large firms that have multiple layers of management evaluating many projects. He found that large hierarchies perform better than single-manager firms when information can be costlessly verified and transmitted inside a firm. In the same vein, Ozbas (2005) argued that interdependent organization design choices — such as centralization and hierarchical layers— are attempts by corporate headquarters to influence and improve managerial behavior, and thereby may lead to efficiency gains in capital allocation. Hoang et al. (2018) provide a recent account of intra-firm capital allocation processes, focusing on the delegation of investment authority, by surveying CFOs from eleven Western European countries.

The allocation of decision rights within a firm is typically contingent on the nature and context of the specific investments considered for funding. In general, decisions are less likely to be delegated when they have long-term consequences (Aghion & Tirole, 1997; Harris & Raviv, 2005). For example, in a study of French firms engaged in multimarket competition, Sengul and Gimeno (2013) found that the competitive context led headquarters to assert more control over the investment decisions of some business units, and to reduce the flow of financial resources to them, in order to avoid the escalation of competition with rival firms. This behavior, labelled 'constrained delegation', showed that anticipated competitive responses may influence both the allocation of capital and the allocation of decision rights pertaining to investment choices within a complex organization. More generally, Sengul and Gimeno (2013) describe a nested system of controls over a subsidiary's decision rights: "permanent headquarters' control over major decisions with long-term consequences, regular delegation of business-level decisions (e.g., advertising, remuneration) to subsidiaries, and exceptional discretionary headquarters control

over the competitive behavior of subsidiaries, such as intervening when a price war is in sight" (p. 459).

The identity of the decision-maker(s) to whom capital allocation decisions are delegated may also be consequential, since individuals differ in their biases and risk preferences. Consider, for instance, the cases of managers who are empire-builders, managers who are predisposed to advertise aggressively, or managers who are close to retirement. Accordingly, whether —and if yes, how much— a firm invests in a given investment alternative may be influenced by whomever is the relevant decision maker (see Sengul et al., 2012). It stands to reason that some firms may take this into account when assigning managers to business units. For example, Gupta and Govindarajan (1984a, 1984b) showed that business-units seeking a growth ("build") strategy performed better when they were run by managers with a greater willingness to take risks, but that this was not the case for business-units pursuing a "harvest" strategy.

Ultimately, the decisions of organizational members reflect, not only those members' individual characteristics, but also multiple aspects of the organizational context in which they operate. For example, organizational structure and incentive systems may jointly curb opportunism (Burton & Obel, 1988); incentives and transfer pricing practices may motivate subsidiaries to exploit synergies (Alles & Datar, 1998; Alonso, Dessein, & Matouschek, 2008); and decision rights and incentives may constrain excessive risk taking in resource allocation decisions by subsidiaries in response to lower-than-expected performance (Sengul & Obloj, 2017).[18]

[18] Beyond the formal organization, there is an increasing recognition that a firm's informal structure —interpersonal relationships or ties (e.g., business unit managers' ties to the CEO)— is an important mechanism that may influence its capital allocation decisions (e.g., Gaspar & Massa, 2011; Vieregger, Larson, & Anderson, 2017).

External Dimension of Capital Allocation:

The Interface between the Firm and Its Environment

The previous two pillars focus on factors that are internal to a firm, namely the determination, comparison, and selection of investment alternatives (horizontal dimension); and the management and governance of capital allocation processes (vertical dimension). However, intra-firm capital allocation is also affected by external factors that influence the availability of capital for allocation, or that guide capital allocation towards particular uses.

We can classify these external factors by the type of external stakeholders or actors that may exert an influence on a firm's internal capital allocation processes. Most relevant of all are the investors and investment community, including intermediaries and influencers, such as institutional investors and investment analysts. They collectively influence the supply of capital to the firm, the expectations of returns from internal capital allocation, and whether free cash flow is reinvested or returned to investors (e.g., Benner & Ranganathan, 2012; Maksimovic, Phillips, & Yang, 2017). Customers (and customer dependence) (e.g., Christensen & Bower, 1996), and competitors (and competitive actions) (e.g., Khanna & Tice, 2001, Henderson & Cool, 2003b) can also influence intra-firm capital allocation decisions.

Alternatively, the literature on the external factors that influence intra-firm capital allocation can be organized, as we do, in three levels of analysis in terms of the mechanisms of interest: the macro environment, the industry environment, and the firm-specific environment. Studies at the macro-environment level of analysis focus on external conditions that are common to all firms within a country or relevant context at a point in time, whereas those at the industry-environment level focus on specific industry conditions, such as industry life cycle, growth, or

cyclicality. Finally, studies at the firm-specific environment level of analysis take into account that each firm engages with different set of external stakeholders.

Macro-environment. A large literature has focused on dimensions of the macro environment that are common among different firms across different industries and yet can cause systematic variation in firms' capital allocation decisions. The contributions in this tradition typically examined the heterogeneity in capital allocation decisions either across countries with different external capital markets or institutions (e.g., Delios & Henisz, 2000; Henderson & Cool, 2003a), or across time periods with different economic outlooks or institutional constraints (e.g., Kuppuswamy & Villalonga, 2015; Singh, Mahmood, & Natarajan, 2017).

Studies that examine cross-country differences in macro environment as an influence on capital allocation have mainly built on two related literatures: comparative institutions, and business groups (and 'institutional voids'). The departure point on these literatures is the large variance in economic, political and legal institutions across countries, which are a result of countries' histories and path-dependent development (Williamson, 1985; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997, 1998; Hall & Soskice, 2001). Among other things, these institutional differences affect the ability of firms to enforce contracts, raise external funds and monitor investments.

A low contract enforcement context among private firms tends to increase the likelihood of integration and equity ties among transacting actors, consistent with transaction cost economics; whereas a low contract enforcement context with public actors (government, regulators, judiciary system, etc.) may increase risk of expropriation and as a result reduce the level of equity investment by multinationals (Delios & Henisz, 2000). Similarly, weak minority shareholder protection and difficulties in monitoring investments undermine the relative

effectiveness of external capital markets as capital allocation devices (Leff, 1976). A partial remedy used by publicly-traded firms from countries with weak enforcement mechanisms is to cross-list in markets with stronger legal institutions, such as the New York Stock Exchange (Coffee, 2002). Yet, Siegel (2005) found that the main benefit of doing so was not the access to effective enforcement mechanisms *per se*, but the establishment of reputational bonding with an institution that both requires higher compliance and enforces better monitoring, which allowed firms to have better access to external financing.

The structure of the financial system —the primacy of market-based vs. bank-based financing in the economy— also creates a systematic variation in access to and allocation of capital. Whereas Anglo-Saxon countries have emphasized capital allocation mediated by stock markets, countries like Germany or Japan rely more on bank-based financing, whereby banks control important long-term ownership stakes and board seats in companies, and are engaged in major investment decisions (Roe, 1993). Although this difference in the structure of the financial system was found to be less important than the legal system underpinning financial transactions (Demirguc-Kunt & Maksimovic, 2002), it nonetheless influences capital allocation by conditioning the access of a firm to external capital.

The business groups literature embodies the connection between internal and external capital markets and cross-country differences prominently. As we reviewed earlier in this paper, there has been a vibrant research stream on business groups, both in finance and in management, over the past 20 years. The essence of this literature is 'institutional voids' —which refer to the absence of developed and well-functioning external capital markets, labor markets, and product markets; and to inadequate government regulation and weak judicial systems— that characterize many emerging economies (Khanna & Palepu, 1997, 2010). In countries with underdeveloped

capital markets, for instance, business groups are more likely to exist and perform better because their internal capital markets serve as a substitute for the deficiencies of the external capital market that firms operate in (e.g., Shin & Park, 1999; Khanna & Rivkin, 2001; Chang & Hong, 2002; Gopalan, Nanda, & Seru, 2007; Khanna & Yafeh, 2007; Almeida, Kim, & Kim, 2015). Khanna and Palepu (2000b), for example, showed that group-affiliated firms outperformed unaffiliated firms in India, and this was mainly driven by group-affiliated firms' ability to access the international capital markets more easily and frequently. A meta-analysis of this literature found that although group affiliation had a small negative effect on performance in general, the comparative performance of group affiliates was stronger in markets with less developed financial infrastructure and lower quality labor market institutions (Carney et al., 2011).

Besides research examining heterogeneity across countries, a recent literature has examined heterogeneity in capital allocation across time periods with different economic outlooks or institutional (typically regulatory) constraints. The focus of this literature has been on whether and how internal capital markets and capital (re)allocation may influence responsiveness and performance of diversified firms under such intertemporal dynamics. Empirical studies of this kind use exogenous shocks in the macro environment, such as financial crisis or regulatory shifts, to identify and test the underlying causal mechanisms.

Several studies have used financial crises as shocks, since such crises create financial constraints for firms that rely on external capital markets. Kuppuswamy and Villalonga (2015), for example, explored how diversified and non-diversified firms fared during the 2007-2009 financial crisis. They found that although unrelated diversifiers typically trade at a discount relative to single-segment firms, the discount decreased substantially during the crisis. They identified two mechanisms explaining the results: better access to credit markets, and more

efficient use of their internal capital markets to fund investment opportunities. Similarly, Chang, Kogut and Yang (2016) found that, controlling for self-selection, globally diversified firms enjoyed higher global diversification premiums during the crisis than their more focused counterparts. The authors attributed this finding to the value of operating flexibility in resource redeployment: globally diversified firms were more likely to enter countries that were less affected by the crisis, thus improving the value of their business portfolios.[19] In general, the evidence suggests that the impact of macro-environmental shocks on firm performance depends on how firms respond to those shocks through their capital allocation patterns and restructuring initiatives.

Overall, studies adopting the macro environment as the level of analysis have examined important sources of heterogeneity in the external context that influence capital allocation, such as economic and legal institutional development, and economic shocks. These studies mostly explored cross-country or longitudinal constraints to external financing (i.e., the supply of funding to companies with investment opportunities) that may influence capital allocation, and how firms within those contexts cope with these constraints (such as affiliation to business groups, diversification, internal capital markets, asset restructuring, and increased debt and bank financing). However, given their orientation, these studies tend to focus on highly-aggregate

[19] Other studies have examined intertemporal variation in capital allocation patterns in response to changes in the institutional environment. Hoskisson et al. (2004), for example, examined asset restructuring in response to economic development, competitive pressures and deregulation in French civil law countries, and found that group affiliated firms tended to increase asset restructuring in response to economic development, while standalone firms tended to do so in response to competitive changes and deregulation. Similarly, Singh et al. (2017) examined external influences on the restructuring of South Korean and Singaporean firms, and found that restructuring was increased with greater capital market development, but this effect declined during the economic shock of the Asian economic crisis of 1998-1999.

mechanisms, such as differences across countries or time periods, and thus typically underplay heterogeneity among industries within those contexts, and among firms within those industries.[20]

Industry environment. Another set of studies emphasize the industry context as a key external influence on capital allocation. In general, these studies are predicated on the observation that the external industry context determines the demand or opportunity for capital investment, either as a function of the industry life cycle (specific periods of growth or economic cycles), or industry-specific shocks or opportunities (such as industry deregulation, new technological opportunities, etc.). The focus is whether firms' capital allocation processes and decisions are sensitive to these investment opportunities and needs, and the performance effects of such allocation decisions. This approach is well-aligned with the rich tradition of portfolio management frameworks in strategic management (e.g., the BCG growth-share matrix, the McKinsey & Company/General Electric framework), which prescribe the alignment of a firm's internal capital allocation decisions with the attractiveness of the industries or markets in which it competes.

The finance literatures on the value of diversification and on internal capital markets take an intrinsically industry-centric approach to valuation and capital allocation (Stein, 1997; Maksimovic & Phillips, 2013). The assessment of internal capital market efficiency is typically done by evaluating whether corporate capital allocation to business units in diversified firms is sensitive to business units' investment opportunities, as proxied by measures of Tobin's Q calibrated from pure-players in same industries (e.g., Shin & Stulz, 1998; Rajan et al., 2000) or measures of industry demand growth (e.g., Maksimovic and Phillips, 2002, 2008). The

[20] Some studies adopting the macro-environment level of analysis incorporate moderating effects of industrial context (e.g., capital intensity) or firm governance or strategy (e.g., group affiliation, diversification), in order to allow for greater elaboration of the mechanisms that they examine (e.g., Hoskisson et al., 2004; Belenzon et al., 2013).

underlying assumption is that efficient internal capital allocation processes should be sensitive to industry indicators of investment opportunities, allocating more resources to those business units with better industry indicators. As we discussed earlier, over the years, empirical studies have provided conflicting evidence on the value of diversification and the efficiency of internal capital markets (see Maksimovic & Phillips, 2013, for a review of the findings).

Another approach to examine industry influences on capital allocation is to focus on changes at the level of the industry, ideally unanticipated shocks, and study how firms with different characteristics allocate capital in response to such industry changes.[21] Zingales (1998), for example, examined the role of financing and capital allocation in explaining the survival or exit of firms following the U.S. trucking deregulation in the 1980s. He found that, even controlling for differences in productivity and ex-ante probability of default, firms with higher pre-regulation levels of financial leverage were less likely to survive. This was explained by the relative inability of these firms to maintain investment (investment levels were negatively associated with leverage among non-survivors). The implication of Zingales's (1998) study was that survival may not select the most efficient firms but those with financial resources that allow them to invest in adaptation —a finding consistent with Nickerson and Silverman's (2003) study of organizational adaptation in the same industry. A related study is Natividad (2013b), who showed that temporary government bans on the production of a by-product of fishing led multi-product fish processors to efficiently redeploy working capital resources to another related by-product.

[21] Some well-established research streams in strategy —such as entry timing and order into emerging industries (Lieberman & Montgomery, 1988; Mitchell, 1989; Klepper & Simons, 2000), exit in declining industries (Ghemawat & Nalebuff, 1985; Lieberman, 1990), and capacity investment strategies and timing (Lieberman, 1987)— could be examined from the point of view of capital allocation, although most of these studies do not emphasize the role of the capital allocation processes or financial constraints.

A particularly interesting and relatively unexplored dimension of the industry context that affects capital allocation are industry-specific business cycles. Although industrial business cycles may be triggered by exogenous macro-economic conditions such as economic growth, overall business cycles, or financial crises; in some industries they may also be triggered by supply-demand imbalances due to imperfect coordination among suppliers in bringing lumpy capacity investments to the market (Gilbert & Lieberman, 1987). Capital investment timing is particularly important in these contexts, since cyclical industries tend to be relatively undifferentiated, and earlier investments may preempt the investment opportunity from laggards. At the same time, imperfect coordination often leads to over-investment, excess capacity and lower returns across the industry (Henderson & Cool, 2003b). During those downturns, financial strength may influence survival (Zingales, 1998), the ability to acquire weakened competitors (Maksimovic & Phillips, 2008), or the ability invest during a downturn (Ghemawat, 1993). Navarro, Bromiley and Sottile (2010) provided descriptive evidence showing that high performers in cyclical industries were able to time capital expenditures in order to be more countercyclical, avoiding investments at peaks and being able to invest during recessions.

A couple of studies made an even stronger link between industry cycles and capital allocation. Henderson and Cool (2003a) compared the timing of the capacity investments of chemical firms based in countries with stock market-based versus bank-based financial systems. Both types of financial systems have advantages and disadvantages: stock market-based financing is generally considered more reactive to new information but with a tendency to focus on short-term performance metrics and to follow bandwagons that may end up in overcapacity; while bank-based financing is seen as more long-term oriented but less reactive to new information. Henderson and Cool's results suggest that neither financing system was effective at

curbing investment bandwagons, but that the firms in a market-based system were relatively less likely to invest at the same time as their peers (albeit more affected by agency problems associated with free cash flow). Separately, Khanna and Tice (2005) examined the impact of financial constraints on pricing and exit of supermarkets chains from city markets across several economic recession shocks. They found that while, in general, debt levels made firms less aggressive, during recessions the level of debt actually increased price competition, particularly in markets cohabitated by high-debt and low-debt supermarket chains. The evidence was consistent with a situation whereby firms without financial constraints were pricing low during recessions in order to induce the exit of competitors with financial constraints. This finding suggests that the effect of industry context on capital allocation and performance may be influenced by the asymmetry of competitors within a market or industry.

Overall, studies examining the relationship between the industry environment and capital allocation within firms provide more nuanced mechanisms than those focusing on the macro environment, particularly about the investment opportunities motivating capital allocation, since those investment opportunities tend to vary across industries, and within industries over time. However, a major weakness of this approach is that it tends to focus on investment opportunities that are shared among industry participants, such as those driven by industry life cycles and supply-demand imbalances. Strategy research suggests that such "industry effects" may be relatively less important in explaining performance differences than individual "firm effects." (see Vanneste, 2017). Therefore, the alignment of capital allocation decisions with industry factors may be less important than their alignment with firm-specific factors, such as productivity advantages due to superior firm-specific resources and capabilities or the firm-specific environment, at least in industries where there are substantial opportunities for differentiation.

The industry-environment level of analysis may be more valid in commoditized industries, with low levels of product differentiation and standard technologies.

Firm-specific environment. Firms may experience different external influences in their capital allocation processes even within the same industry, if they have different links to different stakeholders. For example, firms within an industry may differ in their ownership and investor ties, depend on different customers and suppliers, and may face different competitors in their market niche. Therefore, this third level of analysis may help explain within-industry differences in external influences on intra-firm capital allocation, resulting in strategy and performance differences within an industry.

In finance and strategy, a sizeable literature analyzes the impact of ownership types and structure on strategic choices —including investments and capital allocation — and performance. For example, studies have found that firms with large blockholder investors engaged less in product diversification (Hoskisson, Johnson, & Moesel, 1994); family-controlled firms were less likely to undertake divestitures (Feldman, Amit, & Villalonga, 2016); and minority ownership stakes by the state had a positive impact on the capital expenditures of firms with long-term opportunities (Inoue, Lazzarini, & Musacchio, 2013). A recent large-sample variance-decomposition study found that ownership form (i.e., public vs. private ownership) and ownership structure (i.e., dispersed ownership vs. large blockholders) explained a significant share of variance in firm performance, comparable to that of the industry (Fitza & Tihanyi, 2017).

Of particular interest are institutional investors, who control a large share of ownership in large, public companies in advanced economies and may differ in their objectives and preferences in ways that influence capital allocation. For example, institutional investors that also

directly engage in business activities may exercise less monitoring on a firm's capital allocation than those institutional investors that do not, like pension funds and mutual funds (Kochhar & David, 1996). Institutional investors also differ in the dedication and time horizon of their investment strategies, with some being focused on short-term transient trading while others privilege large, buy-and-hold ownership stakes (Bushee, 1998). Ownership by these investors can shape strategic choices —and their associated capital allocation decisions— by influencing the time horizon of firm strategies (Connelly et al., 2010; Zhang & Gimeno, 2016).

Capital allocation may also be influenced by financial intermediaries, like investment analysts who monitor and evaluate the performance of firms and issue investment recommendations. A growing literature has explored whether evaluations by investment analysts have an impact on strategy and capital allocation (e.g., Zuckerman, 2000; Litov, Moreton & Zenger, 2012; Benner & Zenger, 2016). Research has found that the pressure to meet-or-beat analysts' earnings forecasts may lead management to reduce strategic investments to align performance with external expectations (Graham, Harvey, & Rajgopal, 2005; Zhang & Gimeno, 2010; Benner & Ranganathan, 2012; Gentry & Shen, 2013). Framing and categorization by investment analysts can also influence the perceptions of a firm's strategy among investors and pressure management to conform to those expectations, and as a result undermine attempts to allocate capital in unique ways or to change strategic direction (Benner & Ranganathan, 2012; Benner & Zenger, 2016).

In addition to the investment community, capital allocation may be externally influenced by buyers and suppliers, due to resource dependence considerations (Pfeffer & Salancik, 1978). For example, Martin, Swaminathan and Mitchell (1998) found that Japanese automotive component suppliers were likely to invest in production facilities in a country in response to their

current buyers (automotive assemblers) entering the country (a phenomenon known in the international business literature as "follow-the-buyer"). Christensen and Bower (1996) argue that the inability of leading incumbents to respond to disruptive technologies is also founded on the impact that their current customers had on resource allocation: it was hard for incumbents to justify investments that were not aligned with the current needs and expectations of their current customers, and therefore incumbents missed the opportunity to invest early in disruptive technologies. In parallel, suppliers and employees may also have an impact on capital allocation processes and the ability of firms to adapt to industry changes. Sull (1999), for example, argued that the failure of Firestone to effectively adapt to radial tire technology was due to the firm's commitment to employees and local communities, leading to delays in closing redundant plants, and a preference for transforming existing plants rather than building new ones.[22]

Finally, capital allocation may be externally influenced by relationships of competitive interdependence and specific competitive actions. Capacity investment decisions, for example, reflect oligopolistic interdependence because the payoff of those investments depends on whether rivals have invested or not (Gilbert & Lieberman, 1987). Furthermore, an increased focus on competitors in oligopolistic industries may lead to mimetic investments and herding behavior (Lieberman & Asaba, 2006). By implication, factors such as the financial capacity of a firm may influence the investment decisions of its rivals as well. In their study of French manufacturing firms, Boutin et al. (2013) found that the likelihood of new entry into industries was negatively related to the cash hoarded by incumbents, but positively related to entrants' cash holdings, suggesting that capital resources (deep pockets) can influence the actions of rivals. Similarly,

[22] The logic of resource dependence can also be extended to partnerships. Existing partnerships and alliances can influence strategic choices of new partnerships and the level of capital commitments to those partnerships (Gulati, 1995; Gulati & Gargiulo, 1999). Similarly, ties to political actors and influential stakeholders can open (or close) opportunities for capital allocation in contexts of high political dependence (Siegel, 2007; Henisz, 2017).

Khanna and Tice (2005) found that, during the 1980s and 1990s, Wal-Mart's store network expansions tended to be closer to the locations of supermarket chains with low levels of efficiency and high levels of debt.

These findings suggest that the availability and allocation of capital by a firm may have an indirect (or strategic) effect based on the competitive interactions that they engender. This resonates with Zhang and Gimeno (2010), who found that companies that curtailed output, in order to improve margins and meet investment analysts' earnings forecasts, ended up creating competitive reactions that encouraged rival expansion. More directly, Sengul and Gimeno (2013) found that multimarket competitive interdependence —wherein firms compete with one another in multiple markets and/or businesses simultaneously— led French firms to curb capital allocation to specific businesses, so as to avoid escalation of competition with their multimarket rivals.

In summary, intra-firm capital allocation decisions are subject to the influence of an individual firm's unique relationships with its owners, buyers, suppliers, partners, and competitors. As a result, the firm-specific environment may explain inter-firm heterogeneity in capital allocation processes and outcomes. In contrast to the other two levels of external influence, strategy and management scholars have been more prominent contributors at this level of analysis relative to scholars from other fields, like finance or economics. However, one weakness of this stream of research is that, with a few exceptions (e.g., Christensen & Bower, 1996; Sull, 1999), studies tend to treat the specifics of the capital allocation process as a black box, essentially linking antecedents and observable consequences (specific investments or strategic actions, such as entry, exit, and competitive moves). Thus, further research is needed to

open the black box of intra-firm capital allocation processes, and to explore the impact of the firm-specific environment on them.

Putting It All Together:

Horizontal, Vertical and External Dimensions of Capital Allocation Intersect

A large majority of studies on intra-firm capital allocation take an approach that is focused on either one of the three dimensions —horizontal, vertical, or external— of the presented framework. These focused approaches reflect underlying data or modelling constraints, as well as researchers' concerns with theoretical coherence and conceptual clarity. Nonetheless, there are several studies at the intersection of the three delineated dimensions (see Table 2).

Insert Table 2 about Here

The main added value of these studies is that, by considering more than one dimension simultaneously, they make it possible to uncover more intricate patterns, contingencies, and mechanism affecting capital allocation within firms. For example:

- Intersection of the horizontal and vertical dimensions: Hierarchical structures may constrain both the capital available and the mandate attributed to lower-level managers, and therefore limit the overall search for investment alternatives at the firm level (Sah & Stiglitz, 1986).
- Intersection of the horizontal and external dimensions: The scrutiny of external capital markets and individual shareholders may constrain the range of investment

alternatives that are searched for and considered by top management (Benner & Ranganathan, 2012).

- Intersection of the vertical and external dimensions: Competitive challenges imposed by disruptive technological changes may force top management to extricate capital from the challenged business units (as well as the rights of business-unit managers to invest retained earnings), and to reallocate capital elsewhere in the organization (Christensen & Raynor, 2003).

Hence, the three delineated dimensions provide a rich conceptual framing to explain how firms allocate capital internally. We envision an increasing prevalence and relevance of studies exploring interactions among the different dimensions of intra-firm capital allocation in years to come.

Future Research Directions: Quo Vadis?

Both the depicted evolution of thinking on capital allocation and the presented descriptive framework point to intra-firm capital allocation as a rich and complex research topic. With the guidance of our review, we discuss some implications and future research opportunities for strategy and management, the broad intra-firm capital allocation literature, and other streams of research that either inform or are informed by the allocation of capital within firms.

Toward a Competitive Theory of Capital Allocation within Firms

A particularly salient opportunity lies in the development of a competitive theory of capital allocation within firms. In general, strategy and management scholars tend to hold two contrasting views on the link between access to capital and competitive advantage. On one

extreme, a "supply-side" view holds that having access to capital would, on its own, be sufficient for a firm to achieve competitive advantage. This view is implicit in portfolio management frameworks like the BCG growth-share matrix, by which a firm's capital allocation decisions are deemed sufficient to consolidate the competitive positions of its businesses. On the other extreme, a "demand-side" view is predicated on the idea that a fully fungible resource like capital would be easily available through (efficient) external capital markets, which would fund any value-enhancing investments on favorable terms, and holds that "simply contributing capital isn't contributing much" (Porter, 1987: 51). This view is implicit in the RBV —and thus symptomatic of the dominant perspective in strategy and management—, which dismisses fully-fungible and non-firm-specific resources (like capital) as potential sources of competitive advantage. Yet, both of these views are problematic. The former overlooks the role of factors directly related to differential value creation by a firm —such as its non-financial resources, capabilities, and competitive positioning—, and how difficult it may be for a firm to affect them simply through the allocation of capital. The latter overlooks the role of information asymmetries and frictions between external capital markets and firms, and the resulting adverse effects in terms of insufficient, costly, and belated provision of capital.

Taking the middle ground between these two contrasting views, we call for a competitive theory of intra-firm capital allocation that approaches access to capital as a potential complement to other, more established sources of competitive advantage (e.g., proprietary technology, brand recognition, human capital). As such, a firm's internal capital allocation processes may, under certain circumstances, be a complementary (and oftentimes necessary) source of competitive advantage for a firm. Our view is founded on the idea that capital availability —not only in terms of its quantity and cost, but also in terms of its timing— can be crucial for value-enhancing

investments in competitive situations, and can be further enhanced by allocative flexibility within firms.

Fully developing such a theory is beyond the scope of our review. Nonetheless, we would like to underline here that, in order to be of use to strategy and management scholars, a competitive theory of intra-firm capital allocation should be founded on at least three pillars. First, it should take a business-unit centric perspective and examine specific (and potentially value-enhancing) investment alternatives (e.g., market or industry entries, capacity additions, new product development, and advertising) in terms of their implications for business units. This perspective will give prominence to the relationship of a business unit with both its competitive environment and the rest of its parent firm. As a result, it will draw attention to the role of the business unit as the main determinant of superior firm performance.

Second, the notion of competitive advantage —as the ability of a firm to create (and potentially capture) value in competition with other firms— should lie at the heart of arguments about the relevance of intra-firm capital allocation. After all, it is in market contexts that value is ultimately created and captured by firms. Hence, establishing a link between internal capital allocation and competitive advantage is crucial to understand the performance consequences of investment decisions. The typical emphasis on corporate advantage (achieved either through financial or operational synergies) in the study of multi-business firms and internal capital markets tends to obscure the fact that, in order to achieve superior economic returns, a firm needs to translate corporate advantage into superior value creation (i.e., competitive advantage) by its businesses.

Third, a competitive theory of intra-firm capital allocation should be centered on the observation that, in contexts with high competitive interdependence —where timing, relative

non-financial resources and capabilities, and positioning are of the essence—, having access to capital may be crucial to allow a firm to make value-enhancing investments (e.g., Froot et al., 1993; Shaver, 2011). When capital is unavailable or simply too costly to obtain in external capital markets, heterogeneous access to it (through internal capital markets, government support, or privileged access to loans) may lead to heterogeneous investment patterns and competitive fortunes across firms. The resulting theory will then highlight heterogeneity in competitive conditions, both between and within industries (i.e., differences across market niches and asymmetries between competitors), as a fundamental factor to explain capital allocation within firms and its performance consequences.

There is potentially much to learn from a competitive theory of intra-firm capital allocation, through revisiting questions that were already addressed by existing paradigms, as well as venturing into new research topics. Some salient research questions are delineated below. Beyond those questions, the development of this theory will allow researchers to explore connections between capital allocation and broad topics that are central to competitive strategy, such as the exercise of market power and coordination with competitors, the adoption of broad vs. niche strategies, competition in markets with demand-side increasing returns, technology choices, and risk-management practices. In our view, this represents a broad and momentous research opportunity for scholars that are interested in capital allocation within firms.

Advancing Strategy and Management Research on Intra-firm Capital Allocation

In recent years, the resurgence of a new stream of strategy and management research contributed to the richness of the literature on intra-firm capital allocation, as we discussed in detail. The holistic theoretical perspective that is typically adopted in strategy and management is

an asset to understand such an implicitly complex phenomenon. Nonetheless, the fact that there is still a relative paucity of work in this domain foreshadows opportunities for further scholarly contributions.

A potentially fruitful line of inquiry is a deeper assessment of diversified firms' (relative) insulation from external capital market momentum and industry cycles. On the one hand, firms with larger internal capital markets may invest more aggressively in response to market opportunities than those with smaller ones. This is especially salient in economic downturns, when access to external capital markets is more difficult. In line with this reasoning, several studies have shown that diversified firm's business units, which have access to a larger internal capital market than those of focused firms, invest more aggressively in response to market opportunities and perform better (e.g., Fresard, 2010; Boutin et al., 2013). This rationale is echoed in most studies that take the industry as the level of analysis and which, by assuming a strong correlation between observable industry indicators and a firm's investment opportunities, suggest that an efficient internal capital allocation should be responsive to those industry indicators (e.g., Shin & Stulz, 1998; Rajan et al., 2000).

On the other hand, conceptually it is not *a priori* clear that following the above "rules for capital allocation" can systematically lead to superior performance in an open competitive environment. Investing in high-growth industries, or in industries experiencing a period of high stock-market valuation, or timing investment to a period of industry growth may be perilous, because it may lead firms to incur in bandwagon behavior (Gilbert & Lieberman, 1987; Henderson & Cool, 2003b). In these cases, diversified firms may benefit from using their internal capital markets to allocate capital in a more independent or even contrarian way. Countercyclical capital allocation decisions may be conducive to the competitive advantage of diversified firms'

business units, not only by allowing them to avoid the aforementioned bandwagons, but also by enabling investments at more favorable prices and more successful market pre-emption attempts (Aaker & Day, 1986; Mascarenhas & Aaker, 1989; Bromiley, Sottile, & Navarro, 2008). This rationale is further corroborated by large-sample empirical studies that suggest that diversified firms' internal capital markets enable more tempered —and even contrarian— investment patterns, with potentially favorable performance consequences (e.g., Morgan, Rime, & Strahan, 2004; Ghemawat & Thomas, 2008; Almeida, Kim, & Kim, 2015). On the whole, contingencies governing these mechanisms are still poorly understood.

Future research could also expand the foregoing logic to the study of business groups and their adaptation to the environment. For example, researchers could explore under which circumstances being part of a business group brings adaptive advantages to affiliated firms (through greater flexibility in resource redeployment and capital allocation); and under which circumstances it might hinder adaptation (through buffering affiliates from the environment). This recommendation harkens back to one of the main conclusions in Carney et al.'s (2011) meta-analysis: there is a paucity of research on the differences in strategic choices between group affiliated and non-affiliated firms, and on whether those choices mediate the relationship between group affiliation and performance (see Kim, Hoskisson, & Wan, 2004 and Belenzon, Berkovitz, & Rios, 2013 for exceptions).

The development and acquisition of non-financial resources is an important topic within capital allocation and a fertile ground for further research. Part of the role of strategy, and the essence of capital budgeting, is to transform a fungible resource (i.e., capital) into non-fungible ones, like facilities, R&D, and machinery (Stinchcombe, 2001). Consequently, as we discussed in detail, the relationship between internal capital allocation processes and a firm's ability to

develop or acquire non-financial resources and capabilities has been scrutinized in the literature since the 1990s (e.g., Baldwin & Clark, 1994; Helfat, 1997). What has been less studied —and thus is currently less understood— is the relationship between external capital markets and the attainment of non-financial resources and capabilities. Highlighting this relationship can help shed light on the sanctioning and enabling role of external capital markets over a firm's capital allocation choices, through providing funds for some investments while withholding funds from others. Hence, a promising area of study will be to examine whether external capital markets are able to understand and fund complex firm-specific strategies, echoing Litov, Moreton, and Zenger (2012) and Zenger (2013).

The foregoing arguments highlight the fact that capital allocation within firms responds to firm-specific information and investment opportunities, which may not be well aligned with the signals available to external capital markets (such as industry Tobin's Q). Not only there is a great deal of heterogeneity in firms' abilities to capture specific investment opportunities, but also an advantage of internal capital markets lies in the evaluation of opportunities with different information and criteria than external capital markets. For instance, firms with different stocks of non-financial resources and capabilities may, quite naturally, uncover different investment alternatives and react differently to the same industry or environmental conditions: what might be an unequivocal investment opportunity for a given firm might not be so for another firm. A well-functioning internal capital allocation system is therefore *not* expected to mimic external capital market trends (Williamson, 1975). Overlooking this aspect constitutes a salient shortcoming of much of the empirical internal capital markets literature in finance. Since superior value creation is often associated with uniqueness in firm strategy, capital allocation decisions within firms can, and sometimes *should*, diverge from the dominant perceptions of external capital markets, even if

this divergence is negatively associated with the ability of external capital markets to assess a firm's value (Litov et al., 2012).

Separately, there is evidence that financing choices (such as cash and debt levels) and organization design choices (such as centralized or decentralized decision-making) can both influence a firm's ability to allocate capital to and compete in a given market (e.g., Chevalier, 1995; Haan & Toolsema, 2008; Sengul & Gimeno, 2013). It stands to reason that capital allocation decisions, along with financing choices and organization design parameters, are endogenous to the competitive objectives of corporate management (Sengul & Gimeno, 2013). The interconnection between financing choices, organization design, and competitive behavior remains a promising and vastly underexplored area of research, especially in terms of empirical studies.

Finally, the development of a competitive theory of capital allocation would allow scholars to more directly tackle a salient problem in capital allocation research: the lack of counterfactuals of investing (or not) in response to opportunities. By being centered on business units, a competitive theory could enable a more fine-grained understanding of the type of available (and considered) investment alternatives by a firm, and their interactions with the specific competitive circumstances faced by its business units. In turn, this would draw the attention of capital allocation scholars to certain investments which, despite their limited incremental value according to industry Tobin's Q or NPV criteria (for example, due to unfavorable industry conditions), may be worthwhile for a firm. Specifically, bringing forth the idea that the environment and competitors do not stand still, this perspective would highlight that there is a real economic cost from not making some investments aimed at the preservation of a firm's competitive advantage (Christensen, Kaufman, & Shih, 2008).

Further Implications and Future Research Opportunities

As we depicted in our review, many different research streams inform capital allocation within firms. Here, we would like to highlight a number of promising research avenues, in domains that go beyond strategy and management.

To start, the consideration of new data sources and methods —beyond the commonly-used high-level archival data and field studies—also presents an opportunity for researchers. For instance, detailed intra-firm archival data is already allowing for quantitative empirical analyses of the influence of the informal organizational structure on capital allocation (Duchin & Sosyura, 2013; Glaser et al., 2013). Similarly, the use of survey data and methods has been instrumental in unpacking how managerial decision processes shape internal capital allocation decisions (Graham et al., 2013; 2015). Experimental studies are another promising methodological approach to flesh out different causal mechanisms in capital allocation (e.g., Kotha et al., 2015), as are agent-based computer simulations (for a recent related contribution, see Ketkar & Workiewicz, 2017).

One salient point that this essay made is that the different (potentially) value-enhancing investment alternatives that firms may consider can vary across several dimensions (e.g., risk, returns, uncertainty, scope, temporal orientation). Thus, future research should actively contest the implicit assumption that different investment alternatives can be compared and ranked along a single key performance indicator (e.g., return on investment, net present value). Moreover, in pursuit of long-term survival, firms may have multiple intermediate objectives across different time horizons. As a result, performance criteria that are appropriate for evaluating exploitative investment alternatives that complement existing resources and capabilities may not be

appropriate for evaluating exploratory investment alternatives that develop new ones (e.g., March, 2006; Christensen, Kaufman, & Shih, 2008). Furthermore, firms occasionally make "strategic bets," such as hedging between competing technologies (e.g., Dushnitsky, 2012; Eggers, 2014). From the perspective of firm management, these bets open up new performance dimensions to capital allocation (Adner & Levinthal, 2008).

The relationship between organizational structures and the ability of firms to (re)allocate capital internally is another topic open for scholarly contributions. There is ample evidence that diversified firms and business groups (re)allocate capital through different mechanisms (e.g., Bertrand, Mehta, & Mullainathan, 2002; Billett & Mauer, 2003). However, still little is known about how different organizational structures can condition or enhance financial flexibility within a firm. Most firms face some organizational barriers to capital and resource redeployment — some self-imposed; others forced upon them, for instance, by regulations—, and decision-making is typically dispersed across an organization (Galbraith, 1977; Bower, Doz, & Gilbert, 2005). Relatedly, some studies suggest that the locus of decision-making authority within a firm can influence its realized capital allocation (e.g., Malenko, 2012; Sengul & Gimeno, 2013). Much remains to be explored in this domain.

Another area ripe for exploration is the analysis of intra-firm capital allocation through the lens of comparative governance advantages (Williamson, 1985). An implication of the comparative governance perspective is that firms with different financing and capital allocation processes may specialize to compete in different industries and contexts, and invest with different logics. Thus, we are likely to see firms with different financing and capital allocation processes dominating different sectors of the economy. For example, Santaló and Becerra (2008), reported that 60 percent of the four-digit SIC codes in Compustat in 2001 were populated

exclusively by segments of diversified firms. Moreover, this perspective opens up the debate as to whether, together with the structural characteristics of a market (e.g., relative fragmentation and diversity of competitors), financing and capital allocation processes can be used by firms as organizational devices to coordinate their strategies with competitors. As mentioned before, Sengul and Gimeno (2013) showed evidence that firms use strategic delegation of decision-making authority in capital allocation to facilitate coordination in contexts with multi-market competition.

The connection between vertical integration and a firm's capital allocation decisions across different stages of an industry value chain is another broad and underexplored area of research. Vertical integration has long been a central topic in economics and management (e.g., Williamson, 1975; Grossman & Hart, 1986), with countless everyday examples (e.g., vertical integration of Arcelor-Mittal into iron ore, Coca-Cola and Pepsi into bottling). On the one hand, capital allocation to vertically-related businesses may, in some cases, be assessed as if it occurred across unrelated businesses. In the absence of salient operational connections between two vertically-related businesses, it stands to reason that a parent firm may value investment alternatives in each of those businesses based on their standalone potential. Along these lines, Atalay, Hortacsu, and Syverson (2014) found that half of the vertically-related establishments (i.e., those in adjacent stages of the value chain) that belonged to the same firm had no shipments between them, which gives indirect support to this reasoning. On the other hand, operational connections between vertically-related businesses may have an important influence on aspects relevant to capital allocation within a firm. For example, the presence of a firm in different stages of the value chain can contribute to lowering firm risk levels by allowing efficiency-enhancing operational connections between those stages, beyond just entailing more diverse sources of cash

flows (Helfat & Teece, 1987). Furthermore, captive demand from a firm's activities in subsequent production stages can influence the sensitivity of a firm's investment patterns to overall market demand (Mullainathan & Scharfstein, 2001); and the ability to coordinate multiple stages of the value chain can also bring timing advantages to a firm in downstream competitive markets (Corts, 2001).

The examination of the link between firm ownership and internal capital allocation is another exciting research prospect. Differences across public and private firms are not a novelty to scholars in strategy, management, finance, or accounting. Publicly-traded firms typically have more diffused ownership, more demanding disclosure and compliance requirements, and are subject to more (earnings) pressure from investors and analysts. Maksimovic, Phillips and Yang (2017) found that, after an IPO, listed firms tend to be more responsive to demand shocks and more productive compared to private firms, and that these effects are stronger in industries that are capital intensive and more dependent on external financing. On their part, private firms typically face more constraints in accessing external capital markets, but also have a greater latitude to make their investments. For example, the success of German 'mittelstands' — privately-owned small and medium-sized enterprises, typically operating in niche manufacturing industries— in the period following the 2008-2009 global financial crisis was largely attributed to their reliance on internally-generated capital and counter-cyclical investments.

Finally, heterogeneous organizational objectives may lead firms to make different capital allocation decisions, even when facing similar investment opportunities and constraints. Consider, for example, firms that operate in the same industry but come from different sectors of the economy: for-profit vs. not-for-profit vs. state-owned enterprises. In such mixed-oligopoly settings, firms from different sectors are likely to make dissimilar capital allocation decisions, as

they pursue heterogeneous objectives. Moreover, what a firm sees as its *raison d'être* can affect its choices and create variation even within the same sector. Battilana et al. (2015), for example, showed that hybrid organizations (i.e., organizations that pursue a social mission and sustain their operations through commercial activities) make different choices depending on whether they are socially or commercially imprinted at the time of their founding. To the best of our knowledge, these mechanisms have not yet been extended to capital allocation research.

Conclusion

We provided a structured review of the literature on capital allocation within firms, with an emphasis on strategy and management. This was done in three steps. First, we depicted the evolution of research on intra-firm capital allocation from its infancy in the 1960s until today. Scholarly understanding of intra-firm capital allocation has evolved through different (and sometimes disconnected) streams of research, culminating with a recent resurgence of the topic in the strategy and management literature. Over time, research on intra-firm capital allocation has progressively put a greater emphasis on the implications of allocation decisions to specific business units and investment projects (contrasting with more abstract approaches, centered on the perspective of corporate headquarters) and on the role of multiple organizational and environmental aspects.

Taking stock of over half a century of work on intra-firm capital allocation allowed us to bring forth a theoretically-grounded framework describing capital allocation within a firm as (i) a process of determination, comparison and selection among multiple investment alternatives, (ii) taking place across organizational levels of the firm, and (iii) influenced and constrained by the external context in which the firm is situated. The three pillars of the framework —the

horizontal, vertical, and external dimensions of capital allocation— jointly determine how capital allocation unfolds within firms.

Finally, we discussed resulting implications and future research opportunities for strategy and management, the broad intra-firm capital allocation literature, and other streams of related research. We highlighted, for example, the opportunity for the development of a competitive theory of intra-firm capital allocation; the role of capital as a complementary (and often necessary) source of competitive advantage; and multiple research avenues exploring the fit between capital allocation processes and market opportunities, organizational design and governance choices, or (diverse) firm objectives.

At the onset of strategy and management as fields of study, the allocation of capital within firms was seen as a pivotal research matter. However, in the course of the development of the strategy and management literatures, the topic became largely taken for granted as either self-evident or 'unstrategic'. Other disciplines, like finance and economics, took the lead in exploring intra-firm capital allocation, bringing their own theoretical perspectives to advance research in the topic. In part inspired by relevant work in those other disciplines, there is now a resurgence of research on intra-firm capital allocation in strategy and management that leverages the unique perspectives of strategy and management scholars. We hope that this review will help further bolster this emerging research initiative and put capital allocation within firms back at the center of strategy and management concerns.

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Figure 1. A descriptive framework of capital allocation within firms

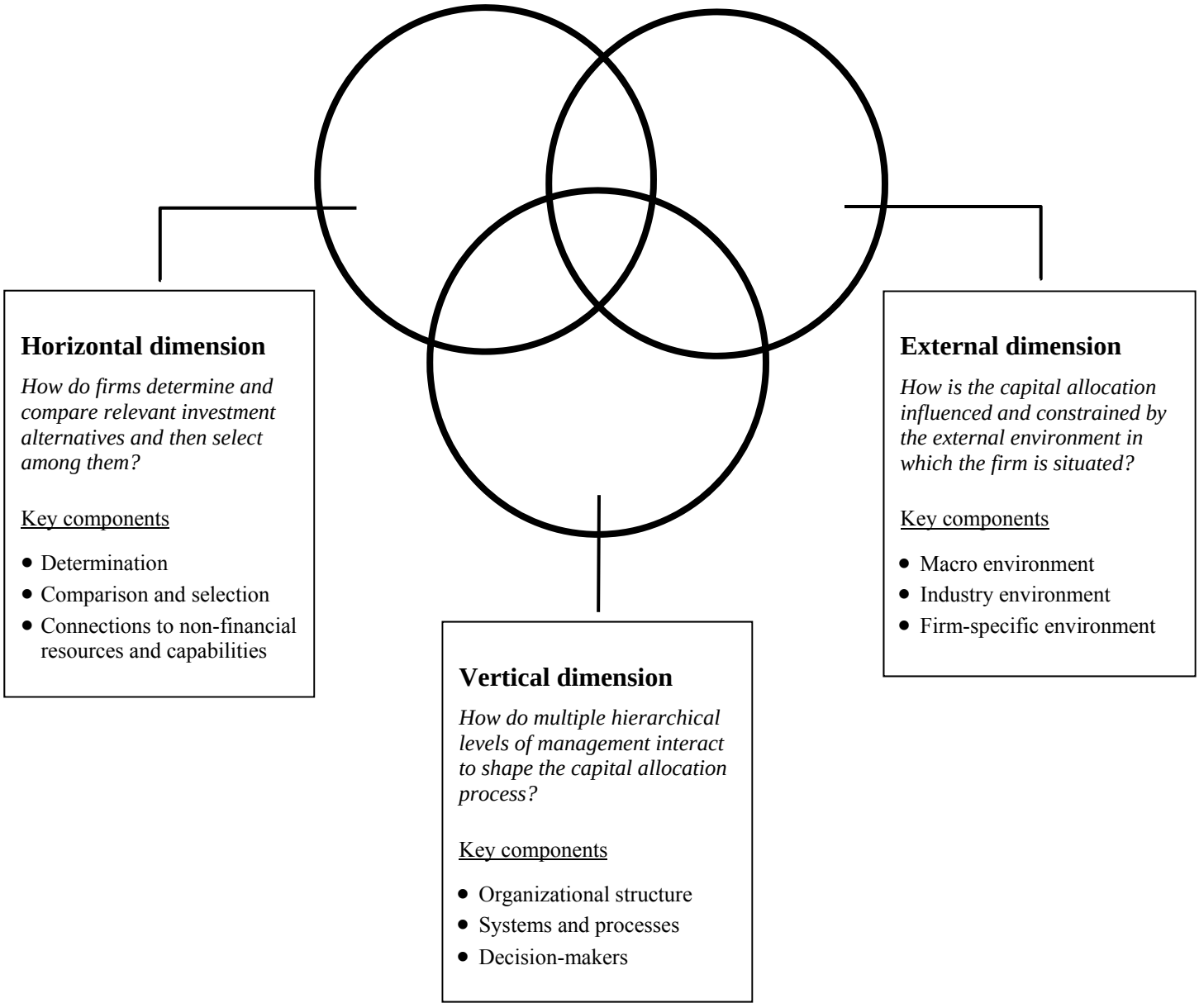

Table 1. Main relevant research areas and representative contributions for three pillars of capital allocation within firms

Relevant research areas	Representative contributions
Horizontal dimension: *How do firms determine and compare relevant investment alternatives and then select among them?*	
Internal capital markets (Finance)	Stein, 1997; Rajan, Servaes, & Zingales, 2000; Khanna & Tice, 2001; Maksimovic & Phillips, 2002; Billett & Mauer, 2003; Ozbas & Scharfstein, 2010; Giroud & Mueller, 2015
Portfolio management	Henderson, 1970; Henderson, 1979; Haspeslagh, 1982; Seeger, 1984
Behavioral theory of the firm	Cyert & March, 1963; Bromiley, 1986, 1991; Tripsas & Gavetti, 2000; Souder & Shaver, 2010; Arrfelt, Wiseman, & Hult; 2013; Kim & Bettis, 2014; Ref & Shapira, 2017
R&D, technology portfolios, and new product development	Hoskisson & Hitt, 1988; Childs & Triantis, 1999; Pfeiffer & Schneider, 2007; Girotra, Terwiesch, & Ulrich, 2007; Eggers, 2012; Klingebiel & Joseph, 2016; Ahuja & Novelli, 2017
Resource-based view	Baldwin & Clark, 1992, 1994; Helfat, 1994; 1997; Maritan, 2001; Arrfelt et al., 2015; Belenzon & Tsolmon, 2016; Morandi, Santaló, & Giarratana, 2017
Vertical dimension: *How do multiple hierarchical levels of management interact to shape the capital allocation process?*	
Transaction cost economics	Williamson, 1975, 1985; Armour & Teece, 1978; Cable & Dirrheimer, 1983; Hoskisson & Galbraith, 1985; Hill, 1988; Klein & Saidenberg, 2010; Zhou, 2011; Natividad, 2013c
Capital budgeting	Pondy, 1962; Aharoni, 1966; Lorange, 1972; Cyert, DeGroot, & Holt, 1979; Bromiley, 1986
Resource allocation process	Bower, 1970; Burgelman, 1983a; Christensen & Bower, 1996; Noda & Bower, 1996
Attention based view	Ocasio & Joseph, 2005; Joseph & Ocasio, 2012; Wilson & Joseph, 2015; Joseph & Wilson, 2018
Decision rights	Aghion & Tirole, 1997; Stein, 2002; Harris & Raviv, 2005; Ozbas, 2005; Alonso, Dessein, & Matouschek, 2008; Sengul & Gimeno, 2013; Sengul & Obloj, 2017

Table 1. Main relevant research areas and representative contributions for three pillars of capital allocation within firms (continued)

Relevant research areas	Representative contributions
External dimension: *How is the capital allocation influenced and constrained by the external environment in which the firm is situated?*	
Institutional environment	Williamson, 1985; Roe, 1993; Delios & Henisz, 2000; Hall & Soskice, 2001; Hoskisson et al., 2004; Belenzon & Tsolmon, 2016; Singh, Mahmood, & Natarajan, 2017
Economic environment	Ghemawat, 1993; Zingales, 1998; Maksimovic & Phillips, 2002, 2008; Khanna & Tice, 2005; Kuppuswamy & Villalonga, 2015; Almeida, Kim, & Kim, 2015; Chang, Kogut, & Yang, 2016
Competitive environment and interactions	Khanna & Tice, 2001, 2005; Henderson & Cool, 2003b; Matthews & Robinson, 2008; Fresard, 2010; Boutin et al., 2013; Sengul & Gimeno, 2013; Ayyagari, Dau, & Spencer, 2015
Business group affiliation	Shin & Park, 1999; Khanna & Palepu, 1997, 2000b; Khanna & Rivkin, 2001; Kim, Hoskisson, & Wan, 2004; Gopalan, Nanda, & Seru, 2007; Almeida, Kim, & Kim, 2015
Ties to external capital market actors (e.g., investors, analysts) and political actors	Henderson & Cool, 2003a; Zhang & Gimeno, 2010, 2016; Smith, 2011; Benner & Ranganathan, 2012; Litov, Moreton, & Zenger, 2012; Zhu & Chung, 2014; Benner & Zenger, 2016

Table 2. Studies at the intersection of the horizontal, vertical, and external dimensions of capital allocation

Representative contributions	See also
Horizontal and vertical dimensions of capital allocation	
Sah & Stiglitz, 1986 — Organization of decision-making units and communication affects errors made by individuals in accepting or rejecting projects (or ideas) and the aggregation of those errors Scharfstein & Stein, 2000 — Two-tiered agency model (CEO vs. division managers; outside investors vs. CEO); rent-seeking behavior by division managers leading to subsidization of weaker divisions by stronger ones ('corporate socialism') Souder & Shaver, 2010 — Poor short-term performance constrains firms in making long-term investments; firms are more likely to make long-term investments when managerial stock options are not yet exercisable	Williamson, 1975; Bromiley, 1986; Hoskisson & Hitt, 1988; Baysinger & Hoskisson, 1989; Arya et al., 2000; Rajan, Servaes, & Zingales, 2000; Kim, Kim, & Lee, 2008; Arrfelt, Wiseman, & Hult, 2013; Kotha et al., 2015; Flammer & Bansal, 2017
Horizontal and external dimensions of capital allocation	
Khanna & Tice, 2001 — After Walmart's entry into their markets, diversified incumbents were quicker to either exit the discount business or to stay and fight; diversified firms' capital expenditures were more sensitive to the productivity of their discount businesses Benner & Ranganathan, 2012 — Financial analyst recommendations trigger changes in strategic investments during periods of uncertain technological change; firms that make high investments despite negative recommendations announce higher value of share repurchases Chang, Kogut, & Yang, 2016 — Decision to diversify globally is self-selected; controlling for self-selection and finding a valuation premium for globally-diversified firms; using the 2008-2009 financial crisis to test for the advantages of globally-diversified firms in terms of operating flexibility	O'Brien & Folta, 2009; Deb, David, & O'Brien, 2017; Ref & Shapira, 2017

Table 2. Studies at the intersection of the horizontal, vertical, and external dimensions of capital allocation (continued)

Representative contributions	See also
Vertical and external dimensions of capital allocation	
Bettis & Prahalad, 1983 — Besides market processes, internal organizational and political/ideological considerations are vital to understanding resource allocation in the economy	Burgelman, 1991; Christensen & Raynor, 2003; Doz & Kosonen, 2007
Christensen & Bower, 1996 — The resource allocation process favors established products/technologies targeting current powerful customers; initially inferior emerging technologies improve over time and eventually invade mainstream markets, leading to the toppling of leading firms by new entrants	
Gilbert, 2005 — Unbundling inertia into resource rigidity and routine rigidity; discontinuous technological change and associated threat perceptions lead firms to overcome resource rigidity but simultaneously amplify routine rigidity	
Horizontal, vertical, and external dimensions of capital allocation	
Long & Ravenscraft, 1993 — Leveraged buyouts (LBOs) cause declines in firms' R&D intensities; large firms tend to have smaller LBO-related declines in R&D intensity	Bower & Gilbert, 2005; Gubbi, Aulakh, & Ray, 2015
Belenzon & Berkovitz, 2010 — Business-group affiliates are more innovative than standalone firms; group affiliation is particularly important in industries that rely more on external funding and in groups with more diversified capital sources	
Souder & Bromiley, 2017 — Effect of stock options on managerial decisions depends on managerial beliefs about stock market reactions; unexercisable stock options positively influence capital expenditures but not R&D; exercisable stock options positively influence R&D but not capital expenditures	