Resource Redeployment and Divestiture as Strategic Alternatives

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Abstract

What should the managers of a multi-business firm do when their company's resources are not used profitably? Research on redeployment proposes that managers should withdraw those resources from the business where they are underutilized and switch them to a business where they can be used more profitably, whereas the literature on divestiture advocates that managers should divest the business containing those resources. In this study, we investigate the factors that lead managers to choose resource redeployment over divestiture as a mode of exit, and *vice versa*. Using a formal model, we establish that the two exit modes act as intertemporal substitutes, whereby redeployment dominates for earlier exits but divestiture dominates for later exits. Although both redeployment and divestiture are inversely related to their implementation costs, redeployment costs amplify the effect of divestiture costs on the likelihood of exit, and divestiture costs amplify the effect of redeployment costs on the likelihood of exit. Finally, we derive a series of results that show that disregarding one of these two exit options as a strategic alternative to the other may lead to misspecifications of empirical models that seek to predict the likelihood of redeployment, divestiture, or exit. Overall, our work contributes to the corporate strategy literature by uniting two streams of research that have largely remained disparate, yet whose insights have significant implications for each other.

Keywords: resource redeployment, divestitures, business exit, corporate strategy, real options, formal model

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INTRODUCTION

What should the managers of a multi-business firm do when their company's resources are not used profitably? Research on resource redeployment proposes that managers should redeploy resources within their firm by withdrawing them from the business where the resources are underemployed and switching them to a business where those resources can be used more efficiently (Anand and Singh, 1997; Belderbos, Tong, and Wu, 2014; Giarratana and Santaló, 2020; Lieberman, Lee, and Folta, 2017; Miller and Yang, 2016a; Morandi Stagni, Santaló, and Giarratana, 2020; O'Brien and Folta, 2009; Sakhartov and Folta, 2014; Wu, 2013). By comparison, the literature on divestiture advocates that managers should divest the business containing those resources, thereby completely removing them from the corporate portfolio (Berry, 2010; Chang, 1996; Capron, Mitchell, and Swaminathan, 2001; Dickler and Bausch, 2016; Feldman, 2014; Vidal and Mitchell, 2015). These two streams of research have largely evolved independently of each other, even though each of them addresses the same underlying strategic problem of how to respond when resources are underutilized within a firm. As such, this study poses two research questions. First, what factors drive the strategic choice between redeployment and divestiture as exit options? And, second, what are the limitations of not regarding these two modes of exit as strategic alternatives to each other?

To analyze these two questions, we draw on existing research on redeployment and divestiture and position these exit modes as strategic alternatives using a formal model that treats them as real options. This approach is advantageous because it allows us to clearly separate redeployment from divestiture as modes of business exit, which previous empirical studies (described in the next section) have largely not been able to do. This approach is also useful because it enables us to explore how the determinants of redeployment and divestiture interact to affect the overall probability of business exit, and to shed light on the implications of not treating resource redeployment and divestiture as strategic alternatives for exiting a business.

Our model derives three sets of novel results, as summarized in Table 1. First, redeployment and divestiture are intertemporal substitutes: redeployment is preferred for earlier exits, while divestiture dominates for later exits. This substitution occurs because divestiture is saved as a "last resort" when the firm cannot use the resources from the divested business in its other lines of business. Second, the costs of redeployment and divestiture each individually reduce the overall probability of exit, as does the interaction between those costs. In other words, redeployment costs amplify the effect of divestiture costs on exit, and divestiture costs amplify the effect of redeployment costs on exit. Third, failing to consider either redeployment or divestiture as possible exit modes may result in decision biases and misspecifications of empirical models that inflate the odds of redeployment, divestiture, and business exit overall.

-----Table 1 here-----

The core contribution of these findings is that they make researchers and managers think differently about business exit. Our results unite two streams of research—the literatures on resource redeployment and on divestiture—that have largely remained disparate up until now.[1] This advance is significant from the perspective of the literature on resource redeployment,

[1] The only previous study we have found that juxtaposes resource redeployment and divestiture as alternative exit options is Lieberman *et al*. (2017). However, there are two key differences between what Lieberman *et al*. (2017) did in their paper relative to what we propose to do in our study. First, although Lieberman *et al*. (2017) advocate the need to examine the choice between redeployment and divestiture, that study explicitly restricts its research question to the process of entering and then exiting a business, rather than the choice between resource redeployment and divestiture. In contrast, we are agnostic about how and when a firm enters a business, and we instead focus our attention on the choice between resource redeployment and divestiture as alternate exit modes. Second, Lieberman *et al*. (2017) elaborate on differences in implementation costs between resource redeployment and divestiture, speculating that the choice of exit mode depends on the balance between the two types of costs. However, Lieberman *et al*. (2017) neither theorize about that balance formally nor test it empirically, and instead call for such efforts in future research. We take up their call for such efforts in the present study.

which typically assumes away the possibility that firms can remove certain resources from their portfolios instead of shifting them to alternate internal uses. This contribution is also important for the literature on divestitures because it more completely portrays the full range of choices that managers have for dealing with resources that are not being used efficiently. Finally, this study offers important managerial implications by generating a set of decision rules to guide the choice between redeployment and divestiture.

LITERATURE REVIEW

This section of the paper has two main goals. First, we seek to survey prior research to identify the determinants of the two exit options we are considering in this study, redeployment and divestiture. We must do this in order to ground our model in the existing literature. Second, we seek to determine whether prior research on redeployment and divestiture has considered the other exit mode. This is a necessary step in establishing whether the gap we have identified—that redeployment and divestiture might be strategic alternatives—really exists in the literature.

Exit by resource redeployment

Resource redeployment is defined as ‘an option to withdraw resources from one product market and transfer them to another’ (Sakhartov and Folta, 2014: 1781). Chandler (1962) and Penrose (1960) were the earliest studies of redeployment as an option for exiting a business. Both studies gave detailed chronological descriptions of how current (Chandler, 1962) and former (Penrose, 1960) divisions of E.I. du Pont de Nemours & Co. faced a decline in their explosives businesses at the end of World War I and had to withdraw some human, physical, and financial resources that were underutilized in explosives to redeploy them to other businesses. While both Chandler (1962) and Penrose (1960) noticed that the business that was to be exited was performing poorly, Penrose (1959; 1960) pioneered the systematic classification of the determinants of resource redeployment. She used the term ‘inducements’ to denote a performance advantage of an alternative business over the business in which the firm’s resources were currently used. Importantly, her notion of performance as a determinant of business exit did not refer to the absolute performance of the business that was to be exited, but rather to the *performance advantage* of an alternative business over the business that was to be exited:

> The declining profitability of existing markets… is, of course, one aspect of the matter, but there is no reason to assume that it is generally the most important. It is a special case of the changing opportunity cost to the firm of its own resources. It is not necessary that existing markets become less profitable in themselves, only that they become *relatively* less profitable… This can just as well occur because of the rise of the new opportunities for investment as because of the decline of the old. (Penrose, 2009: 170)

(Penrose, 1959; 1960) also identified ‘obstacles’ as another determinant of redeployment, by which she meant the adjustment required to stop using resources in the original business and to start using them in a different business. By operationalizing differences between businesses inversely with ‘relatedness’ (Rumelt, 1974), researchers elaborated on the impact of the costs of implementing exit by redeployment:

> With respect to a marginal change in the scope of the firm, the givens are a set of factors and a list of markets to which they may be transferred and result in smaller or greater competitive advantages. Let us define that market in which the factor will yield the highest rents as the ‘closest.’ Further, let us think of the distance to that market as larger to the extent that the critical factors in the market differ from those in the firm's current scope. The more a firm has to diversify, *i.e*., the farther from its current scope that it must go, *ceteris paribus*, the larger will be the loss in efficiency and the lower will be the competitive advantage conferred by the factor. (Montgomery and Wernerfelt, 1988: 625)

Subsequent theoretical research on redeployment explored the concepts of relative performance and implementation costs (*e.g*., Triantis and Hodder, 1990; Kogut and Kulatilaka, 1994; Lieberman *et al*., 2017; Sakhartov, 2017, 2018; Sakhartov and Folta, 2014, 2015). The formalism of real options enabled that work to pinpoint time as an important consideration in the study of redeployment. Because resources can be redeployed at any time before they fully deteriorate, identifying the optimal time of redeployment is a critical part of the analysis. While valuation models of the redeployment option (Kogut and Kulatilaka, 1994; Sakhartov, 2018; Sakhartov and Folta, 2014; 2015; Triantis and Hodder, 1990) identified the best time for redeployment only implicitly, a dynamic choice model in Lieberman *et al*. (2017) derived the optimal time of redeployment explicitly and reported that the cumulative probability of exit by redeployment grows faster over time when businesses are more related (*i.e*., when the cost of implementing redeployment is lower). While these formal models developed the theory of redeployment, they all assumed that redeployment was the only exit option, thus ignoring the possibility that managers could compare alternate exit modes (like divestiture) and choose the mode that best suited the context.

In terms of empirical support for the theory of exit by redeployment, only Lieberman *et al*. (2017) tested the role of time and found that the odds of exit by redeployment grow faster when the businesses in which redeployment is occurring are more closely related to each other. There were also several unsuccessful efforts to prove that implementation costs impede redeployment: Lieberman *et al*. (2017) and O'Brien and Folta (2009) found a negative effect of relatedness on exit, contrary to the relationship expected based on Penrose (1959; 1960) and Montgomery and Wernerfelt (1988).[2] Regarding relative performance, O'Brien and Folta (2009) reported that the returns from a business were negatively associated with the likelihood of exit from that business, a result that could confirm Penrose's (1959; 1960) point about inducements if the performance of alternative businesses is assumed to be invariant. Miller and Yang (2016a) found that multi-business firms were more likely simultaneously to exit businesses and to raise

[2] Although our model in this paper does not provide a theoretical explanation for the discrepancy between these empirical findings and theoretical predictions, Sakhartov and Folta's (2014) does. Because relatedness increases the synergy from contemporaneously sharing resources among a firm's businesses and because the use of resource redeployment compromises synergy, strong relatedness may suppress exit *via* resource redeployment by increasing the benefits of contemporaneously sharing resources among a firm's businesses (Sakhartov and Folta, 2014). Morandi Stagni *et al*. (2020) provide empirical evidence consistent with this point as well.

their commitments to other businesses when the difference in the performance of those businesses was greater, a result that is aligned with the conception of inducements as relative performance. Belderbos *et al*. (2014) reported that multinational firms whose subsidiaries have asymmetric performance face a lower risk of an overall decline in firm performance, which that study attributed to resource redeployment between subsidiaries. Giarratana and Santaló (2020) illustrated that multi-business firms in the drink sector redeployed the shelf space from product niches that experienced tax increases, which the authors treat as representing adverse shifts in demand in these niches. Similarly, Morandi Stagni *et al*. (2020) found that diversified firms redeploy cash from markets that experienced tariff changes, which represent adverse shifts in competition in those markets. Finally, several studies about diversification provide some additional indirect support for the theory of exit by redeployment by showing that firms are more likely to enter related businesses when they face lower absolute or relative returns in their original businesses (Anand, 2004; Anand and Singh, 1997; Wu, 2013). However, while the above studies purport to empirically validate the three key determinants of exit by resource redeployment (*i.e*., timing, relatedness, and relative performance), they all measure redeployment as the change in a firm's set of businesses. However, that operationalization of redeployment cannot reliably separate exit by redeployment from exit by divestiture.

Exit by divestiture

Divestiture is defined as the removal of one or more of a firm's businesses, subsidiaries, or divisions by selloff, spinoff, or other mode of corporate scope reduction (Feldman, 2021). Research has proposed that unfavorable performance of the divesting firm (Jain, 1985; Duhaime and Grant, 1984) and/or the divested business (Duhaime and Grant, 1984) promotes exit by divestiture. In some cases, researchers attributed poor performance to ill-conceived diversification into unrelated businesses (Penrose, 1959), while in other cases, researchers regarded subpar returns as resulting from unforeseen contingencies (Jain, 1985). As with exit by redeployment, exit by divestiture has been characterized as having its own implementation costs, which are often referred to as 'barriers to exit':

> There are a series of barriers to exit working against divestment decisions, in such a way that companies are inclined to hang on to unprofitable businesses. (Porter, 1976: 21)

Porter (1976) and Harrigan (1980; 1981) argued that barriers to exiting a given business exist when (a) capital is sunk into that business, (b) the business is interdependent with the firm's other businesses, or (c) the firm's managers have inappropriate expectations for that business or private agendas that conflict with divestiture. The first of these barriers is a direct cost of divestiture that is linked to the properties of and the market for the resources of the business:

> The more durable the assets are, the more specific they are…, the less likely it will pay to sell off… an unprofitable business... The significance of durable and specific assets as an exit barrier stems from their effect on the calculation determining the desirability of exit. It pays to exit from a business if its contribution to the entire company divided by its resale… value is less than the company's opportunity cost of capital... But the value that can be recovered by… selling off a business may be quite a bit lower than the value of these assets on the books. When the investment in a business is written down accordingly, the contribution the company is earning on the assets by operating them may exceed its next best use for the capital, in which case the business should not be divested. (Porter, 1976: 22)

> Relatively new, unsaleable physical assets could deter some firms from exiting, particularly if the cost of exit represented a real cash outflow that could be avoided (or deferred) by continuing to operate underutilized plants... The thin resale market for highly specific and inflexible assets might discourage firms from exiting if they are adverse to sustaining a substantial loss on disposal. (Harrigan, 1980: 601)

In addition to highlighting divestiture costs, the above quotes indirectly appeal to time as an important consideration in the study of divestiture. Both quotes imply that the more time remains until the end of the useful life of certain resources, the less likely the business that contains those resources is to be divested. Harrigan (1980) also expresses a more direct focus on time by articulating the conditions under which it is better to divest at present or in the future:

> The firm may wish to exit from a declining business quickly if competitors are cutting their prices or otherwise impairing the profitability of the industry. Early exit may become imperative if the firm hopes to recover much of its assets' values. If industry structural traits do not appear to make the business hospitable for other strategies… and if competitive vigor reduces the likelihood that later exits will not produce better performance in the business, it may be advantageous to cash in on a declining business early, before other firms reach the same conclusions... The objective of divestiture is prudent timing. (Harrigan, 1980: 602)

Many empirical studies have tested predictions that exit by divestiture is motivated by poor performance and restricted by implementation costs. Most extant tests validate the idea that poor performance of either the divesting firm or the divested unit (or both) raise the likelihood that the unit would be divested (see, for example, Duhaime and Grant (1984) and Ravenscraft and Scherer (1991), among others). Regarding implementation costs, various exit barriers such as the liquidity of the market for corporate assets (Schlingemann, Stulz, and Walkling, 2002), shared resources (Harrigan, 1980), and demand expectations (Harrigan, 1981) impede divestiture. Harrigan's (1980) point about the optimal timing of divestiture has not yet been tested in empirical research, except for changes in the estimation of hazard-rate models in some studies (*e.g.*, Ravenscraft and Scherer, 1991). Ultimately, studies of exit by divestiture commonly assume away the possibility of exiting a business by resource redeployment (*e.g.*, Schlingemann *et al*., 2002), and in most (but not all) cases, the data that are used to measure exit by divestiture do not contemplate redeployment (*e.g.*, Chang, 1996; Miller and Yang, 2016b; Berry, 2010; Vidal and Mitchell, 2015).

Summary of literature review

Three conclusions follow from the above literature review. First, the bodies of research on redeployment and divestiture have explained the same phenomenon, exit from a business. Second, the two research streams have developed independently of one another. This separation is apparent in the theoretical treatment of each exit mode, which has assumed away the possibility of the other exit mode. It is also apparent in empirical work that has ascribed exit to either redeployment or divestiture without (a) ensuring that managers actually ignored the other exit mode, or (b) controlling for the possibility that the determinants of one exit mode affect the choice of the other exit mode. Third, ideas about the optimal timing of redeployment and of divestiture have not been formalized in an empirically testable manner, meaning that the question of *when* firms should exit their businesses by redeployment or by divestiture has not yet been answered. Thus, in the next section, we present a model that uses the accumulated insights about the determinants of redeployment and divestiture to fill these three gaps in the literature, and to illustrate the risks of not considering redeployment and divestiture jointly.

MODEL

The model[3] considers a firm that, at the initial time $t = 0$, deploys the proportion m_{i0} of its resources in its core business i; the firm uses the remaining proportion $(1 - m_{i0})$ of the resources in its peripheral business j. The model is designed so that the firm stays in its core business i until the end of the useful life of its resources $t = T$, but it can exit the peripheral business by using one of two real options. First, the firm can shut down the peripheral business j and redeploy all resources that were originally used in that business to the core business i. Second, the firm can divest the peripheral business j and keep the proceeds from that divestiture. The model involves three essential parts: (1) a specification of the returns in the firm's businesses, (2)

[3] There are two main reasons why we must develop our own model of the choice between redeployment and divestiture, rather than extending or modifying Lieberman *et al*.'s model (2017). First, Lieberman *et al*. (2017) represent the contrast between the redeployment and divestiture options as a parametrical difference between their implementation costs. Second, their model does not include any of the other determinants of the redeployment and divestiture decisions, especially the performance conditions under which those options are used. These two design decisions would prevent us from generating any results specifically about the divestiture option (which Lieberman *et al*. (2017) do not do either), and from investigating the intertemporal substitution between the redeployment and divestiture options.

a specification of the two real options for exiting the peripheral business, and (3) a decision rule for how the firm uses those options. We describe the three parts of the model in turn below.

Returns in the firm's businesses

Returns in the firm's businesses are assumed uncertain. In particular, the margin C_{it} in the core business and the margin C_{jt} in the peripheral business follow geometric Brownian motions:

$$C_{it} = C_{i0}e^{\left[\left(\mu_i - \frac{\sigma_i^2}{2}\right)t + \sigma_i W_{it}\right]} \qquad (1)$$

$$C_{jt} = C_{j0}e^{\left[\left(\mu_j - \frac{\sigma_j^2}{2}\right)t + \sigma_j W_{jt}\right]} \qquad (2)$$

$$dW_{it}dW_{jt} = \rho dt. \qquad (3)$$

In Equations 1–3, C_{i0} and C_{j0} are margins in businesses i and j, respectively, at the initial time $t = 0$; μ_i and μ_j are drifts for the two corresponding margins; σ_i and σ_j are volatilities of those margins; and W_{it} and W_{jt} are Brownian motions with the correlation coefficient ρ. This specification reflects Penrose's (1959) idea that exit from business j by redeployment is 'induced' by the advantage of business i over business j (high value of $(C_{it} - C_{jt})$), and Duhaime and Grant's (1984) idea that divestiture of j is motivated either by poor performance in j (low C_{jt}) or by poor performance of the firm overall (low C_{it} combined with low C_{jt}).

Real options for exiting the peripheral business

The first option through which the firm can exit the peripheral business at any time before $t = T$ is to redeploy all of its resources to the core business. If the firm redeploys resources to the core business i, the net margin that is earned with the resources that are redeployed from j is lower than the regular margin C_{it} in the core business i, by the marginal redeployment cost S.[4] The marginal redeployment cost S is reduced by relatedness between i and j (Montgomery and Wernerfelt, 1988). Under this specification, the marginal redeployment cost is an 'obstacle' (Penrose, 1959) that emerges due to the need to adjust resources, which were previously used in one business, for use in a different business. Examples of such adjustment costs are the retraining of employees, the repurposing of buildings, and the re-equipment of manufacturing plants. Thus, the full cost R_t^x of redeployment is a product of (a) the marginal redeployment cost S of a unit of resources; (b) the amount $(1-m_{i0})$ of resources redeployed to i; and (c) the current realization C_{it}^x of the uncertain margin C_{it}. Formally,

$$R_t^x = S(1-m_{i0})C_{it}^x. \qquad (4)$$

Equation 4 replicates the modeling of redeployment costs in Sakhartov and Folta (2015) and enables the following representation of the expected net present value V_t^{xR} of the firm when the firm exits the peripheral business by redeploying resources to the core business:

$$V_t^{xR} = \begin{bmatrix} -R_t^x + C_{it}^x + e^{-r\partial t} E^{P^i}\left[V_{t+\partial t}^{xR} \mid M_t^* = 2, x\right] & \text{if } M_{t-\partial t} = 1 \\ C_{it}^x + e^{-r\partial t} E^{P^i}\left[V_{t+\partial t}^{xR} \mid M_t^* = 2, x\right] & \text{if } M_{t-\partial t} = 2 \end{bmatrix}. \quad (5)$$

In Equation 5, $E^{P^i}[\cdot]$ is the expectation with respect to the probability distribution P^i for C_{it}, r is a risk-free interest rate, and $V_{t+\partial t}^{xR}$ is the net present value of the firm in the immediate next time period $(t+\partial t)$. Expectation $E^{P^i}[\cdot]$ is conditioned on the current or past decision to redeploy resources $(M_t^* = 2)$ and is estimated based on the known current state x for C_{it}. Equation 5

[4] Redeployment costs are related to the notion of sunk costs (Dixit, 1989) in the sense that redeployment costs increase the degree to which an investment that a firm makes in entering a business is sunk (*i.e.*, cannot be recovered in exiting that business). However, because our study does not examine entry decisions, sunk costs do not feature in our model.

includes two lines because redeployment cost R_t^x is incurred only once at the time of redeployment (if $M_t = 2$ and $M_{t-\partial t} = 1$); after the redeployment (if $M_t = 2$ and $M_{t-\partial t} = 2$), the return to the firm is C_{it}^x.

The second option through which the firm can exit business j at any time before $t = T$ is to divest that business. If the firm does so, it receives the proceeds D_t that are equal to the discounted net present value that similar firms would accumulate, on average, in deploying the amount $(1 - m_{i0})$ of resources in business j from time $s = t$ to time $s = T$. The proceeds are reduced by the discount $\gamma \leq 1$, which the buyer of the resources demands in an imperfect factor market, representing the cost of divestiture (Harrigan, 1980; Porter, 1976).[5] Formally,

$$D_t = (1-\gamma)(1-m_{i0})\sum_{s=t}^{T} e^{-r(s-t)}\hat{C}_{js}, \qquad (6)$$

where $\hat{C}_{js}$ is the average margin that is earned by firms that operate in business j at time s.

One interpretation of $\hat{C}_{js}$ and γ in Equation 6 is that the buyer of business j, which faces information asymmetry about the actual realization C_{js}^y for the margin C_{js}, considers the average margin $\hat{C}_{js}$ but demands a discount γ as compensation for risk. Alternatively, the buyer may know the unfavorable realization C_{js}^y for C_{js} but expects to reset business j to average industry performance $\hat{C}_{js}$ after the acquisition. A second interpretation is that discount γ compensates the buyer for the effort required to turn business j around. Under either of these

[5] The price at which resources are sold should ideally be modeled as an equilibrium in a game between the divesting firm and the buyer of the divested resources. This task is beyond the scope of our study, and so we leave it for future research.

two interpretations of the buyer's behavior, the expected net present value V_t^{xD} of the focal firm when it divests the peripheral business can be expressed formally as follows:

$$V_t^{xD} = \begin{bmatrix} D_t + m_{i0}C_{it}^x + e^{-r\partial t}E^{P^i}\left[V_{t+\partial t}^{xD} \mid M_t^* = 3, x\right] & \text{if } M_{t-\partial t} = 1 \\ m_{i0}C_{it}^x + e^{-r\partial t}E^{P^i}\left[V_{t+\partial t}^{xD} \mid M_t^* = 3, x\right] & \text{if } M_{t-\partial t} = 3 \end{bmatrix}. \quad (7)$$

In Equation 7, $E^{P^i}\left[V_{t+\partial t}^{xD} \mid M_t^* = 3, x\right]$ is the firm's expected net present value in the immediate next time $(t+\partial t)$ conditioned on the current or past choice to divest business j $(M_t^* = 3)$ and based on the known current state x for margin C_{it}. Equation 7 has two lines because proceeds D_t from the divestiture occur only once when the resources are sold (if $M_t = 3$ and $M_{t-\partial t} = 1$); each time after the divestiture (if $M_t = 3$ and $M_{t-\partial t} = 3$), the return to the firm equals $m_{i0}C_{it}^x$.

The decision rule for the firm

The two ways of exiting the peripheral business are options, rather than obligations, for the firm. They are contingent claims that are exercised only when doing so is profitable to the firm. An obvious alternative for the firm at any time from $t = 0$ to $t = T$ is to maintain the *status quo* and keep the amount m_{i0} of resources in business i and the amount $(1 - m_{i0})$ of resources in business j. If the firm maintains the *status quo* at time t when the current realizations for C_{it} and C_{jt} are C_{it}^x and C_{jt}^y, the firm's expected net present value V_t^{xy} can be expressed as follows:

$$V_t^{xy} = m_{i0}C_{it}^x + (1 - m_{i0})C_{it}^y + e^{-r\partial t}E^{P^{ij}}\left[V_{t+\partial t}^{xy} \mid M_t^* = 1, x, y\right]. \quad (8)$$

In Equation 8, $E^{P^{ij}}[\cdot]$ is the expectation with respect to the joint probability distribution P^{ij} for C_{it} and C_{jt}, and $V_{t+\partial t}$ is the firm's net present value in the immediate next time $(t+\partial t)$. This expectation is conditioned on the current choice to maintain the *status quo* $(M_t^* = 1)$ and is estimated based on the known current states x and y for C_{it} and C_{jt}, respectively.

With Equations 5, 7, and 8, the firm's decision $M_t^* \in \{1,2,3\}$ with respect to business j when C_{it} and C_{jt} are in their respective states x and y is summarized as follows:

$$\left(M_t^* \middle| M_{t-\partial t}\right) = \begin{bmatrix} \arg\max\limits_{M_t} \begin{Bmatrix} m_{i0}C_{it}^x + (1-m_{i0})C_{it}^y + e^{-r\partial t}E^{P^{ij}}\left[V_{t+\partial t}^{xy} \mid M_t^* = 1, x, y\right] & \text{if } M_{t-\partial t} = 1, \\ -R_t^x + C_{it}^x + e^{-r\partial t}E^{P^i}\left[V_{t+\partial t}^{xR} \mid M_t^* = 2, x\right] & \text{if } M_{t-\partial t} = 1, \\ D_t + m_{i0}C_{it}^x + e^{-r\partial t}E^{P^i}\left[V_{t+\partial t}^{xD} \mid M_t^* = 3, x\right] & \text{if } M_{t-\partial t} = 1 \end{Bmatrix} \\ 2 \quad \text{if } M_{t-\partial t} = 2 \\ 3 \quad \text{if } M_{t-\partial t} = 3 \end{bmatrix}. \quad (9)$$

Three features of Equation 9 are noteworthy. First, the equation cannot return the unconditional current choice M_t^*, which is needed to analyze exit from the peripheral business. Instead, the equation estimates the optimal decision $\left(M_t^* \middle| M_{t-\partial t}\right)$ at time t, conditional on what the firm did in the immediate previous time $(t-\partial t)$. This *conditioning on the past* occurs due to the irreversibility of exit: once the firm exits its peripheral business, its options to exit that business are void (the two bottom lines in Equation 9). Second, Equation 9 is the Bellman equation (Bellman, 1957), which casts the choice to exit business j as dynamically optimal. The use of dynamic optimality accommodates Harrigan's (1980) ideas about the optimal timing of exit. Dynamic optimality demands that current choice M_t (1, 2, or 3) be assessed based on its current return $(m_{i0}C_{it}^x + (1-m_{i0})C_{it}^y$, $-R_t^x + m_{i0}C_{it}^x$, or $D_t + m_{i0}C_{it}^x$) and on the effect of that choice on returns in the remaining lifecycle of the resources $(E^{P^{ij}}\left[V_{t+\partial t}^{xy} \mid M_t^* = 1, x, y\right]$, $E^{P^i}\left[V_{t+\partial t}^{xR} \mid M_t^* = 2, x\right]$, or $E^{P^i}\left[V_{t+\partial t}^{xD} \mid M_t^* = 3, x\right]$). This *projecting into the future* introduces inertia to the firm's choice to exit the peripheral business because the instantaneous advantage of exit may be exceeded by its future downsides. Third, conditioning on the past and projecting into the future render the firm's decision with respect to its peripheral business intractable analytically.

Although exit cannot be assessed analytically, Equation 9 breaks the problem of exit into a sequence of simpler sub-problems that is amenable to a numerical solution. The choice to exit the peripheral business is stated in a recursive form that enables the use of backward induction to find optimal conditional choices $\left(M_t^* \middle| M_{t-\partial t}\right)$ at all times t and with all values of C_{it}^x, and C_{jt}^y. The solution requires discretization of continuous-time distribution P^{ij}. Like Sakhartov and Folta (2015), this model uses the bivariate version (Boyle, Evnine, and Gibbs, 1989) of the approximation of geometric Brownian motions with binomial lattices (Cox, Ross, and Rubinstein, 1979). With this approach, the mean and the variance of the original distribution are preserved if the time step ∂t on the lattice is small. On the lattice, the next-period margins $C_{it+\partial t}$ and $C_{jt+\partial t}$ have four states: $C_{it+\partial t}^u$ and $C_{jt+\partial t}^u$ with probability q^{uu}, $C_{it+\partial t}^u$ and $C_{jt+\partial t}^d$ with probability q^{ud}; $C_{it+\partial t}^d$ and $C_{jt+\partial t}^u$ with probability q^{du}; or $C_{it+\partial t}^d$ and $C_{jt+\partial t}^d$ with probability q^{dd}.[6] Accordingly, expectation $E^{P^{ij}}\left[V_{t+\partial t}^{xy}\right]$ in Equation 9 can be estimated as $E\left[V_{t+\partial t}^{xy}\right] = q^{uu}V_{t+\partial t}^{uu} + q^{ud}V_{t+\partial t}^{ud} + q^{du}V_{t+\partial t}^{du} + q^{dd}V_{t+\partial t}^{dd}$. Also, $E\left[V_{t+\partial t}^{xR}\right] = (q^{uu} + q^{ud})V_{t+\partial t}^{uR} + (q^{du} + q^{dd})V_{t+\partial t}^{dR}$ and $E\left[V_{t+\partial t}^{xD}\right] = (q^{uu} + q^{ud})V_{t+\partial t}^{uD} + (q^{du} + q^{dd})V_{t+\partial t}^{dD}$.

The backward induction starts at the penultimate time $t = T - \partial t$ with the terminal conditions $V_T^{xy} = 0$, $V_T^{xR} = 0$, and $V_T^{xD} = 0$ that suggest that the resources have fully exhausted

[6] The formulas for calculating $C_{it+\partial t}^u$, $C_{jt+\partial t}^u$, $C_{it+\partial t}^d$, $C_{jt+\partial t}^d$, q^{uu}, q^{ud}, q^{du}, q^{dd} are given in Sakhartov and Folta (2015).

their ability to generate returns by that time. The algorithm proceeds recursively backward in time with a time step ∂t until it reaches time $t = 0$. Because the firm is known to have initially been in the peripheral business ($M_0 = 1$), the model can then proceed recursively forward in time until it reaches time $t = T$. In each step going forward in time and for each possible combination of returns C_{it}^{x}, and C_{jt}^{y}, the model returns the unconditional choice M_t^* based on the known immediate previous choice $M_{t-\partial t}$ and on the optimal conditional decision $\left(M_t^* \middle| M_{t-\partial t}\right)$ that was recovered in the backward induction. Finally, the three-dimensional matrix (t, x, and y) that is generated for M_t^* can be used to analyze (a) when (*i.e.*, t), (b) by which of the two options, redeployment or divestiture (*i.e.*, $M_t^* = 2$ or $M_t^* = 3$), and (c) under what performance conditions (*i.e.*, x and y) the firm will optimally exit the peripheral business.[7]

RESULTS

As articulated in the literature review and the description of the model, the three parameters that affect exit are time, performance, and implementation costs. In this section of the paper, we explore how two of these parameters, time and implementation costs, affect exit by

[7] The closest precedent to this specification of the decision rule for the firm is Sakhartov (2017), which considered the tendency for a firm to stay diversified in two businesses when diversification could start and stop only by means of resource redeployment. There are two key differences that distinguish the model in this study from that in Sakhartov (2017). First, the two studies use very different stochastic processes: whereas Sakhartov (2017) uses a discrete-time VAR2 process, this study uses continuous-time Geometric Brownian motion. In Sakhartov (2017), the discrete-time VAR2 process was appropriate to generate results regarding the overall probability that a firm would be diversified at a particular moment in time. By contrast, our study requires that we use continuous-time Geometric Brownian motion because our model seeks to predict the optimal timing of redeployment and divestiture. Second, the two studies use very different methodological approaches: whereas Sakhartov (2017) uses a Monte-Carlo simulation method (Brandt *et al*., 2005), this study uses a quasi-analytical approach based on the binomial lattice method (Boyle *et al*., 1989; Cox *et al*., 1979). In Sakhartov (2017), the 10,000 paths that were simulated by the Monte-Carlo simulation method were sufficient to predict the overall probability that a firm would be diversified at a particular moment in time. However, using the Monte-Carlo simulation method to simulate this number of paths would not be sufficient to accurately predict the intertemporal substitution between redeployment and divestiture, and using the model to simulate more paths (*e.g*., 1,000,000) makes that model cumbersome and non-executable. Thus, to predict the intertemporal substitution between redeployment and divestiture, we rely on a quasi-analytical approach based on the binomial lattice method rather than the Monte-Carlo simulation method used in Sakhartov (2017).

redeployment *versus* by divestiture. As mentioned above, the model cannot be solved analytically. Thus, we explore how time and implementation costs affect exit by holding constant the values of other parameters in the model, as described in Appendix 1. We explore the effect of performance on exit in Appendix 2, since those results are somewhat more intuitive. We also carefully checked the sensitivity of the results we report below to our choice of ancillary parameters, as outlined in Appendix 3.

Time and exit choice

Figure 1 shows the evolution of the probabilities (averaged over all states for returns at a given time) that the firm exits the peripheral business by redeployment or by divestiture. Two patterns in Figure 1 are noteworthy. First, the dominant mode of exit changes over time. Whereas redeployment is the preferred strategy for an earlier exit, divestiture becomes the dominant strategy for a later exit. Thus, Figure 1 reveals the intertemporal substitution of redeployment and divestiture.[8] Second, both exit modes exhibit inverse U-shaped relationships with time. We begin by providing some intuition for this second result, which will then allow us to explain the first result.

-----Figure 1 here-----

There are two reasons why the curves representing the probabilities of redeployment and divestiture in Figure 1 each have an inverse U-shape. First, the initial increase in the probabilities of redeployment and of divestiture occurs because the firm *projects its strategy into the future* (as described in the discussion of Equation 9). Over time, the firm progressively learns

[8] As with any substitution (*e.g.*, the substitution between two products satisfying the same need of a consumer, or the substitution between the labor and capital that are required to make the same product), the substitution between redeployment and divestiture represents the replacement of the use of one exit mode with the use of the other exit mode. We term this substitution "intertemporal" because it unfolds over time, but only in one direction. Specifically, redeployment that occurs earlier in time can substitute for divestiture that occurs later in time, and *vice versa*. But, earlier divestiture cannot substitute for later redeployment, nor can later redeployment substitute for earlier divestiture.

about its likely future positions on the distribution of business returns, thus increasingly experiencing scenarios where the current payoff to exit is higher than the payoffs to future exits. As a result, the probabilities of redeployment and divestiture both initially increase in Figure 1.

Second, in turn, the subsequent declines in the probabilities of exit in Figure 1 occur because the firm *conditions its strategy on the past* (also described in the discussion of Equation 9). Thus, scenarios in which the peripheral business underperforms in absolute terms or relative to the core business may still occur in the declining portions of the curves. But, by the time those scenarios occur, the firm will already have exercised its exit option (redeployment in the blue line or divestiture in the red line). Thus, as the graph progresses further to the right, fewer scenarios for exit remain as a strategic choice for the firm (as reflected in the last two lines in Equation 9), suggesting that the probabilities of both redeployment and divestiture decline as more and more time elapses.

With respect to the intertemporal substitution of redeployment and divestiture, the peaks of the two lines are separate because the use of divestiture as an exit option grows much more slowly than the use of redeployment. With divestiture (but not with redeployment), the permanence of that exit option means that the firm loses the ability to generate future returns from the divested resources. Thus, the firm is concerned about the possibility that the current payoff to divestiture, even if positive in absolute terms, may be outweighed by the payoff from divesting the peripheral business later. This opportunity cost of premature exit by divestiture introduces substantial inertia into the use of that exit mode. This is reflected in Figure 1 by the fact that the peak probability of divestiture occurs later than that of redeployment.[9]

[9] When either of the two implementation costs becomes prohibitively high, the intertemporal substitution we observe between redeployment and divestiture can degenerate to the permanent dominance of the less costly exit option over the entire lifecycle of the firm's resources. In such extreme scenarios, the blue and the red lines in Figure 1 would never intersect because the line representing the prohibitively costly exit option would always lie beneath the line representing the less costly exit option.

Implementation costs and exit choice

Figure 2 analyzes the individual and interdependent effects of redeployment cost S and divestiture cost γ on exit. Figure 2 averages exit intensity over possible realizations of the margins and predicts the following five outcomes: (a) the probability of redeployment when divestiture is disallowed (Panel A); (b) the probability of divestiture when redeployment is disallowed (Panel B); (c) the probability of redeployment when divestiture is allowed (Panel C); (d) the probability of divestiture when redeployment is allowed (Panel D); and (e) the probability of exit when redeployment and divestiture are both allowed (Panel E). In all panels, Figure 2 predicts the cumulative probability that the firm will exit the peripheral business j by the middle of the lifecycle of the firm resources (*i.e.*, time step 100 out of 200).

-----Figure 2 here-----

When the firm can exit the peripheral business only by redeploying resources to the core business (Panel A), the divestiture cost does not change the odds of exit and the redeployment cost has a monotonic negative effect on those odds. Similarly, when the firm can exit the peripheral business only by divesting that business (Panel B), the redeployment cost plays no role and the divestiture cost reduces the likelihood of exit monotonically. Panels A and B represent the design of studies of exit that have considered only one exit option, redeployment or divestiture, at a time. The key assumption of this approach is that determinants of an alternate exit option do not change the use of the focal exit option. The two panels confirm that this assumption holds when the firm disregards either the redeployment or the divestiture option.

Panels C and D display a more holistic setting where the firm does not ignore one of the two exit options. Panel C shows that the divestiture cost affects the likelihood that the firm will redeploy resources, in two ways. First, the filled contour map in Panel C changes color along the vertical axis from dark blue at the bottom to orange at the top, suggesting that firms are more likely to redeploy resources as the cost of divestiture increases. Second, although firms are less likely to redeploy resources as the cost of redeployment increases (consistent with the results in Panel A), that relationship attenuates when divestiture costs are lower (*i.e.*, at the bottom of Panel C). This indicates that the negative effect of the redeployment cost on the odds of redeployment is positively moderated by the divestiture cost. Only when the divestiture cost is prohibitively high will the redeployment cost exhibit the negative relationship with the probability of redeployment that it is usually assumed to have.

To clarify the intuition behind these results, when divestiture is prohibitively expensive, the firm does not consider it as a viable exit option, and the firm must simply decide whether to exit the peripheral business by redeployment or not. Accordingly, the likelihood that the firm will use redeployment as its exit mode depends strongly on the redeployment cost as the key determinant of this exit option. By contrast, when the divestiture cost is lower, the firm actually faces a choice among exiting the peripheral business by redeployment, exiting by divestiture, or not exiting at all. In that situation, the effect of the redeployment cost on the likelihood that the firm will select redeployment as the exit mode is muted by the possibility that the divestiture option is more profitable for the firm.

Panel A of Table 2 illustrates the potential consequences of ignoring how the divestiture cost might moderate the relationship between redeployment costs and the probability of redeployment. The panel reports the upward bias in the predicted probability of redeployment when the moderating role of divestiture costs is ignored. This bias is computed by subtracting the values used to construct Panel C of Figure 2 from the respective values used to build Panel A of Figure 2. As in Panels A and C of Figure 2, this bias is reported as a function of the cost of redeployment (S) and the cost of divestiture (γ). The results in this panel show that significant bias results from ignoring how divestiture costs moderate the relationship between redeployment costs and the probability of resource redeployment. For example, at medium levels of both redeployment and divestiture costs ($S = 30$ and $\gamma = 0.075$), ignoring the moderating role of divestiture costs inflates the probability of resource redeployment by over 100%. Furthermore, the magnitude of the bias is systematically related to the two implementation costs: the bias grows monotonically in redeployment costs, and it declines monotonically in divestiture costs. These patterns underscore the possible risk of not capturing empirically how divestiture costs may moderate the relationship between redeployment costs and the probability of redeployment.

-----Table 2 here-----

Similar observations can be made with regard to the differences between Panels B and D. In particular, Panel D shows that the redeployment cost affects the propensity of the firm to divest. The graph in Panel D changes color along the horizontal axis from dark blue at the left margin to orange at the right margin, suggesting that the firm is more likely to divest as the cost of redeployment increases. Also, although the firm is less likely to divest as the cost of divestiture increases (consistent with the results in Panel B), that relationship weakens when the redeployment cost is lower (*i.e.*, at the left margin of Panel D). This indicates that the negative effect of the divestiture cost on the odds of divestiture is positively moderated by the redeployment cost. Only when redeployment costs are very high will the divestiture cost exhibit the negative relationship with the probability of divestiture that it is usually assumed to have.

To add intuition to these results, we offer the following explanation. When redeployment is prohibitively expensive, the firm does not consider it as an exit option, and the firm must simply decide whether to exit the peripheral business by divestiture or not. As a result, the likelihood that the firm will use divestiture as its exit mode depends on the divestiture cost as the key driver of this exit option. Conversely, when the redeployment cost is lower, the firm actually faces a choice among exiting the peripheral business by divestiture, exiting by redeployment, or not exiting at all. Then, the effect of the divestiture cost on the likelihood that the firm will select divestiture as the exit mode is muted by the possibility that the redeployment option may be more profitable for the firm.

Panel B of Table 2 illustrates the potential consequences of ignoring how redeployment costs might moderate the relationship between divestiture costs and the probability of divestiture. The panel reports the upward bias in the predicted probability of divestiture when the moderating role of redeployment costs is ignored. This bias is computed by subtracting the values used to construct Panel D of Figure 2 from the corresponding values used to build Panel B of Figure 2. As in Panels B and D of Figure 2, this bias is reported as a function of the cost of redeployment (S) and the cost of divestiture (γ). The results in this panel show that significant bias results from ignoring how redeployment costs moderate the relationship between divestiture costs and the probability of divestiture. For instance, at medium levels of both redeployment and divestiture costs ($S = 20$ and $\gamma = 0.075$), ignoring the moderating role of redeployment costs inflates the probability of divestiture by over 56%. Moreover, the magnitude of the bias is systematically related to the two implementation costs: the bias declines monotonically in redeployment costs, and it increases monotonically in divestiture costs. These systematic patterns again underscore the potential risk of not capturing empirically how redeployment costs may moderate the relationship between divestiture costs and the probability of divestiture.

Finally, Panel E aggregates redeployment and divestiture into a single construct of exit. This panel shows that the probability of exit increases from the top right corner (where both costs are very high) to the bottom left corner (where both costs are very low). The key implication is that the redeployment cost reinforces the effect of divestiture cost on exit, and *vice versa.* Consequently, an empirical model that predicts the likelihood of exit based only on one type of implementation cost may be mis-specified, as may be a model that includes redeployment and divestiture costs as explanatory variables individually but not the interaction between them.

To clarify the intuition behind these results, when divestiture is prohibitively costly (at the top of Panel E), the firm uses redeployment as the exit mode and the likelihood of exit by redeployment depends strongly on the redeployment cost. By contrast, when the divestiture cost is low (at the bottom of Panel E), the firm chooses between redeployment and divestiture for exiting the peripheral business, and the effect of the redeployment cost on the likelihood of exit is mitigated by the possibility that divestiture is the more attractive exit mode. As a result, the divestiture cost reinforces the sensitivity of the likelihood of exit to redeployment costs. Similarly, when redeployment is prohibitively costly (on the right side of Panel E), the firm uses divestiture as the exit mode and the likelihood of exit by divestiture depends strongly on the divestiture cost. By contrast, when the redeployment cost is low (on the left side of Panel E), the firm again chooses between redeployment and divestiture for exiting the peripheral business; and the effect of the divestiture cost on the likelihood of exit is mitigated by the possibility that redeployment is the more attractive exit mode. Again, the redeployment cost reinforces the sensitivity of the likelihood of exit to divestiture costs.

Panel C of Table 2 illustrates the potential consequences of ignoring how the interaction between redeployment and divestiture costs might moderate the relationship between the two implementation costs and the overall probability of exit. The panel reports the upward bias in the predicted probability of exit (*i.e.*, the sum of the probabilities of redeployment and divestiture, that is, the values from Panels A and B of Figure 2) when the moderating role of the interaction between redeployment and divestiture costs (shown in Panel E of Figure 2) is ignored. This bias (again reported as a function of the cost of redeployment (S) and the cost of divestiture (γ)) is not trivial. For example, at medium levels of both redeployment and divestiture costs ($S = 20$ and $\gamma = 0.075$), ignoring the moderating role of the interaction between redeployment and divestiture costs overestimates the probability of exit by 49%. The magnitude of this bias is systematically related to the two implementation costs: the bias declines monotonically in redeployment costs, and it declines monotonically in divestiture costs when redeployment costs are low to average.

DISCUSSION AND CONCLUSION

Summary of results

This study has investigated the factors that drive the strategic choice between redeployment and divestiture as exit options that managers can use when their firm's resources are no longer deployed profitably, as well as the limitations of not conceptualizing these two exit modes as strategic alternatives to one another. We have developed a formal model that treats redeployment and divestiture as real options, and hence, positions them as alternative exit modes. We derive three sets of novel results from this model, as summarized in Table 1. The first insight is that even though the likelihoods of redeployment and divestiture both exhibit concave relationships with the maturity of a firm's resources, the two exit modes act as intertemporal substitutes, whereby redeployment dominates for earlier exits but divestiture dominates for later exits. Second, although redeployment and divestiture are each inversely related to their respective implementation costs, redeployment costs amplify the effect of divestiture costs on the overall likelihood of exit, and divestiture costs amplify the effect of redeployment costs on the overall likelihood of exit. Third, this study sheds light on the various challenges that arise when researchers and managers ignore one of the two exit modes as a strategic alternative to the other.

Theoretical contributions

This study contributes to the corporate strategy literature by uniting two streams of research on business exit—resource redeployment and divestiture—that have largely remained separate until now. Our work also contributes to each of these bodies of literature in its own right.

In terms of the contribution to the corporate strategy literature overall, this study is the first to explicitly analyze redeployment and divestiture as strategic alternatives to one another. The only other study that comes close to conducting this comparison is Lieberman *et al*. (2017): although that paper advocated the need to examine the choice between redeployment and divestiture and discussed the differences between the two exit modes, it never formally modeled that comparison and only reported empirical results about exit *via* redeployment. Thus, the evidence we produce that redeployment and divestiture serve as strategic alternatives to each other, as well as our analyses of the drivers of the choice between these exit modes, are important and novel insights to emerge from the present work. The significance of this work is highlighted by juxtaposing the paucity of research on the choice between exit modes against the ample body of research on the choice between entry modes. Entry and exit are inverses in terms of the direction in which they shift corporate scope, yet the attention paid to the former eclipses the attention paid to the latter. It is striking how much research has analyzed the choice between entry *via* acquisition *versus* entry *via* organic growth (Penrose, 1959; Capron and Mitchell, 2009, 2012; Cassiman and Veugelers, 2006; Blonigen and Taylor, 2000; Lee and Lieberman, 2009; Lockett *et al*., 2011; Stettner and Lavie, 2014; Puranam and Vanneste, 2016), while so few studies have investigated the choice between exit *via* redeployment *versus* exit *via* divestiture. The current study takes a step towards remedying this imbalance.

In addition to this contribution to the corporate strategy literature, the present paper also contributes directly to research on resource redeployment. By explicitly considering the possibility that firms can remove certain resources from their portfolios instead of shifting them to alternate internal uses, this study resolves a persistent omission in research on resource redeployment. Although existing research has analyzed various determinants of the decision to redeploy resources and the dynamics thereof (Kogut and Kulatilaka, 1994; Sakhartov, 2017, 2018; Sakhartov and Folta, 2014; 2015; Triantis and Hodder, 1990; Lieberman *et al*., 2017), these models have usually assumed that redeployment is the only exit option, thus failing to address how these determinants and dynamics might change when divestiture is introduced as an alternative. Empirically, moreover, redeployment is usually measured as a change in a firm's set of businesses, making it difficult to disentangle its true implications from those of divestiture. Perhaps as a consequence of these two limitations, empirical research seeking to support theoretical insights about redeployment has produced mixed results (Lieberman *et al*., 2017; O'Brien and Folta, 2009; Miller and Yang, 2016a; Belderbos *et al*., 2014; Anand, 2004; Anand and Singh, 1997; Wu, 2013). Accordingly, this paper contributes to the redeployment literature by illustrating that it is necessary for scholars to consider divestiture alongside redeployment to correctly depict and robustly quantify the redeployment decision and its dynamics.

Finally, for research on divestitures, the current study offers the contribution that redeployment may be an alternate way for managers to deal with resources that are not being used profitably within their firms. Although various papers have analyzed the various drivers of divestitures in general (Dickler and Bausch, 2016; Lee and Madhavan, 2010; Brauer, 2006;

Johnson, 1996), as well as the decision to divest *versus* retain certain businesses (Feldman, 2014; Berry, 2010; Vidal and Mitchell, 2015) or to sell off *versus* spin off *versus* carve out existing businesses (Bergh, Johnson, and Dewitt, 2008; Powers, 2001; Slovin, Sushka, Ferraro, 1995), no research has yet contemplated redeployment alongside these various divestiture modes. The present work therefore adds to this stream of research by arguing and providing evidence as to why redeployment should be considered alongside divestiture, and what goes wrong when scholars fail to do so. Thus, this paper advances the literature on divestitures by more completely portraying the full range of choices, as well as their drivers, that managers have for dealing with resources that are not being used efficiently within their firms.

Future research

In addition to its implications for existing research, this study opens up several valuable avenues for future research.

For quantitative scholars, our study highlights at least three major areas for further inquiry: the temporal dynamics of redeployment and divestiture, the development of more precise measures of the underlying parameters that drive the choice between redeployment and divestiture, and the operationalization of these two exit modes in empirical research. We discuss each of these matters in turn.

First, the theoretical model in our study pivots on the temporal patterns of redeployment and divestiture, especially the notion of intertemporal substitution between these exit modes. We establish that redeployment is used as the exit mode earlier in the lifecycle of the firm's resources, but divestiture eventually supersedes redeployment as the exit mode at some point before the end of the useful life of those resources. Because mapping model time to real time is a challenging exercise at best, our model cannot identify the specific moment in time at which this substitution takes place. But, the insight that our model does make clear is that it is necessary for researchers to examine a sufficiently long time window (*i.e.*, from the present all the way to the end of the useful life of the firm's resources) to be able to observe the intertemporal substitution between redeployment and divestiture as exit modes. In comparison, most empirical studies of redeployment and divestiture consider decisions to utilize either of these two exit modes within a shorter time window (Anand, 2004; Anand and Singh, 1997; Berry, 2010; Chang, 1996; Lieberman et al., 2017; Miller and Yang, 2016b; O'Brien and Folta, 2009; Vidal and Mitchell, 2015; Wu, 2013). These assumptions have prevented scholars from fully examining the temporal dynamics not only of redeployment and divestiture, but also of other major corporate strategy decisions, such as alliances and acquisitions or organic growth and acquisitions. Thus, our approach in this study calls for quantitative researchers to use econometric models that explicitly incorporate and test the role of time (*e.g.*, hazard rate, time series, and competing risk models) in their analyses. This is in line with Feldman's (2020: 192) call for future research in corporate strategy "to overcome the complexity of modeling longer-term sequences of corporate strategy transactions… and to begin developing more comprehensive insights about the sequential and intertemporal nature of corporate strategy transactions," such as the divestiture and redeployment decisions analyzed in the present study.

Second, our theoretical model identifies three key parameters that affect firms' decisions to exit by redeployment *versus* by divestiture: time, relative performance, and implementation costs. We just discussed how researchers could start to incorporate time more explicitly into empirical studies of redeployment and divestiture (and corporate strategy more generally), and in our literature review, we identified several studies that investigated the role of relative performance in each of these decisions (Anand, 2004; Anand and Singh, 1997; Belderbos *et al.*, 2014; Duhaime and Grant, 1984; Giarratana and Santaló, 2020; Miller and Yang, 2016a; Morandi Stagni *et al*., 2020; O'Brien and Folta, 2009; Ravenscraft and Scherer, 1991; Wu, 2013). This leaves implementation costs. There is a significant opportunity for scholars to develop novel measures of the costs of implementing the two modes of business exit, and to test how these costs shape the redeployment and divestiture decisions as well as the choice between these exit modes.

In terms of redeployment, early research argued that implementation costs should be lower when businesses are more related to one another (Montgomery and Wernerfelt, 1988), and this logic forms the basis for the operationalization of redeployment costs we use in our model. Qualitatively, when redeployment costs are "low" in our model, the firm's businesses are perfectly related to each other and their resource requirements are identical, thus rendering the adjustment of the firm's resources for use in another business costless. When redeployment costs are "high," the firm's businesses are so unrelated to each other that the cost of adjusting the firm's resources for use in another business is prohibitive. Despite the utility of this approach to measuring redeployment costs (see Sakhartov (2017) for an example in the context of corporate diversification), opportunities remain for quantitative scholars to develop more nuanced measures of redeployment costs. For example, recent research has begun to measure various aspects of redeployment costs, such as the effects of differences in institutional contexts across countries (Ge and Lindahl, 2019) as well as differences in profiles of tangible (Sakhartov, 2017) and human resources (Chauvin and Poliquin, 2020; Sakhartov and Folta, 2015).

For divestitures, implementation costs were initially said to stem from a lack of liquidity in factor markets (Harrigan, 1980; Porter, 1976), and this logic equally forms the basis for the operationalization of divestiture costs we use in our model. When divestiture costs are "low" in our model, the market for the firm's resources is absolutely liquid, making the divestiture of those resources costless. When divestiture costs are high, the market for the firm's resources is so illiquid that it is impossible (*i.e*., prohibitively costly) to divest those resources. As with redeployment costs, opportunities remain for scholars to develop additional representations of divestiture costs beyond the lack of liquidity in factor markets. For example, recent research has begun to measure various other aspects of the implementation costs of divestitures, such as how divestitures can dissipate the gains from corporate centralization and disrupt synergies between related businesses (de Figueiredo, Feldman, and Rawley, 2019), and how these transactions can impose significant costs on non-shareholding stakeholders (Bettinazzi and Feldman, 2021). In sum, for both redeployment and divestitures, we call for future research to continue to operationalize, test, and codify different representations of the implementation costs of these two exit modes (and perhaps other modes of corporate strategy as well), and to study their impact on these decisions.

Third, two of the key points to emerge from our literature review are that existing research has been unable to empirically separate exit by redeployment from exit by divestiture, and that studies of redeployment and divestiture commonly assume the other mode of exit away (Anand, 2004; Anand and Singh, 1997; Belderbos *et al*., 2014; Giarratana and Santaló, 2020; Miller and Yang, 2016a; Morandi Stagni *et al*., 2020; O'Brien and Folta, 2009; Wu, 2013). We resolved these limitations in our study by developing a formal model, which, as Adner *et al*. (2009) note, is an approach that gives researchers advantages such as precision, logical consistency, and the ability to identify unanticipated effects. Having said this, a major opportunity still remains for empirical researchers to determine how to reliably separate redeployment from divestiture. Generally speaking, data availability makes it easier to identify when firms undertake divestitures than it is to detect when they redeploy resources within their organizations. Thus, scholars who have already gathered data that have the ability to measure resource redeployment (*e.g.*, Chauvin and Poliquin, 2020; Giarratana and Santaló, 2020; Miller and Yang, 2016a; Morandi Stagni et al., 2020) could supplement their datasets with information on divestitures. Researchers could equally begin building new datasets that combine data on both redeployment and divestiture, as some existing working papers have begun to do (*e.g.*, Eklund and Feldman, 2021).

For qualitative scholars, our study highlights the need for future research into how managers view opportunities for value creation in their firms, as well as which criteria they use to select among those opportunities. In our paper, we model the exit decision using, in the parlance of asset-pricing modelers, an American-type option, whereby the firm chooses to exit a business *at the moment in time when doing so would generate the most value for the firm*. This dynamically-optimal modeling decision (Bellman, 1957) is consistent with an interpretation of managers taking a long-term view of their firm's opportunities and making strategic decisions accordingly. By comparison, Lieberman *et al*. (2017) model the exit decision as occurring *at the first moment in time when doing so would create value for the firm*. Their approach is instead consistent with an interpretation of managers taking a shorter-term view of their firm's strategic opportunities in their decision-making.

We believe that qualitative work can shed valuable light on the managerial and strategic implications of the distinction between these two approaches to modeling the decision to exit a business. For example, scholars could conduct grounded, inductive case studies to develop frameworks detailing the circumstances in which executives and boards might consider the decision to exit a business from a short-term versus long-term perspective. Existing research has highlighted the point that even though a long-term orientation to strategic decision-making creates more value for firms (Flammer and Bansal, 2017), managers instead tend to make decisions that prioritize short-term outcomes (Souder and Shaver, 2010; Wang and Bansal, 2012). Thus, the possibility of gaining insight into *when* managers might take a long-term orientation to decision-making (especially for critical corporate decisions like business exit), and perhaps even *what circumstances* prompt them to do so, would be extremely valuable advances to the literature. These ideas would also yield an important complement to the burgeoning literature on the temporal orientation of investors (Bushee, 1998; Connelly *et al*., 2010), which has underscored the distinctions between dedicated (*i.e*., long-term) and transient (*i.e*., short term) investors and the implications that these differences carry for firms' strategic decision-making (*e.g*., Oehmichen *et al*., 2021). This might itself open new opportunities for research into the interactions between the temporal orientation of managers and that of investors.

Practical implications

Beyond these research implications, the present study also offers three decision rules that can help managers make effective choices in terms of how to deal with underutilized resources. First, once managers recognize that resources are not being fully utilized, they should consider redeployment *before* divestiture as the strategy for responding to that problem. Interestingly enough, this is the opposite of insights that the authors of this study gleaned from interviews with the lead integration manager at Google, who noted that the default pattern of decision-making at his company was typically the reverse (divestiture followed by redeployment) when managers realize that resources are not being utilized to their best and fullest extent.

With this being said, the second decision rule that emerges from our work is that managers must also realize that redeployment ultimately expires as an option after enough time elapses, leaving divestiture as the only choice that they may have at their disposal. This is an important insight because it suggests that managers may be limiting the range of strategic choices that are available to them by waiting too long to deal with underutilized resources. This point is consistent with research showing that managers exhibit significant inertia when it comes to divestiture (Dranikoff, Koller, and Schneider, 2002; Chen and Feldman, 2018; Bettinazzi and Feldman, 2021). The current study shows that one new reason why this may be the case is that by the time managers undertake divestitures, they simply have no other options left.

Third, and finally, by failing to consider both divestiture and redeployment as viable exit options, managers may put themselves in a position where they bear the costs of either exit option more acutely. Put differently, by only considering one exit option, managers should follow a simple decision rule to pursue that exit option less often as it becomes more expensive. However, by considering both exit options simultaneously, this heuristic softens in situations where the alternative exit option is more costly than the focal exit option. In companies where both divestiture and redeployment may each carry significant costs, it is useful for managers to recognize that they may have alternative options at their disposal.

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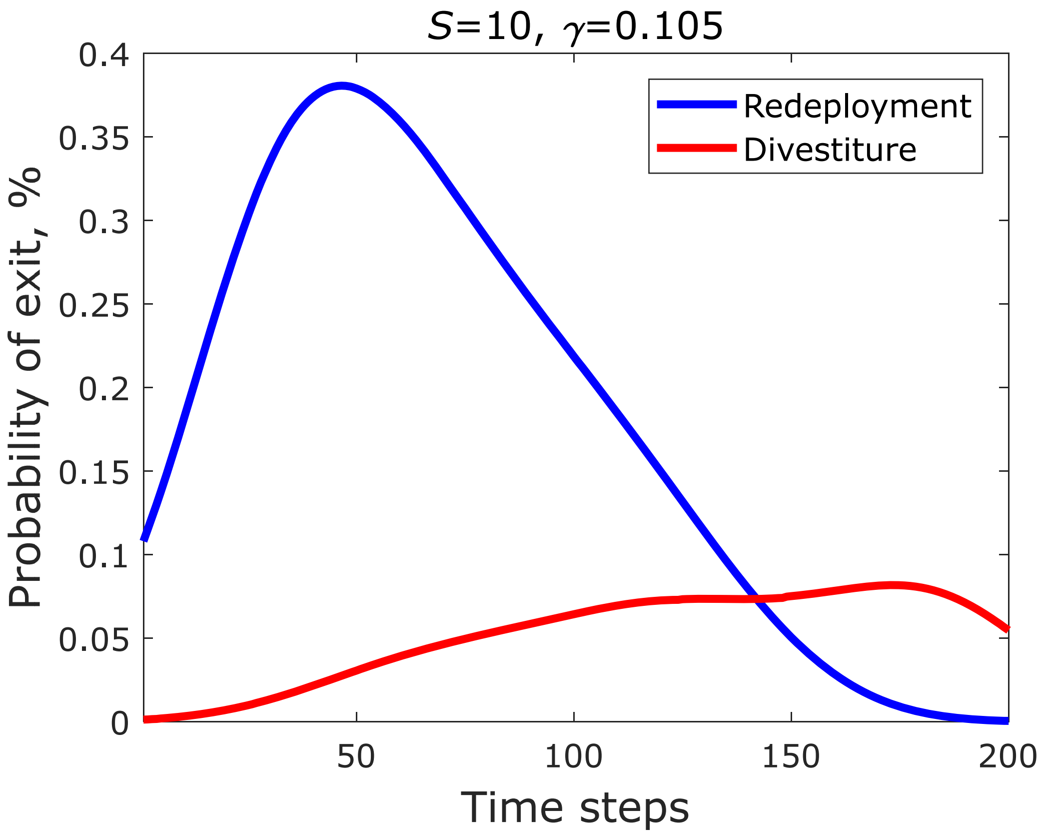
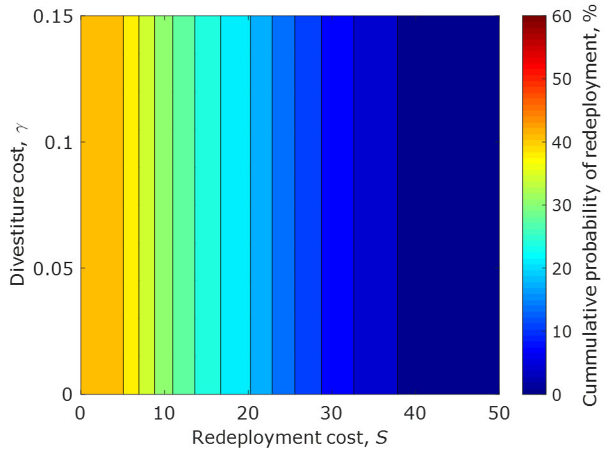
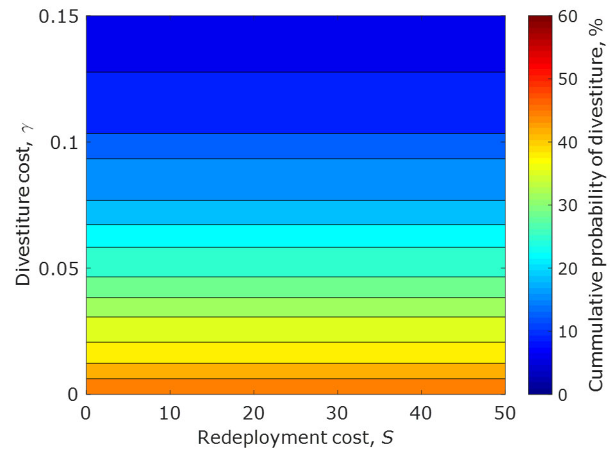


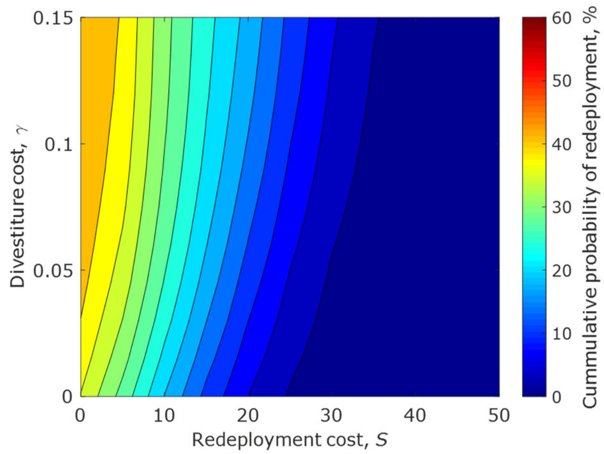
Figure 1. Average instantaneous probability of exit over time



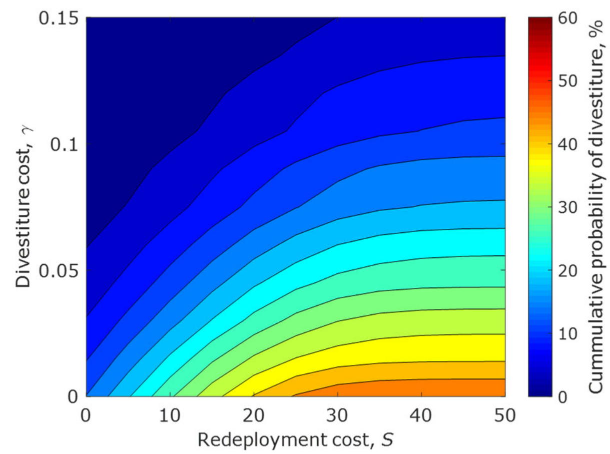
Panel A. Only redeployment



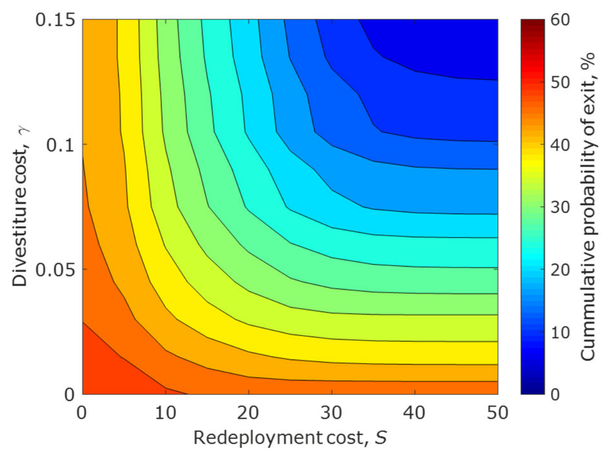
Panel B. Only divestiture



Panel C. Divestiture and redeployment



Panel D. Divestiture and redeployment



Panel E. Divestiture and redeployment

Figure 2. Implications of redeployment and divestiture costs for exit

Table 1. Summary of novel findings

Theme	Summary of Findings	Depiction
Timing of exit by redeployment and by divestiture	The probabilities of redeployment and of divestiture both have inverse U-shaped trends in time.	Figure 1
	The probability of redeployment is higher than the probability of divestiture earlier in the resource lifecycle.	
	The probability of divestiture is higher than the probability of redeployment later in the resource lifecycle.	
Interaction between redeployment costs and divestiture costs in determining the probability of exit	The cumulative probability that the firm will have exited its peripheral business by a particular time depends not only on redeployment and divestiture costs individually, but also on their interaction.	Figure 2; Panel E
Implications of considering one exit option without considering the other option	When the interaction between redeployment and divestiture costs is ignored, the predicted probabilities of redeployment, divestiture, and exit are biased upward.	Table 2

Table 2. Biases resulting from simplified representations of exit

A. Bias in predicting the probability of redeployment when divestiture costs are ignored, %

		S										
		0	5	10	15	20	25	30	35	40	45	50
	0.000	19.16	40.24	58.35	104.07	210.83	377.87	731.47	1533.01	3546.91	9517.91	32007.12
	0.015	13.05	28.84	40.55	72.47	149.21	255.72	465.17	908.77	1920.18	4655.18	13753.64
	0.030	8.83	21.11	27.74	50.45	106.08	177.51	317.86	607.35	1252.52	2956.13	8468.66
	0.045	5.98	15.12	19.13	35.63	78.22	128.48	222.74	408.18	787.73	1727.52	4342.37
	0.060	3.97	11.29	13.13	25.11	57.00	93.07	158.69	282.65	533.22	1089.94	2633.13
γ	0.075	2.67	8.12	8.97	17.85	42.78	69.04	115.73	204.38	369.48	735.26	1604.52
	0.090	1.72	5.77	6.06	12.33	31.58	50.47	84.88	145.77	254.67	482.79	1018.47
	0.105	1.10	4.25	3.86	8.77	23.38	37.67	62.62	108.95	186.94	343.94	682.25
	0.120	0.67	2.88	2.43	5.99	17.27	27.61	46.52	79.90	134.20	239.49	451.45
	0.135	0.41	2.21	1.57	4.12	12.82	20.37	34.71	60.12	99.93	174.17	324.83
	0.150	0.25	1.44	0.98	2.72	9.07	15.19	25.83	44.88	74.49	129.70	225.01

B. Bias in predicting the probability of divestiture when redeployment costs are ignored, %

		S										
		0	5	10	15	20	25	30	35	40	45	50
	0.000	218.86	118.76	65.02	34.41	17.16	7.33	2.50	0.63	0.12	0.02	0.00
	0.015	264.42	140.18	74.78	38.23	18.32	7.97	2.99	0.93	0.23	0.04	0.01
	0.030	352.46	189.07	104.91	57.08	30.03	14.62	6.23	2.15	0.58	0.11	0.01
	0.045	435.97	232.46	124.53	66.42	33.23	16.01	6.59	2.35	0.66	0.14	0.02
	0.060	565.80	300.30	164.58	89.97	47.95	24.31	11.15	4.52	1.46	0.36	0.06
γ	0.075	700.89	369.69	201.82	107.18	56.33	29.00	13.29	5.28	1.72	0.44	0.08
	0.090	945.79	474.11	252.97	138.23	73.83	38.39	18.62	8.02	2.88	0.80	0.17
	0.105	1097.84	560.92	303.48	164.06	89.63	47.40	23.63	10.29	3.91	1.17	0.26
	0.120	1682.07	781.83	398.46	208.74	113.13	58.74	29.48	13.36	5.19	1.66	0.41
	0.135	2035.90	1000.53	493.22	259.31	142.64	76.36	39.41	18.70	7.80	2.72	0.74
	0.150	2867.23	1359.74	653.56	336.24	175.94	91.18	47.16	22.44	9.50	3.40	0.98

C. Bias in predicting the probability of exit when the interaction between redeployment costs and divestiture costs is ignored, %

		S										
		0	5	10	15	20	25	30	35	40	45	50
	0.000	76.47	73.77	62.27	52.63	44.75	31.07	19.47	11.07	5.55	2.46	0.92
	0.015	67.85	66.95	57.65	49.89	44.56	32.69	21.72	12.89	6.58	2.93	1.10
	0.030	63.77	65.37	59.01	54.21	50.91	38.44	25.77	15.11	7.61	3.35	1.25
	0.045	54.84	57.52	53.08	50.32	49.14	39.01	27.32	16.92	8.85	4.01	1.51
	0.060	48.82	52.59	50.54	50.23	51.99	43.26	31.62	20.01	10.52	4.73	1.78
γ	0.075	38.91	42.81	42.83	44.25	48.89	43.80	34.17	22.90	12.60	5.88	2.26
	0.090	34.66	38.01	39.06	41.59	47.30	43.80	36.14	25.12	14.16	6.68	2.59
	0.105	24.90	28.09	29.46	33.23	40.92	41.83	38.29	29.44	17.90	8.87	3.53
	0.120	22.64	25.22	27.13	30.73	37.75	38.96	36.98	29.57	18.51	9.46	3.85
	0.135	16.53	18.92	20.55	24.12	31.34	34.98	36.78	32.93	22.56	12.19	5.15
	0.150	12.65	14.41	16.15	19.29	25.20	29.69	33.20	32.33	24.24	14.13	6.21

APPENDIX 1: PARAMETER VALUES IN REPORTED RESULTS

The following parameter values are held constant in Figures 1 and 2 in the paper: $C_{i0} = C_{j0} = 0.08$, $\sigma_i = \sigma_j = 0.2$, $\rho = 0$, $T = 1$, $r = 0.08$, and $m_{i0} = 0.8$. The number of time-discretization steps is also uniformly set to $N = 200$. Like in Sakhartov and Folta (2014; 2015), $\mu_i = \mu_j = r$, thus implying the use of the risk-neutral (martingale) probability measure Q^{ij} instead of the actual probability measure P^{ij} (Cox and Ross, 1976; Harrison and Kreps, 1979). In Figure 1, the costs of implementing exit are set to $S = 10$ and $\gamma = 0.105$. In Figure 2, the values of S and γ vary along the axes of each of the panels and appear there.

APPENDIX 2: PERFORMANCE AND EXIT CHOICE

Whereas Figure 1 presented the dynamics of exit averaged over all possible realizations of margins C_{it}^{x} and C_{jt}^{y}, Figure A2-1 dissects the bivariate binomial lattice at four points in time, as shown in Panels A-D. [10] Each panel represents a 'snapshot' at a given point in time of the odds of redeployment (left-hand-side plots) and of divestiture (right-hand-side plots) over the entire space for realizations C_{it}^{x} and C_{jt}^{y}. Both redeployment and divestiture costs are held at moderate levels ($S=10$, $\gamma=0.105$).

-----Figure A2-1 here-----

The left plot in Panel A of Figure A2-1 shows that firms start using redeployment as a mode of exit early in the resource lifecycle, at time step 8.[11] In the upper left corner, the margin in the core business C_{i8} has its highest possible realization $C_{i8}^{\max}$, whereas the margin in the peripheral business C_{j8} has its lowest possible realization $C_{j8}^{\min}$. Even though the simultaneous occurrence of $C_{i8}^{\max}$ and $C_{j8}^{\min}$ is rather unlikely, if the margins of the core and peripheral businesses are in that state of the world, the firm will redeploy its resources from the peripheral business to the core business. This finding that redeployment occurs when one business performs substantially worse than another is entirely consistent with the Penrose's (1959, 1960) idea of inducements for resource redeployment. By comparison, the right plot in Panel A shows that firms do not use divestiture as an exit option this early in the resource lifecycle.

Panel B of Figure A2-1 shows the initial use of divestiture and the developing use of redeployment as exit options a bit further into the resource lifecycle, at time step 15. In the bottom left corner of the plot on the right, both margins C_{i15} and C_{j15} have the lowest possible realizations $C_{i15}^{\min}$ and $C_{j15}^{\min}$. In this case, the minimum value of the margin in the peripheral business $C_{j15}^{\min}$ credibly signals that that business is very unlikely to turn around and is therefore worth exiting. The minimum value of the margin in the core business $C_{i15}^{\min}$ credibly signals that that the core business is very unlikely to become an attractive destination for resource redeployment in the future. Together, these two considerations make the firm exit the peripheral business by divestiture. This result is consistent with the established view that poor performance in the divesting firm (Jain, 1985; Duhaime and Grant, 1984) and/or the divested business (Duhaime and Grant, 1984) motivates divestiture. In terms of redeployment, the left plot of Panel B of Figure A2-1 depicts a line whose slope is greater than 45 degrees, meaning that the returns

[10] The lattice has the shape of a rectangular pyramid with the apex at time $t=0$ and the known margins C_{i0} and C_{j0}, and with the base at time $t=T$ and a range of margins C_{iT} and C_{jT}. The expansion of the pyramid from the apex to the base corresponds to the property of the geometric Brownian motion that the margins become more uncertain the farther they are projected into the future. The resulting four 'slices' of the pyramid are parallel to the base because time is fixed. Although Panels A-D of Figure A2-1 are shown as having the same size, the scale of each subsequent panel is larger due to the increasing ranges of possible margins going farther into the future.

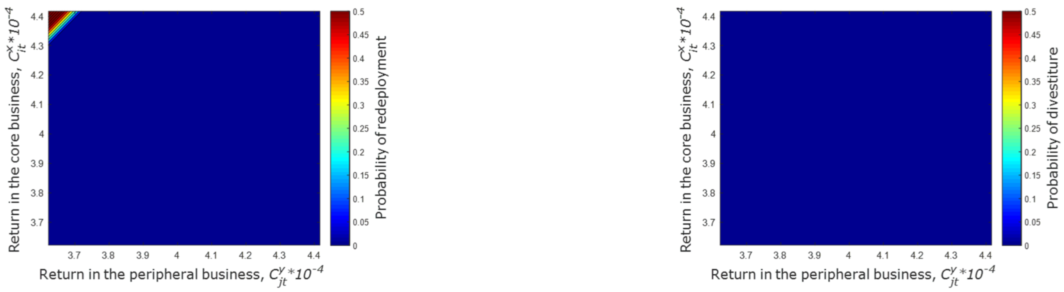
[11] When the margins of its core and peripheral businesses are this extreme ($C_{it}^{\max}$ and $C_{jt}^{\min}$), the firm will not use redeployment as an exit option in earlier periods (*i.e.*, before time step 8) because it is still studying its position in the distribution of the margins and waiting to see if better conditions for redeployment emerge in the future.

in the core business are higher than the returns in the peripheral business ($C^x_{i15} > C^y_{j15}$). This justifies redeployment, in line with Penrose (1959, 1960).

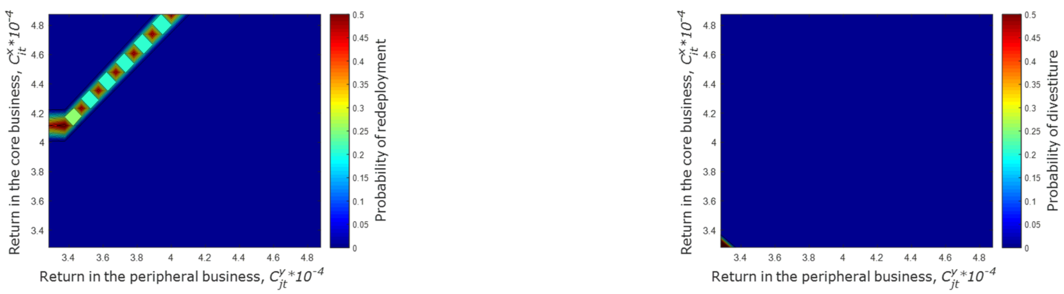
Panel C of Figure A2-1 shows the evolution of the use of redeployment and divestiture even further into the resource lifecycle, at time step 101. In the plot on the left, the line for redeployment (whose slope is still greater than 45 degrees) has expanded, as more possible states have emerged in which the margins of the core business exceed those of the peripheral business. In the plot on the right, divestiture continues to occur when the performance of the peripheral business is very low. When the margin in the core business is also low, the firm chooses divestiture as the exit option, as evidenced by the vertical line just to the right of the origin. This finding is consistent with the idea that poor performance of the divesting firm overall (Jain, 1985; Duhaime and Grant, 1984) and/or of the specific divested business (Duhaime and Grant, 1984) motivates divestiture. When the margin in the core business is higher, however, the firm stops using divestiture as the exit option and instead chooses redeployment.

Panel D of Figure A2-1 shows the end of the use of redeployment and the continuing use of divestiture close to the end of the resource lifecycle, at time step 175. Redeployment has disappeared as an exit option because, by this point in time, options for a profitable resource redeployment have either been exhausted in previous periods (*i.e.*, conditioning on the past) or have become less attractive than divestiture (*i.e.*, intertemporal substitution). In terms of divestiture, the effect of the performance of the core business continues to be discrete: a very low margin in the core business is a necessary but not sufficient condition for divestiture. For divestiture to occur, the margins in both businesses have to be low.

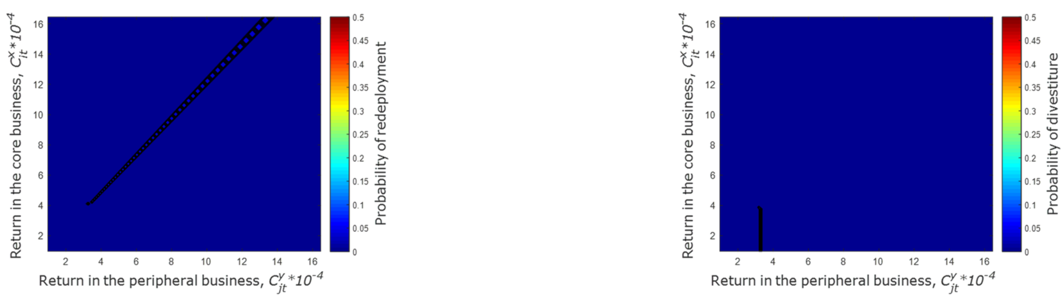
One concluding observation from Figure A2-1 is that the states of the world in which the firm chooses to exit by redeployment are mutually exclusive of those in which the firm chooses to exit by divestiture. This is evidenced by the fact that redeployment and divestiture are not located in the same parts of the plots in any of the panels in Figure A2-1. To be more specific, the firm exits the peripheral business by divestiture when both the peripheral and core businesses perform poorly. However, the firm exits the peripheral business by redeploying resources from the peripheral business to the core business when the peripheral business performs worse than the core business, even if the performance of the peripheral business is not poor.



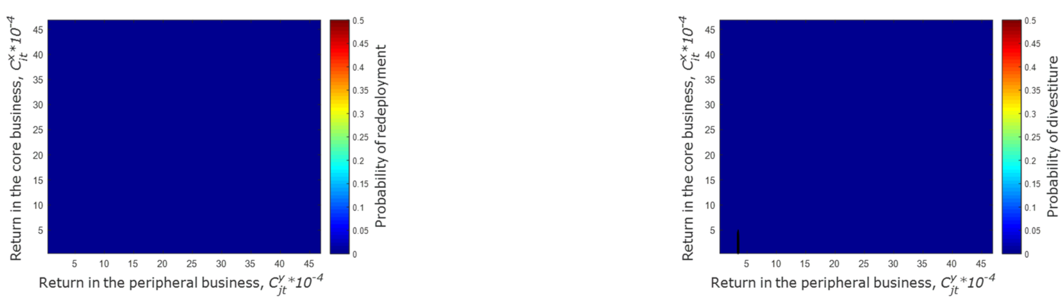
Panel A. Time step 8 out of 200



Panel B. Time step 15 out of 200



Panel C. Time step 101 out of 200



Panel D. Time step 175 out of 200

Figure A2-1. Implications of performance for exit

APPENDIX 3: ROBUSTNESS TESTS

Because the probability of exit cannot be determined analytically in the model, we computed the solution numerically by holding constant the values of certain parameters in the model. In addition to these parametric conditions, we also make a few non-parametric assumptions in order for the model to be efficient in terms of computational time. In this Appendix, we summarize all of the robustness checks we conducted in the following table:

Assumption in baseline model		Robustness of results to assumption
		Parametric Assumptions
1	$\rho = 0$	With $\rho = -0.5$ and $\rho = 0.5$, the intertemporal substitution between redeployment and divestiture (Figure 1) and the interactions between redeployment and divestiture costs (Figure 2) remain.
2	$\sigma_j = 0.2$	With $\sigma_j = 0.05$ and $\sigma_j = 0.5$, the intertemporal substitution between redeployment and divestiture (Figure 1) and the interactions between redeployment and divestiture costs (Figure 2) remain, although with $\sigma_j = 0.05$, divestiture only marginally surpasses redeployment at later time steps.
3	$\sigma_i = 0.2$	With $\sigma_i = 0.05$ and $\sigma_i = 0.5$, the intertemporal substitution between redeployment and divestiture (Figure 1) and the interactions between redeployment and divestiture costs (Figure 2) remain.
4	$C_{j0} = 0.08$	With $C_{j0} = 0.07$ and $C_{j0} = 0.09$, the intertemporal substitution between redeployment and divestiture (Figure 1) and the interactions between redeployment and divestiture costs (Figure 2) remain, although with $C_{j0} = 0.07$, divestiture only marginally surpasses redeployment at later time steps.
5	$C_{i0} = 0.08$	With $C_{i0} = 0.07$, the intertemporal substitution between redeployment and divestiture (Figure 1) is muted because divestiture tends to surpass redeployment in general. With $C_{i0} = 0.09$, the intertemporal substitution between redeployment and divestiture (Figure 1) remains, even though divestiture only marginally surpasses redeployment at later time steps. With $C_{i0} = 0.07$ and $C_{i0} = 0.09$, the interactions between redeployment and divestiture costs (Figure 2) remain.
		Non-Parametric Assumptions
6	The firm can redeploy either all or none of resources from the	When partial redeployment of resources from the peripheral business to the core business is allowed, the firm does not use that option, thus reconfirming the baseline results.

	peripheral business to the core business.	
7	The firm can divest either all or none of resources from the peripheral business.	When partial divestiture of resources from the peripheral business is allowed, the firm does not use that option, thus reconfirming the baseline results.
8	The firm can either redeploy or divest resources (but not both) from the peripheral business.	When the firm is allowed to divest part of the resources from the peripheral business and to redeploy another part of those resources to the core business, the firm does not use that option. The firm instead uses only the mode of exit that is optimal given the conditions it faces, thus reconfirming the baseline results.
9	The firm can redeploy resources from the peripheral business to the core business only once.	When the firm is allowed to undertake repeated reverse redeployments of resources that were originally used in the peripheral business, the firm uses that additional flexibility only if the redeployment cost is low. Meanwhile, the key qualitative features of the relationships reported in Figures 1 and 2 remain intact.
10	The firm cannot either reacquire the divested resources or buy any new resources using the proceeds from the divestiture.	We cannot quantitatively test the robustness of our results to this non-parametric assumption without making the questionable assumption that the firm can acquire the resources it divested at a below-market price. If such arbitrage opportunities existed, the firm would repeatedly acquire and divest its businesses, meaning that there would be very little redeployment. If such arbitrage opportunities are absent, all of our results remain unchanged.