IS SYNERGY A BARRIER TO BUSINESS EXIT?

Arkadiy V. Sakhartov*
Gies College of Business
University of Illinois at Urbana-Champaign
arkadiys@illinois.edu

Jeffrey J. Reuer
Leeds School of Business
University of Colorado
jeffrey.reuer@colorado.edu

*Corresponding author.

Abstract

This study investigates a prevalent assumption or argument that synergy between businesses in a multi-business firm acts as a barrier for exiting that firm's business. Using a formal model, the study situates synergy in the context where the firm can exit its business through resource redeployment or through divestiture. The model identifies six conditions, in terms of the type of synergy and of the determinants of resource redeployment and divestiture, with which synergy can actually increase, rather than decrease, the odds of business exit. Knowledge of these conditions may be useful in future empirical research on business exit and can stimulate better exit decisions by executives. The results are also instrumental for more balanced perspectives of synergy than the view that has developed since the field's formation.

Keywords: business exit, synergy, resource redeployment, divestiture, formal model

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INTRODUCTION

Corporate scope decisions were featured in early definitions of strategy and are bound up with related decisions such as organizational structure and resource allocation choices in internal capital markets (*e.g*., Ansoff 1965; Chandler 1962). Given this centrality of corporate scope to the strategy agenda, it is not surprising that Rumelt, Schendel, and Teece (1994) identified corporate scope choices as one of four fundamental issues in strategy. Exit from a business represents one of the main ways how executives manage corporate scope, so it is natural to consider what factors optimally contribute to or impede business exit. While the iconic BCG growth-share matrix and other popular portfolio planning tools encouraged managers to make business exit decisions by evaluating a business' standalone profit potential and resource needs (*i.e*., as proxied by relative market share and growth), it is now appreciated that such decisions are considerably more complex. For example, so-called business "dogs" that are candidates for divestiture might have important interdependencies with activities in other businesses; ironically, any resulting synergies are assumed away in the BCG matrix yet are often used to justify why businesses are in corporate portfolios in the first place. Exit decisions are further complicated inasmuch as they can shape future decisions by the firm or the actions of rivals (Leiblein, Reuer, and Zenger 2018).

Following these important conceptual and historical antecedents, it appears that business exit is receiving even more accolades now than when business exit decisions first became a research topic in strategy several decades ago (*e.g*., Duhaime and Grant 1984; Harrigan 1980; Porter 1976). Prominent companies are often praised for their timely exits from businesses. For example, on the news that Google divested its Motorola business, the firm's stock grew by 2.6%, reflecting investors' support to their exit from handset devices (*Business Today* 2014).[1] Likewise, the closure of the mobile system-on-chip business was named by analysts as 'Intel's new strategy [that] is the right one for the company' (*Forbes* 2016). A recent survey of more than 1,000 executives reports that 70% of them have planned to sell units

[1] The intensity, with which Google exits businesses, can be appraised by visiting the webpage https://killedbygoogle.com/. This source reports that the relatively young company, Google, discontinued more than 170 products and projects.

or assets (*Deloitte* 2018). Responding to the increasing popularity of business exit, strategy researchers have recently elaborated on motivations as well as barriers to exit (Berry 2010; Lieberman, Lee, and Folta 2017; Miller and Yang 2016; O'Brien and Folta 2009; Vidal and Mitchell 2015). These barriers to exit can be the result of many factors, including behavioral biases (*e.g.*, overconfidence bias, confirmatory bias, *etc*.) or the different interests of an organization's stakeholders (*e.g*., non-owner managers with career interests in the business' continuation in the corporate portfolio), and they can also reflect rational considerations (*e.g*., uncertainty and irreversible investment) (*e.g*., Elfenbein and Knott 2015).

Perhaps the most prominent exit barrier emphasized in strategy research over the years is synergy between a to-be-exited business and other businesses that would stay in the firm (Porter 1976). Often relabeled 'interrelatedness' (Porter 1976), 'entanglement' (Harrigan 1981), 'facility sharing' (Harrigan 1980), or 'knowledge leveraging' (Chang 1996), synergy is the enhancement in performance of a multi-business firm over the performance of its constituent businesses if they were operated as separate, single-business firms. The key implication is that such synergy could offset the poor performance of a firm's business that is a candidate for exit. As a consequence, multi-business firms were argued qualitatively (Porter 1976) and shown formally (Lieberman *et al*. 2017) and empirically (Chang 1996; Duhaim and Grant 1984; Harrigan 1980; 1981; Lien and Klein 2013; O'Brien and Folta 2009) to avoid exiting businesses in the presence of synergy. This idea is so prevalent and taken for granted that it can be thought of being in the DNA of strategy research and practice. But is it always the case that synergy is a barrier to exit? Can it actually promote rational exit in some specific circumstances?

Taking up this core premise in strategy and offering a response to these questions is the aim of the present study. As will be discussed, answering these questions critically depends on whether exit from a business prevents a firm from the continuous attainment of synergy that previously involved that business. When synergy is restricted, by definition, to the permanent sharing of resources between a firm's businesses (Chang 1996; Harrigan 1980; Lieberman *et al*. 2017; Sakhartov and Folta 2014), exit stops such sharing and thus immediately eliminates synergy. With that specific conception of synergy, it indeed inhibits business exit. However, research in corporate strategy over the years has identified many

different types of synergy (Ansoff 1965; Karim 2006; Karim and Mitchell 2001; Walter and Barney 1990), only some of which demand the continuous sharing of resources between a firm's businesses. This study revisits those existing descriptions of synergy sources and, based on that broader representation, explores when synergy precludes business exit and when it does not. For the purposes of precision and formal analysis, we therefore distinguish synergy based on the continuous and contemporaneous sharing of resources from synergy that can remain after a business exit. For our analysis, we also separately consider the redeployability of corporate resources as a distinct source of value in multi-business firms. To explore whether synergy impedes business exit, this study also draws on research on two modes of business exit: resource redeployment and divestiture. Following recent advances in this research (Feldman and Sakhartov 2020; Helfat and Eisenhardt 2004; Lieberman *et al*. 2017; Sakhartov and Folta 2014; 2015) and using determinants of redeployment and of divestiture summarized in Figure 1, this study builds a formal model that theoretically elaborates the casual relationship between synergy and exit.

Insert Figure 1 about here

There are three advantages of the formal model for this investigation. First, conclusions reached with the model are not bound by the scarcity of empirical data for measuring various types of synergy and alternative modes of exit, which is frequently the case in empirical research in strategy. As reflected in the next section, data scarcity has indeed hampered progress and this has implications for responding fully to the key research questions of this study. Provided that the formalization offered here adequately represents known descriptions of synergy and determinants of business exit, the model affords a laboratory that enables the study of the implications of synergy for exit. Second, instead of seeking to either assume or refute the previously-suggested effect of synergy on business exit, the formal model rigorously derives that effect and then is able to go on to identify specific conditions under which synergy does not act as an exit barrier. Third, by holding determinants of exit other than synergy constant and tracing how the change in the likelihood of exit relates to the change in synergy, the theoretical model is able to diagnose the causal effect. As a result, while the formalization lacks the external validity of other research approaches (*e.g*., large-sample statistical analyses), it also avoids some of the limitations that

beset these methodologies (*e.g*., identification, measurement challenges for underlying mechanisms involving particular types of synergy, *etc*.). The relationships identified by formal models can then be used as the basis for follow-on empirical analyses and for the elaboration of heuristics that executives can use when making business exit decisions.

The model's output is novel in that it isolates a set of conditions for which *synergy raises the odds of business exit*, thus reversing the negative effect on exit that was universally ascribed to synergy. These conditions are specified using (a) a broader conception of synergy, (b) determinants of resource redeployment, and (c) determinants of divestiture that are all reviewed in turn in the next section. The casual pathway that involves the following six conditions is shown in Figure 2. A first necessary, but not sufficient, condition is that business exit does not stop synergy. This condition concurs with the existing broader conception of synergy and enables a new casual effect of synergy on exit, in addition to the traditional negative effect of synergy on exit that assumed that exit should always compromise synergy. The mere presence of another casual mechanism, however, does not guarantee that synergy stops being an exit barrier or that it can instead stimulate exit.

A second necessary condition is that the cost of exiting a business *via* divestiture is high. With high costs, divestiture becomes unattractive, thus opening the possibility that the counterintuitive positive effect of synergy on exit can be observed when a business is exited *via* redeployment instead. That positive effect cannot be realized when a business is exited *via* divestiture because the divested resources are eliminated from the firm's portfolio, thus potentially compromising synergy.

The next two required conditions make exit *via* redeployment attractive: a third condition is that the cost of exiting a business *via* redeployment is low, while a fourth condition is that returns in the exited business are not strongly positively correlated with returns in a firm's other businesses. The lack of a strong positive correlation enables the divergence of returns between a firm's businesses, thus inducing future redeployment of resources from the exited business. In turn, low redeployment costs eliminate an obstacle to exit that would make redeployment prohibitively expensive.

The last two conditions ensure that redeployment is not intrinsically valuable to such a high degree that exit by redeployment occurs anyway, regardless of synergy. Specifically, a fifth condition is that the initial return in a business that is a candidate for exit is similar to returns in a firm's other businesses. If that condition is violated and the to-be-exited business currently underperforms the firm's other businesses by a lot, the firm will exit that business anyway, regardless of synergy. A sixth necessary condition is that volatility of returns in a firm's businesses is low. If that condition is not met and the firm's businesses are highly volatile, that high volatility will expand the bands for future returns and create many future scenarios with very substantial underperformance of a business that is a candidate for exit, leading to the exit in those cases, regardless of synergy. Finally, when all the six necessary conditions are satisfied, synergy amplifies the benefits of the moderately attractive redeployment such that synergy has the counterintuitive, but causal, positive effect on exit.

Insert Figure 2 about here

Each of the six conditions that are necessary to change synergy from a barrier to a stimulus for exit are discussed in detail in the results section, but taken together they have at least two broad implications for corporate strategy research. First, the results elaborate upon the strategic management field's theory about exit barriers. Since the beginning of that theory in the 1970s (Porter 1976), synergy has been strongly believed to be a key barrier to business exit. Multiple studies sought to support that idea empirically (Chang 1996; Duhaime and Grant 1984; Harrigan 1980; 1981; Lien and Klein 2013) and formally (Lieberman *et al*. 2017). The model in this paper does not suggest that the argument was wrong. Instead, the model takes up the presumption that this idea is always true, by rigorously identifying the boundary conditions for synergy to be a barrier, or stimulus, to exit. The presence of such conditions, which are logically derived from the existing academic research on synergy and on business exit, should facilitate better empirical tests, instead of indiscriminately seeking to confirm the hypothesis that synergy precludes exit. The knowledge of these conditions can also inform executives' exit decisions.

Second, the results of the study complement the emerging research on the choices that firms can make among alternative exit modes (Lieberman *et al*. 2017; Feldman and Sakhartov 2020). As the

interactions of synergy with the determinants of resource redeployment and of divestiture demonstrate, synergy importantly interferes with that choice. Parameters used to formally derive the results that underlie these two broad implications for future research as well as practice are first introduced qualitatively in the review of the relevant literature immediately below. Subsequent sections derive the formal model and provide analyses isolating conditions under which synergy acts as a barrier, or stimulus, to business ext.

THEORETICAL BACKGROUND

Synergy in corporate strategy research

Synergy was first introduced to strategy research during the merger wave of the 1960s when firms accumulated so much cash and other resources that they sought to enter new businesses through acquisitions and put the excess resources to use.[2] At that time, perhaps not surprisingly, corporate strategy formed as a major branch of strategy research. While business strategy focused on how a firm gains and sustains a competitive advantage in a particular business, corporate strategy started to explain how merged firms can enjoy corporate advantages over independent operation of the single-business firms:

> Synergy… is one of the major components of the firm's product-market strategy. It is concerned with the desired characteristics of fit between the firm and its new product-market entries… It is frequently described as the '2+2=5' effect to denote the fact that the firm seeks a product-market posture with a combined performance that is greater than the sum of its parts. (Ansoff 1965, p. 75)[3]

[2] The authors thank a reviewer for suggestions on clarifying the objectives of this theoretical background. The purpose of this section is not to provide a comprehensive review of conceptualizations, operationalizations, and classifications of synergy. Such work has been done in many studies (*e.g*., Collis and Montgomery 1998; Porter 1987; Seth 1990; Singh and Montgomery 1987; Walter and Barney 1990). Instead, this section provides the original definition of synergy in corporate strategy research by Ansoff (1965) that did not demand that synergy disappear upon exit; the section also uses a few examples of accounts of synergy (*i.e*., Karim 2006; Karim and Mitchell 2000; Walter and Barney 1990) that comply with the original broad definition.

[3] This quote from Ansoff (1965) has remained the predominant way of defining synergy in corporate strategy literature. For example, Collis and Montgomery (2005: 78) referred to synergy as a "mathematical equation in which two plus two equals five." Also, the requirement that synergy in corporate acquisitions breaks down the equation "2+2=4" was highlighted by Chatterjee (1986: 120): "the term 'synergy' is used in the literature because the value creation implies a breakdown in the value additivity principle for the merged entity." Hill *et al*. (1992: 502) reiterated Ansoff's (1965) definition as follows: "Providing precision to the term 'synergy'… simply means that for two outputs, XI and X2, the value created by their joint production is greater than the value created if they are produced separately." Finally, in a recent comprehensive review of the literature on synergy in corporate acquisitions, Feldman and Hernandez (2018: 1) summarized that synergy has been defined in that literature as "a combination of two firm's assets that are more valuable together than they are separately."

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Ansoff (1965) elaborated that, when businesses in a multi-business firm are related, that firm can share such resources as distribution channels, sales forces, R&D, advertising, warehouses, manufacturing plants, and management expertise across its businesses to create synergy. "Relatedness" in this context represents the similarity between businesses combined by a firm (Rumelt 1974). Because technological and marketing knowledge is "scale free" (Levinthal and Wu 2010), a firm can apply knowledge created in one business to another similar business, avoiding the withdrawal of that scale free resource from the original business and avoiding costly duplication in knowledge development (Bryce and Winter 2009; Porter 1987; Teece 1980; Teece *et al*. 1994).[4] In turn, the sharing of the distribution channels and of sales forces can add the 'demand-side synergy' that occurs when a firm offers several products to the same customer, thus adding the convenience of one-stop shopping and raising the consumers' willingness-to-pay (Lieberman *et al*. 2017; Ye, Priem, and Alshwer 2012). Besides synergy that was linked to the contemporaneous sharing of resources between related businesses, Ansoff (1965) discussed 'startup synergy' that did not require resource sharing on an ongoing basis and occurred due to faster implementation, lower costs, and lower risks of attaining the needed resources from an acquired firm than of creating them in-house:

> It is not uncommon to find instances where a large and fully competent organization is better off to buy a development from a smaller firm which can develop it cheaper by virtue of greater flexibility and lower overheads. (Ansoff 1965, p. 200)

Subsequent corporate strategy research has extended the list of synergies that do not require the contemporaneous sharing of a firm's resources across businesses. Thus, Walter and Barney (1990) classified synergy sought in corporate mergers into 20 types, each of which was measured separately by interviewing professional acquisition intermediaries. At least five out of the 20 types raised in that study correspond to what Ansoff (1965) named 'startup synergy' and are not directly linked to contemporaneous resource sharing *per se*: (a) the merger promotes visibility with investors, bankers, or

[4] The authors thank the anonymous reviewer for the idea that gradual learning of knowledge that resides in one business by another business can make this benefit more longitudinal, and thus demanding that the firm persist in both businesses, than would be in the case when all knowledge is learned immediately.

governments; (b) the merger broadens the customer base for existing goods and services of the acquiring company at less cost than developing that expansion internally; (c) the merger expands manufacturing capacity of the acquiring company at less cost than creating new facilities, equipment, and/or physical assets; (d) the merger lets the acquiring firm use the target's purchasing and procurement systems at less cost than improving them internally; and (e) the merger lets the acquiring company utilize the target's personnel, skills, or technology at less cost than developing those resources otherwise. Indeed, a multi-business firm that is formed in the merger can continue to reap benefits of the promoted visibility (*i.e*., 'a') even after divesting the acquired firm or redeploying resources of the acquired firm to the acquirer's business. Similarly, the acquiring firm can keep the advanced customer base (*i.e.* 'b'), manufacturing facilities (*i.e.,* 'c'), purchasing and procurement (*i.e.,* 'd'), and personnel and technology (*i.e.,* 'e') while discontinuing the target's business and thus stopping the resource sharing.

Finally, some accounts of synergy consider gains that accrue to merging firms when these firms recombine their resources after the deal (Capron, Dussauge and Mitchell 1998; Capron, Mitchell and Swaminathan 2001; Karim 2006; Karim and Mitchell 2000). For example, transformation of an acquirer's international strategy or organizational structure made possible by an acquisition (*e.g*., Cadbury Schweppes' acquisition of Adams and movement from a multidomestic to a more global approach) can bring benefits independent of the continuation of the acquired business in the combined entity. More broadly, Karim and Mitchell (2000) described that this recombination involves changing resources of merging firms. With such a recombination, merging firms seek new mechanisms to assemble routines that underlie different resources; thanks to this search, the merged firm creates valuable and unique resources (Karim and Mitchell 2000). Some of these recent accounts of synergy also involve the reconfiguration of merged businesses and even link the attainment of synergy to business exit instead of demanding the continuation of those businesses. Specifically, both Karim and Mitchell (2000) and Karim (2006) operationalized such reconfiguration with cases where one party of the merger exits its businesses, thus stopping the sharing of resources between businesses.

Resource redeployment and divestiture as exit modes

Corporate strategy research has classified business exit into two distinct modes: a firm can exit its business by divesting it or by redeploying resources from it to other businesses (Feldman and Sakhartov 2020; Lieberman *et al*. 2017). Divestiture is 'the sale of all or part of an operating unit by an ongoing firm' (Vidal and Mitchell 2015, p. 1101), while redeployment is the exercise of 'an option to withdraw resources from one product market and transfer them to another' (Sakhartov and Folta 2014, p. 1781).[5] The next two subsections review determinants of redeployment and of divestiture.

Determinants of resource redeployment

Penrose (1959) highlighted 'inducements' as a key determinant of resource redeployment. Such inducements represent an advantage in performance of a business to which resources are redeployed over the business which is exited through the withdrawal of those resources. Another way to think about inducements is to consider them an opportunity cost to the continued use of resources in a business that underperforms (Levinthal and Wu 2010). As Figure 1 shows, theoretical work on resource redeployment operationalized inducements as the initial return advantage in the recipient business (Sakhartov 2017; 2018; Sakhartov and Folta 2015), as volatility of returns in a firm's businesses (Kogut and Kulatilaka 1994; Sakhartov 2017; 2018; Sakhartov and Folta 2014; 2015; Triantis and Hodder 1990), or as lack of correlation of those returns (Sakhartov 2017; 2018; Sakhartov and Folta 2015; Triantis and Hodder 1990). Sakhartov and Folta (2015) clarified that each of these inducements of resource redeployment has a unique role. Specifically, correlation makes returns in two businesses converge, thus reducing the odds of a *future* return advantage in the recipient business, so lower correlations provide inducements for redeployment. Volatility expands confidence bands for returns and enables greater *future* return

[5] Before Helfat and Eisenhardt (2004) introduced the term "inter-temporal economies of scope," the use of resource redeployment had often been confused with synergy. Meanwhile, as the provided definition of resource redeployment that is based on Helfat and Eisenhardt (2004) shows, the attribute that is unique to resource redeployment is the withdrawal of resources from a business. Thus, withdrawal of resources makes resource redeployment inter-temporal: resources that were used in one business in the past are no longer used in that business and are deployed instead in another business in the next time period. Research after Helfat and Eisenhardt (2004), such as Lieberman *et al*. (2017), Sakhartov (2017), and Sakhartov and Folta (2014), has kept resource redeployment separate from synergy.

advantages in the recipient business. The initial return advantage *instantaneously* puts the return in the recipient business above the exited business. In line with the theoretical conception of inducements, the role of the performance advantage as a primary stimulus for redeployment was confirmed in case studies (Chandler 1962; Penrose 1960) and in empirical work (Anand 2004; Anand and Singh 1997; Wu 2013). Sakhartov and Folta (2015) formally demonstrated that the three proxies for inducements interact with each other, thus demanding that inducements be considered in their entirety to explain redeployment.

Researchers have also regarded redeployment costs as an 'obstacle' to redeployment (Penrose 1959). Montgomery and Wernerfelt (1988) explained that such costs represent a loss in efficiency that occurs when resources are redeployed to a different business. That loss is smaller when a firm redeploys resources to a more related businesses because relatedness (*i.e.*, the similarity of resource requirements between businesses) reduces the need to retrain employees and to adjust manufacturing equipment. Accordingly, theoretical work incorporated redeployment costs in the modeling of resource redeployment (Feldman and Sakhartov 2020; Sakhartov 2017; 2018; Sakhartov and Folta 2015). Empirical research on resource redeployment often operationalized redeployment costs inversely with relatedness between a business from which resources are withdrawn and a business to which they are redeployed (Anand and Singh 1997; Lieberman *et al*. 2017; Wu 2013). Studies that captured redeployment costs with relatedness nearly always measured relatedness between two businesses as their affiliation with the same broad industry classification group. Finally, Sakhartov and Folta (2015) formally derived that redeployment costs interact with inducements, thus demonstrating the need to assess the combined effect of those determinants in predicting resource redeployment.

Ultimately, a few recent studies have identified synergy as a parameter that either directly reduces the odds of resource redeployment or, at least, mitigates the effects of other determinants of redeployment on exit. Thus, Sakhartov and Folta (2014), Sakhartov (2017), and Lieberman *et al*. (2017) cast synergy as an enhancement in performance of a multi-business firm that shares resources contemporaneously across its businesses over performance those businesses would have if they were operated as independent single-business firms. Because the highest value from redeployment of resources from one business to another

business is realized when the resources are withdrawn from the original business and thus are no longer shared, synergy was therefore argued to reduce the proclivity of a firm to exit the involved business. In line with that expectation, the formal model in Lieberman *et al*. (2017) diagnosed that, when redeployment costs are low, exit by redeployment is reduced by synergy. The same model demonstrated that synergy suppresses the effect of redeployment costs on the odds of exit by redeployment. Likewise, Sakhartov and Folta (2014) formally derived that the effects of redeployment costs and of return volatility on the value realized by a firm in exiting a business by redeployment are mitigated by synergy. In addition, the formal model in Sakhartov (2017) illustrated that synergy suppresses the effect of redeployment costs on resource redeployment. We therefore wish to examine in the present analysis the effects of alternative types of synergy that are not extinguished upon redeployment.[6]

Determinants of divestiture

Previous research has proposed that low performance of a firm overall and of a specific business that is a candidate for exit is a key motivation for divestiture. Most empirical studies of this exit mode confirmed that poor performance of a divesting firm (Berry 2010; Chang 1996; Damaraju, Barney and Makhija 2015; Duhaime and Grant 1984; Jain 1985; Markides 1992; Montgomery and Thomas 1987; Ravenscraft and Scherer 1991; Schlingemann, Stulz, and Walkling 2002) or of a divested unit (Duhaime and Grant 1984; Ravenscraft and Scherer 1991; Vidal and Mitchell 2015) raised the odds that the focal business would be divested.

Exit by divestiture is also affected by 'barriers to exit'. Porter (1976) and Harrigan (1980; 1981) classified exit barriers into three groups: (a) divestiture costs incurred in selling a business on the factor market, (b) synergy of the business with the firm's other businesses, and (c) reluctance of the firm's managers to exit the business due to inadequately high expectations for its future performance or due to a

[6] The authors thank the reviewer for mentionin the possibility that return correlation is codetermined with relatedness so that strongly related business have strongly positively correlated returns. Although the initial ideas about such a relationship have not been fully worked out either conceptually or empirically, Sakhartov and Folta (2015) demonstrated the lack of a strong relationship between relatedness and correlation. Instead of assuming a specific relationship that has never been proven, this study (just like Sakhartov 2017 as well as Sakhartov and Folta 2015) remains agnostic with regard to the relationship between relatedness and return correlation. The model introduced in the next section accommodates any relationship between them.

conflict of the divestiture with private agendas of those managers. Extant research robustly confirmed that the three barriers impede divestiture. Thus, Feldman and Sakhartov (2020) illustrated formally that exit by divestiture is suppressed by divestiture costs. Schlingemann *et al*. (2002) demonstrated empirically the presence of the first barrier by showing that firms were less likely to sell businesses that operated in less liquid markets for corporate assets. Harrigan (1981) empirically confirmed the potency of the second barrier by showing that synergy of focal businesses with other businesses operated by firms (*i.e*., the sharing of reputation, facilities, strong customers, and advertising) deterred exit by those firms from the focal businesses, even when those focal businesses declined. Also, Chang (1996) corroborated the role of synergy as an exit barrier by finding a negative relationship between divestiture of a business by a firm and the applicability of that firm's knowledge across that business and the firm's other businesses; the cross-applicability of knowledge was operationalized as resource relatedness between the firm's businesses. Like relatedness involved in redeployment costs, relatedness present with synergy was often measured as the affiliation of two businesses with the same broad industry classification group. Finally, Harrigan (1981) verified empirically the strength of the third barrier by finding a negative relationship between divestiture of a focal business and managerial expectations of enduring demand in that business.[7]

Although divestiture has recently been positioned as a strategic alternative to resource redeployment (Lieberman *et al*. 2017; Feldman and Sakhartov 2020), most research on exit has focused either on divestiture (Berry 2010; Chang 1996; Capron *et al*. 2001; Dickler and Bausch 2016; Feldman 2014) or on redeployment (Anand and Singh 1997; Chandler 1962; Penrose 1960; Sakhartov 2017; Sakhartov and Folta 2014; 2015), or conflated the two exit modes empirically (O'Brien and Folta 2009; Miller and Yang 2016). In formal analyses presented below, we therefore model business exit *via* divestiture or redeployment, as we investigate how alternative types of synergy potentially shape exit barriers for these alternative modes of business exit.

[7] Besides performance and exit barriers, theoretical (Dixit 1989) and empirical (O'Brien & Folta 2009) studies on real options suggested that uncertainty about performance of a firm's businesses reduces the proclivity of the firm to exit its businesses. Although those arguments were not explicitly linked to divestiture as a mode of exit, they were not attributed uniquely to redeployment either. To avoid the risk of omitting the implied relationship, Figure 1 connects volatilities with divestiture.

Summary of the reviewed literature

The undertaken review of the literature on the alternative modes of exit and on synergy identifies the following three limitations in the existing research that we seek to address in the present paper. First, the argument that synergy acts as a barrier to exit was restricted to the understanding of synergy as the benefit that occurs only at the time when a firm contemporaneously shares resources across its businesses. By contrast, some accounts of synergy are broader and include the time after the resource sharing across businesses concludes. Second, like redeployment costs, at least some types of synergy are affected by relatedness, a codetermination that has not been unpacked and disentangled empirically in previous research. Because relatedness involved in redeployment enables exit by lowering redeployment costs while relatedness involved in synergy due to contemporaneous sharing of resources discourages both types of exit, the difficulty of separating the two ramifications of relatedness has resulted in ambiguity regarding whether synergy indeed suppresses business exit (*e.g.*, Lieberman *et al*. 2017). Third, because synergy affects both redeployment and divestiture and because the two are competing exit modes with interacting determinants, the identification of the ultimate effect of synergy on exit demands a theoretical understanding of that effect in the context where exit can be done through redeployment or through divestiture. This suggests that both modes of exit should be considered at once in analyses. Considering these limitations, the next section builds a formal model that enables alternative conceptions of synergy raised in the previous research, that separates the operationalizations of synergy and redeployment costs from each other, and that accommodates business exit by redeployment or by divestiture.

MODEL

The model considers a firm that, at the initial time $t = 0$, consists of two businesses, i and j. The firm deploys proportion m_{i0} of its resources in business i and the remaining proportion $(1 - m_{i0})$ in business j. Without loss of generality, the model is specified so that the firm remains in business i until the end of the useful life of its resources $t = T$ but it can exit business j by using one of the following two exit

modes at any time between $t = 0$ and $t = T$. First, the firm can exit business j by redeploying all resources that were originally used in that business to business i. Second, the firm can divest business j and keep the proceeds from that sale. The model involves three essential parts: (a) a specification of margins in the firm's businesses, (b) a specification of the current net cash flow of the firm, and (c) a specification of the business exit decision. These three parts of the model are described in turn below.

Margins in the firm's businesses

Following precedents of modeling business exit by resource redeployment (Sakhartov 2018; Sakhartov and Folta 2014; 2015) and by divestiture (Feldman and Sakhartov 2020), margins in the firm's two businesses are modeled as exogenous and uncertain. Namely, margins C_{it} and C_{jt} in businesses i and j, respectively, follow geometric Brownian motions:

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

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

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

Besides its prevalence in models of the exit options, this specification makes a reasonable assumption that uncertain variables C_{it} and C_{jt} get more difficult to predict farther into the future. In Equations 1–3, C_{i0} and C_{j0} are margins in businesses i and j at the initial time $t = 0$; μ_i and μ_j are drifts for the 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 model accommodates Penrose's (1959) idea that exit from business j by redeployment is 'induced' by the advantage of business i over business j. In particular, the specification captures the three dimensions of inducements that were noted earlier: (a) the current return advantage, $\left(C_{i0} - C_{j0}\right)\big/C_{j0}$, of business i over business j (Sakhartov 2017; 2018; Sakhartov and

Folta 2015); (b) volatilities, σ_i and σ_j, of returns in both businesses (Kogut and Kulatilaka 1994; Sakhartov 2017; 2018; Sakhartov and Folta 2014; 2015; Triantis and Hodder 1990); and (c) correlation, ρ, of these returns (Sakhartov 2017; 2018; Sakhartov and Folta 2015; Triantis and Hodder 1990). Finally, this specification accommodates the idea of Duhaime and Grant (1984) that divestiture of j is motivated either by poor performance in j (*i.e.*, low C_{jt}) or by poor performance of the firm overall (*i.e.*, low C_{it} paired with low C_{jt}).

Current net cash flow of the firm

Besides its dependence on the uncertain margins in the firm's businesses, the current net cash flow of the firm, F_t^{xy}, depends on (a) the choice of the firm to stay in business j, to exit business j by redeploying all resources from it to business i, or to exit business j by divesting it; (b) the specification of synergy; (c) the specification of the redeployment cost; and (d) the specification of the proceeds from divestiture. If the firm stays in business j at time t, it continues to deploy proportion m_{i0} of its resources in business i and the remaining proportion $(1-m_{i0})$ in business j, thus realizing the following current net cash flow:

$$F_t^{xy} = \beta m_{i0} C_{it}^x + (1-m_{i0}) C_{jt}^y . \qquad (4)$$

In Equation 4, $\beta \geq 1$ is the synergy factor that raises the return to the use of a unit of the firm's resources in business i due to synergy of this business with business j; C_{it}^x and C_{jt}^y are the current realizations for margins C_{it} and C_{jt}; whereas F_t^{xy} is the firm's current net cash flow that stems from these realizations. In this specification, the condition that $\beta > 1$ ensures the presence of synergy and complies with the existence of the '2+2=5' effect where the combined performance of the firm

$\beta m_{i0}C_{it}^{x} + (1-m_{i0})C_{jt}^{y}$ is greater than the sum of its parts performance $m_{i0}C_{it}^{x} + (1-m_{i0})C_{jt}^{y}$ (Ansoff, 1965: 75).[8]

If the firm exits business j by redeploying all resources from that business to business i and if synergy is restricted to the permanent sharing of resources between the firm's businesses, the current net cash flow realized by the firm at time t is as follows:

$$F_t^{xy} = C_{it}^{x} - S(1-m_{i0})C_{it}^{x}. \qquad (5)$$

Equation 5 replicates previous accounts of redeployment costs. Namely, like Sakhartov and Folta (2014), this model assumes that such costs represent the loss in efficiency of deploying resources in the new use relative to their continued deployment in that use; the loss is mitigated by relatedness (Montgomery and Wernerfelt 1988). Because the model captures such efficiency with margin C_{it}, the total costs of redeploying resources to business i is a product of that margin, of the marginal redeployment cost, S; and of the amount of redeployed resources, $(1-m_{i0})$. The current net cash flow, F_t^{xy}, of the firm does not depend on the realization of the margin, C_{jt}^{y} because business j is exited at time t.

If the firm exits business j by redeploying all resources from that business to business i and if synergy is not restricted to the contemporaneous sharing of resources between the firm's businesses, the current net cash flow realized by the firm at time t is as follows:

$$F_t^{xy} = \beta C_{it}^{x} - S(1-m_{i0})C_{it}^{x}. \qquad (6)$$

Like in Equation 4, the synergy factor $\beta \geq 1$ increases the return to the deployment of a unit of the firm's resources in business i due to synergy. In contrast to Equation 5, this enhancement continues after business j is exited because the synergistic resources are kept by the firm.[9]

[8] The marginal case $\beta = 1$ captures the possibility that there is no synergy, *i.e.*, '2+3=5' in terms of Ansoff's (1965) definition.

[9] Like in Equation 4, the marginal case $\beta = 0$ in Equation 6 accommodates the possible absence of synergy.

If the firm exits business j by divestiture and regardless of whether synergy is restricted to the contemporaneous sharing of resources, the current net cash flow of the firm is as follows:

$$F_t^{xy} = m_{i0}C_{it}^{x} + (1-\gamma)(1-m_{i0})\sum_{s=t}^{T} e^{-r(s-t)}\hat{C}_{js} \,. \qquad (7)$$

Equation 7 replicates the model of Feldman and Sakhartov (2019). Namely, if the firm divests business j, it attains the proceeds that are equal to the discounted net present value that similar firms would accumulate, on average (*i.e.*, with average margin $\hat{C}_{js}$), in using amount $(1-m_{i0})$ of resources in j from time $s=t$ to time $s=T$. The proceeds are reduced by 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).[10]

Business exit decision by the firm

With F_t^{xy} specified in Equations 4–7, the firm's current exit choice is characterized as follows:

$$\left(M_t^* \middle| M_{t-\partial t}\right) = \arg\max_{M_t}\left\{F_t^{xy} + e^{-r\partial t}E^{P^{ij}}\left[V_{t+\partial t}^{xy} \mid M_t^*\right]\right\}. \qquad (8)$$

In Equation 8, the firm's current choice takes three values, $M_t^* \in \{1,2,3\}$: (a) with $M_t^* = 1$, the firm stays in business j; (b) with $M_t^* = 2$, the firm exits j by redeploying resources to i; or (c) with $M_t^* = 3$, the firm exits j by divestiture. Equation 8 is the Bellman equation (Bellman 1957), which casts exit as a dynamically optimal choice. With such optimality, current choice M_t is assessed not only based on its current return , F_t^{xy} but also based on the effect that choice is expected to have on all future returns,

[10] With the broader definition of synergy that is discussed in the section titled 'Synergy in corporate strategy research,' some types of synergy may remain even after divestiture. With this possibility, Equation 7 would resemble Equation 6 and would be restated in the following way: $F_t^{xy} = \beta m_{i0}C_{it}^{x} + (1-\gamma)(1-m_{i0})\sum_{s=t}^{T} e^{-r(s-t)}\hat{C}_{js}$. The key result of this scenario is that it becomes even easier to diagnose the counterintuitive positive effect of synergy on exit. In particular, the second necessary condition for the positive effect of synergy on exit (*i.e.*, high divestiture costs) loses its potency, and synergy can promote exit even when the divestiture cost is low. The five other necessary conditions remain intact. The resuts for this scenario are available from the authors upon request.

$E^{P^{ij}}\left[V^{xy}_{t+\partial t} \mid M^{*}_{t}\right]$. Here, P^{ij} is the probability distribution for the two margins specified in Equations 1–3; $V^{xy}_{t+\partial t}$ represents value the firm will accumulate between the immediate next time $t+\partial t$ and the end of the useful life of its resources $t=T$; and r is the risk-free interest rate used for temporal discounting.

Another feature of Equation 8 is that it cannot return the unconditional choice M^{*}_{t} that is needed to analyze how synergy affects exit. 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 $(t-\partial t)$. The conditioning suggests that the scenario where business j is exited *via* resource redeployment (*i.e.*, $M^{*}_{t}=2$) is feasible only if the firm did not already exit j in the past (*i.e.*, $M^{*}_{t-\partial t}=1$). Likewise, the scenario where business j is exited *via* divestiture (*i.e.*, $M^{*}_{t}=3$) is feasible only if the firm did not already exit that business (*i.e.*, $M^{*}_{t-\partial t}=1$).

The options to exit business j at any time $t\in\left(0,T\right)$ are similar to American-type stock options, whose value and exercise time cannot be assessed analytically. With this intractability, Equation 8 splits the solution into a series of simpler problems that are amenable to a numerical solution. The exit choice is stated in a recursive form that uses backward induction to find choices $\left(M^{*}_{t}\middle|M_{t-\partial t}\right)$. The solution involves discretization of continuous-time distribution P^{ij}. Like Sakhartov and Folta (2015), this model follows Boyle, Evnine, and Gibbs (1989) and Cox, Ross, and Rubinstein (1979) to discretize Equations 1–3 with a binomial lattice, which preserves the mean and the variance of distribution P^{ij} if the time step ∂t on the lattice is small. On this lattice, the next-period margins $C_{it+\partial t}$ and $C_{jt+\partial t}$ have four states: $C^{u}_{it+\partial t}$ and $C^{u}_{jt+\partial t}$ with probability q^{uu}; $C^{u}_{it+\partial t}$ and $C^{d}_{jt+\partial t}$ with probability q^{ud}; $C^{d}_{it+\partial t}$ and $C^{u}_{jt+\partial t}$ with probability

q^{du}; or $C^{d}_{it+\partial t}$ and $C^{d}_{jt+\partial t}$ with probability q^{dd}.[11] Thus,

$E^{P^{ij}}\left[V^{xy}_{t+\partial t}\right] = q^{uu}V^{uu}_{t+\partial t} + q^{ud}V^{ud}_{t+\partial t} + q^{du}V^{du}_{t+\partial t} + q^{dd}V^{dd}_{t+\partial t}$ where $V^{uu}_{t+\partial t}$ is calculated using $C^{u}_{it+\partial t}$ and $C^{u}_{jt+\partial t}$; $V^{ud}_{t+\partial t}$ is estimated using $C^{u}_{it+\partial t}$ and $C^{d}_{jt+\partial t}$; $V^{du}_{t+\partial t}$, is assessed using $C^{d}_{it+\partial t}$ and $C^{u}_{jt+\partial t}$; and $V^{dd}_{t+\partial t}$ is computed using $C^{d}_{it+\partial t}$ and $C^{d}_{jt+\partial t}$.

The backward induction starts at the penultimate time $t = T - \partial t$ with the terminal condition $V^{xy}_{T} = 0$ suggesting that the firm's resources will have exhausted ability to generate cash flows by the immediate next time. The use of Equation 8 proceeds recursively backward in time with a time step ∂t until time $t = 0$. In each step going backward in time, the procedure returns optimal choice $\left(M^{*}_{t} \middle| M_{t-\partial t}\right)$ at time t that is conditioned on what the firm did in the immediate previous time $(t - \partial t)$. Because the firm starts in both businesses i and j (*i.e.*, $M_0 = 1$), the model then reverses the direction and goes recursively forward in time until time $t = T$. In each step going forward in time and for each combination of C^{x}_{it} and C^{y}_{jt}, the model returns unconditional choice M^{*}_{t} based on the known previous choice $M_{t-\partial t}$ and on the optimal conditional decision $\left(M^{*}_{t} \middle| M_{t-\partial t}\right)$ recovered in the backward induction. Finally, the probabilities of exit by redeployment (*i.e.*, $M^{*}_{t} = 2$) and by divestiture (*i.e.*, $M^{*}_{t} = 3$) in each time t is estimated by summarizing these instances weighted by probabilities of co-occurrence of C^{x}_{it} and C^{y}_{jt}.

RESULTS

As outlined above, the model identifies six conditions necessary to make synergy trigger, rather than impede, business exit: (a) exit does not stop synergy; (b) the divestiture cost is high; (c) the redeployment cost is low; (d) margins in the firm's businesses are not strongly positively correlated to each other; (e)

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

volatility of the margins is low; and (f) the margins are initially similar to each other. The first condition is tested in all reported results by comparing the effect of synergy on exit between alternative definitions of synergy. To check the necessity of each of the other five conditions, figures for each focal condition are created when the remaining four conditions are already met. If the variation of a parameter is not required for the proof of the respective condition, the following values are used to ensure that those four conditions are met: high divestiture cost $\gamma = 0.15$, low redeployment cost $S = 10$, zero return correlation $\rho = 0$, low volatility of the margins $\sigma_i = \sigma_j = 0.2$, and equal initial margins $C_{i0} = C_{j0} = 0.08$. If the variation of a parameter is needed for the proof of the respective condition, the range for the parameter is reported with the respective analysis. Other ancillary parameters take the following values: $T = 1$, $N = 200$, $r = 0.08$, and $m_{j0} = 0.2$. Finally, all figures in this section show the cumulative probability that redeployment, divestiture, or exit overall has happened by the middle of the resource lifecycle (*i.e.*, by $t = T/2$).

High divestiture cost

Figure 3 depicts the effect of synergy on exit when exit stops synergy (*i.e.*, the blue lines) and when exit does not stop synergy (*i.e.*, the red lines). Each of these cases is analyzed with low divestiture cost $\gamma = 0$ (*i.e.*, the two broken lines) and with high divestiture cost $\gamma = 0.15$ (*i.e.*, the two solid lines). The contrast in slope between the solid red line (where all the six necessary conditions are met) and the solid blue line (where exit stops synergy but the other five conditions are met) confirms that synergy can promote exit only when such exit does not stop synergy. In turn, the contrast between the upward slope of the solid red line and the downward slope of the broken red line (where the divestiture cost is not high but the other five conditions are met) confirms that synergy can stimulate exit only when the divestiture cost is high. It is noteworthy that the broken red line has a downward slope, thus demonstrating that just defining synergy in a broader sense (*i.e.*, as not eliminated by exit) does not make synergy promote business exit.

Insert Figure 3 about here

To explain the positive effect of synergy on exit, Figure 4 reports this effect separately for redeployment (*i.e.*, the two panels in the top row of the figure) and for divestiture (*i.e.*, the two panels in the middle row of the figure). The figure also extends the results in Figure 3 to a range of the divestiture cost $\gamma \in [0.00, 0.15]$. Thus, the bottom row of Figure 4 considers a more general context for the effect of synergy on exit overall, in which the lines from Figure 3 coincide with the left and with the right margins.

Insert Figure 4 about here

The two plots in the bottom row of Figure 4 have the same pattern for the odds of exit at their bottom margins (where trivial synergy does not affect exit regardless of how it is defined) but diverge from each other farther from these margins (where synergy is non-trivial). Specifically, in the plot at the bottom of Panel A, the broken white line encloses the area where synergy raises the odds of exit. In contrast, the plot at the bottom of Panel B does not have such an area. Because the two plots differ only in whether exit stops synergy, Figure 4 validates the first necessary condition diagnosed in contrasting the solid lines in Figure 3. The location of the marked area in the domain of higher divestiture costs validates the second necessary condition observed in comparing the red lines in Figure 3. The four graphs in the top and in the middle rows in Figure 4 show the source of the positive effect of synergy on exit. Thus, the two plots in the middle row are similar. Therefore, regardless of how synergy is defined, it always reduces the odds of divestiture. Because divestiture removes some resources from the firm, such elimination compromises synergy and is opposed by the firm. In contrast, the two plots in the top row differ from each other, thus driving the difference between the two graphs in the bottom row. Indeed, the positive effect of synergy on exit occurs with higher divestiture costs that make the firm prefer redeployment to divestiture. In contrast to divestiture, resource redeployment allows the firm to keep synergistic resources and to even improve their use by allocating them to the business with a higher margin.

Low redeployment cost

Figure 5 again shows the effect of synergy on exit when exit eliminates synergy and when exit does not stop synergy. In this figure, each of these cases is studied with low redeployment cost $S = 10$ and with

high redeployment cost $S = 50$. The difference in slope between the solid red line (where all the six necessary conditions are met) and the solid blue line (where exit stops synergy but the remaining five conditions are met) reconfirms that synergy can stimulate business exit only when exit does not stop synergy. Also, the difference between the upward slope of the solid red line and the downward slope of the broken red line (where the redeployment cost is not low but the other five conditions are met) validates the idea that synergy can facilitate business exit only when the redeployment cost is low.

Insert Figure 5 about here

Figure 6 breaks business exit into redeployment and divestiture. The analysis involves a range of the redeployment cost $S \in [0, 50]$. In the plot at the bottom of Panel A, the broken white line encircles the area where synergy promotes exit; Panel B does not have such an area. Accordingly, Figure 6 lends additional support to the first necessary condition for the positive effect of synergy on exit. The position of the marked area in the domain of lower redeployment costs corroborates the third necessary condition already diagnosed in comparing the red lines in Figure 5. The nearly identical topography of the two plots in the middle row of Figure 6 suggests that, regardless of the definition of synergy, it reduces the odds of divestiture. This negative effect of synergy on exit is stronger when higher redeployment costs do not let the firm exit the business *via* redeployment. In contrast to the similarity of the plots in the middle row of Figure 6, the plots in the top row of the figure differ from each other and explain the divergence between the graphs in the bottom row. Thus, the positive effect of synergy on exit overall occurs when lower costs of redeployment make the firm choose redeployment over divestiture. Because, with redeployment, the firm keeps synergistic resources and can raise the efficiency of their use, synergy stimulates such an exit.

Insert Figure 6 about here

Lack of strong positive correlation of returns between businesses

As earlier, Figure 7 displays the effect of synergy on exit when exit stops synergy and when exit does not stop synergy. In this figure, each of these contexts is broken into cases with zero correlation $\rho = 0$ and with strong positive correlation $\rho = 0.98$ between the two businesses' margins. The difference in slope

between the solid red line (where all the six necessary conditions are met) and the solid blue line (where exit stops synergy but the other five conditions are met) validates that synergy can promote exit only when such exit does not stop synergy. Moreover, the contrast in slope between the red lines corroborates the idea that synergy can induce exit only when returns in the firm's businesses are not perfectly positively correlated to each other.

Insert Figure 7 about here

Figure 8 separates redeployment from divestiture and uses a broad range of return correlations, *i.e.* $\rho \in [-0.98, 0.98]$. In the bottom plot in Panel A, the broken white line borders the area where synergy raises the odds of exit; while the bottom graph in Panel B lacks such an area. Thus, Figure 8 reconfirms the first necessary condition for the positive effect of synergy on exit. The location of the encircled area in the domain of less-than-perfectly-positive correlation validates the fourth necessary condition diagnosed in Figure 7. The similarity of the two graphs in the middle row of Figure 8 means that, regardless of how synergy is defined, it reduces the odds of divestiture. This negative effect is stronger when more positive correlation makes returns in both businesses converge to each other, thus reducing inducements for resource redeployment and increasing the firm's preference for divestiture. Unlike the plots in the middle row of Figure 8, the plots in the top row of the figure differ from each other, thus justifying the contrast between the two graphs for exit overall. Notably, the positive effect of synergy on exit overall occurs with less-than-perfectly-positive correlation that let the firm appreciate redeployment between the businesses that perform asymmetrically. Because redeployment improves the efficiency of the resource use and lets the firm keep synergistic resources, synergy promotes exit by redeployment in this case.

Insert Figure 8 about here

Low volatility of business returns

Figure 9 displays the effect of synergy on exit when synergy ends with exit and when synergy does not stop with exit. Each of these cases is split into scenarios with low volatility of margins $\sigma_i = \sigma_j = 0.20$

and with high volatility $\sigma_i = \sigma_j = 0.92$. The difference in slope between the solid lines reconfirms that synergy can stimulate exit only when such exit does not end synergy. Moreover, the contrast between the upward slope of the solid red line and the downward slope of the broken red line supports the condition that synergy can stimulate business exit only when returns in the firm's businesses are not highly volatile.

Insert Figure 9 about here

Figure 10 breaks exit into redeployment and divestiture and uses a range of return volatility $\sigma_i = \sigma_j \in [0.02, 0.92]$. In the bottom plot in Panel A, the broken white line encloses the area where synergy raises the odds of exit; while the bottom plot in Panel B lacks such an area. Thus, Figure 10 corroborates the first necessary condition for the positive effect of synergy on exit. The location of the marked area in the domain of lower volatility supports the fifth necessary condition already demonstrated with Figure 9. The similarity of the two graphs in the middle row of Figure 10 shows that, regardless of the conception of synergy, the odds of divestiture are always reduced by synergy. This negative effect is stronger when less volatile margins do not suffice to strongly induce redeployment. Unlike the plots in the middle row, the plots in the top row of Figure 10 differ from each other and justify the contrast between the two graphs in the bottom row. Namely, the positive effect of synergy on exit overall occurs with lower volatility because otherwise volatile margins would introduce large differences in future performance between the businesses and would make the firm redeploy resources anyway, regardless of synergy.

Insert Figure 10 about here

Similarity of initial returns between businesses

Finally, Figure 11 again indicates the effect of synergy on exit when synergy ends with exit and when synergy does not end with exit. For this figure, each of these cases is split into cases with similar initial margins $\left(C_{i0} - C_{j0}\right)/C_{j0} = 0$ and with dissimilar initial margins $\left(C_{i0} - C_{j0}\right)/C_{j0} = 25\%$. The difference in slope between the two solid lines reconfirms that synergy can trigger exit only when that exit does not

terminate synergy. Moreover, the contrast between the two red lines corroborates the idea that synergy can promote business exit only when the two margins are initially symmetric.

Insert Figure 11 about here

Figure 12 discriminates between redeployment and divestiture and uses a range of the current return advantage, *i.e.* $\left(C_{i0} - C_{j0}\right)\big/C_{j0} \in \left[0\%, 25\%\right]$. In the bottom plot in Panel A, the broken white line borders the area where synergy raises the odds of exit; whereas the bottom graph in Panel B does not have such an area. Accordingly, Figure 12 supports the first necessary condition for the positive effect of synergy on exit. The location of the marked area in lower current return advantages validates the sixth necessary condition already discussed with Figure 11. The similarity of the two graphs in the middle row of Figure 12 means that, regardless of the definition of synergy, it always diminishes the likelihood of exit by divestiture. This effect is stronger when margins in the two businesses are more similar to each other initially because otherwise different initial margins would induce the firm to exit the business by redeployment thus mitigating the effect on divestiture. Unlike the middle row of Figure 12, the plots in the top row differ from each other, thus justifying the contrast between the two plots for exit overall. In particular, the positive effect of synergy on exit overall occurs with more similar initial margins because otherwise dissimilar margins would make the firm switch resources anyway, regardless of synergy.

Insert Figure 12 about here

DISCUSSION

Does synergy inherent in multi-business firms hinder business exit? Theory in corporate strategy has for decades cast synergy as an exit barrier and, thus, has long answered this question in the affirmative (Harrigan 1981; Porter 1976). Because synergy often occurs when firms contemporaneously share resources across their businesses and because business exit interrupts such sharing, firms having synergy were expected to resist business exit, and rationally so. With this effect, multi-business firms were shown formally (Lieberman *et al*. 2017) and empirically (Chang 1996; Duhaim and Grant 1984; Harrigan 1980; 1981; Lien and Klein 2013; O'Brien and Folta 2009) to reduce the use of business exit in the presence of

synergy. However, we have suggested that it is important and insightful to return to Ansoff's (1965) original conception of synergies as well as the more recent appreciation that not all types of synergy demand the permanent sharing of resources (Walter and Barney 1990) and that synergy can continue after business exit (Karim 2006; Karim and Mitchell 2001). With this recognition, the ultimate effect of synergy on business exit is less certain than previously believed. Besides, determinants of exit other than synergy have been argued to interact with synergy in affecting exit in multi-business firms (Lieberman *et al*. 2017; Sakhartov 2017; Sakhartov and Folta 2014) and, therefore, can interfere with the effect of synergy on exit. To improve the understanding of the effect of synergy on business exit, this study develops a formal model of exit from a firm's business. Following recent precedents of modeling exit, the modeled firm is allowed to select whether to exit its business in the presence of synergy (Lieberman *et al*. 2017) and, if so, whether to undertake that exit *via* resource redeployment or *via* divestiture (Feldman and Sakhartov 2020).

The developed model demonstrates that, instead of always acting as an exit barrier, synergy can stimulate exit under some specific conditions. Namely, the model derives a set of conditions with which synergy actually increases, rather than decreases, the odds of exit. These conditions are specified using the determinants of exit by redeployment and by divestiture highlighted in existing research. When (a) synergy is not defined unnecessarily narrow as a benefit that ends with exit, such synergy induces exit if all of the other five conditions holds: (b) the cost of exiting a business *via* divestiture is high; (c) the cost of exiting a business *via* resource redeployment is low; (d) the return in the business that is a candidate for exit is not strongly positively correlated with returns in the firm's other businesses; (e) the current return in a business that is a candidate for exit is similar to returns in the firm's other businesses; and (f) returns in the firm's businesses are not highly volatile.

The derived conditions that turn synergy into a stimulus for business exit have three important implications for strategy research. First, these results elaborate the theory about exit barriers. Since the emergence of that theory decades ago (Porter, 1976), synergy has been firmly believed to be such a barrier. Many empirical (Chang 1996; Duhaim and Grant 1984; Harrigan 1980; 1981; Lien and Klein

2013) and formal (Lieberman *et al*. 2017) studies have tried to confirm a universal negative effect of synergy on business exit. Despite highlighting a positive effect of synergy on business exit, the results in this study do not contend that the popular idea that synergy is an exit barrier was wrong. Instead, the present investigation corrects the long-standing belief that the argument is always true, by rigorously identifying the boundary conditions for that argument, rather than by rejecting that argument completely.[12] The knowledge of such conditions, which are logically derived from the existing academic premises on synergy and on business exit, should improve empirical tests in research on exit and may also ultimately stimulate better exit decisions by managers. Thus, empiricists interested in business exit can confidently test the hypothesis that synergy is an exit barrier when synergy disappears with exit (*i.e*., the first branching out from the main path to the positive effect of synergy on exit in the flow in Figure 2). The hypothesis that synergy is an exit barrier can be reliably tested when the divestiture cost is low (*i.e*., the second branching out from the main path to the positive effect of synergy on exit in the flow in Figure 2). The hypothesis that synergy constrains exit can be confidently tested when the redeployment cost is not low (*i.e*., the third branching out from the main path to the positive effect of synergy on exit in the flow in Figure 2). The hypothesis that synergy is an exit barrier is expected to hold when returns in the firm's businesses are positively correlated with each other (*i.e*., the fourth branching out from the main path to the positive effect of synergy on exit in the flow in Figure 2). The hypothesis that synergy hampers exit should hold when returns in the firm's businesses do not have low volatility (*i.e*., the fifth branching out from the main path to the positive effect of synergy on exit in the flow in Figure 2). Finally, the hypothesis that synergy is an exit barrier can be tested when initial returns in the firm's businesses are not similar to each other (*i.e*., the sixth branching out from the path to the positive effect of synergy on exit in in Figure 2). In other words, to more-confidently test the hypothesis that synergy is an exit barrier, empiricists need to make sure that at least one of the derived six necessary conditions does not hold.

[12] As reviewed recently by Makadok, Burton, and Barney (2018), two important levels of theoretical contributions in strategic management are (a) the question 'When?' that is concerned with the identification of boundary conditions for existing theories, and (b) the question 'Why?' that is concerned with the identification of causal mechanisms. This study implements both 'a' and 'b'. In particular, with regard to 'a', this study derives boundary conditions for the preexisting proposition that synergy constrains business exit. With regard to 'b', this study identifies the causal mechanisms *via* which synergy can increases the odds of exit.

Second, the findings in this research extend the nascent focus on the choice that multi-business firms can make among alternative exit modes (Lieberman et al. 2017; Feldman and Sakhartov 2020). By avoiding the unnecessarily restrictive focus on divestiture for business exit and by considering the option for a firm to exit its business by resource redeployment, this study enriches the account of business exit by accommodating the alternatives available to executives. This fuller account revises some of the relationships reported in recent research that already allowed the modeled firms to choose how to exit business. As the diagnosed interactions of synergy with the determinants of resource redeployment and of divestiture reveal, synergy importantly interferes with that strategic choice of the exit mode.

Third, the results in this study add to the discussion of the complex role synergy plays in strategy. Whereas the importance of synergy in corporate strategy has been highlighted for more than 50 years (Ansoff 1965; Barney 1988; Karim 2006; Ahuja and Novelli 2017), the perils of synergy have also been recognized. The 'synergy trap' (Sirower 1997) was raised to reflect the limited understanding of synergy by managers, specifically in the contexts where managers buy synergy in the factor market. Similarly, the limited understanding of synergy by stock market participants was said to create the 'uniqueness paradox' that may lead to capital constraints to firms having unique synergies and complex strategies that analysts and others in capital markets might not understand (Litov, Moreton and Zenger 2012). Synergy was also argued to render substantial 'coordination costs' (Zhou 2011) that can even turn synergy into 'diseconomies of scope' (Rawley and Simcoe 2010). Moreover, synergy was maintained to introduce an opportunity cost to other valuable resource deployment strategies, such as resource redeployment (Lieberman *et al*. 2017; Sakhartov and Folta 2014). While embracing a more balanced appraisal of synergy like all those studies, this study focuses on the tradeoff, with which synergy has been said to add an opportunity cost to resource deployment strategies, and isolates cases where synergy indeed compromises such strategies from cases where it does not.

There are a number of interesting opportunities to build upon and extend this research in different directions to further advance corporate strategy research. To begin with, this study has considered multi-business firms in a very general way, and there are multiple ways to enrich the treatment of firm strategy

and organization. Future studies could distinguish between businesses operating in different product markets *versus* geographic markets in order to delve more deeply into product market and international diversification. In the latter case, the international dimension of corporate strategy implicates a number of additional, unique parameters that can figure into the model, including barriers to business exit (*e.g.*, local employment laws or other institutions) and inducements to redeployability (*e.g.*, exchange rates, macroeconomic risks in a host country, *etc*.), among others. The model might also be enriched by considering differences in ownership in business units in order to explore the implications of organizational form of businesses in the corporate portfolio. For instance, joint ventures present barriers to redeployment since a firm's partner has decision rights and bargaining power, just as divestiture might be impeded or facilitated by certain contractual provisions. In contracting with other parties upfront or upon business exit, information asymmetries will affect the terms of transactions as well and could be featured in formal analysis. As a final example of future research directions, the modes of business exit that this study has examined might be cast more broadly as part of corporate restructuring, which can include other alternatives that might be examined, including spinoffs and equity carveouts (*e.g.*, Corredor and Mahoney, 2021). All of these research directions permit new avenues for research into the specific roles that synergy plays in firms' corporate strategies. Within the broader field of strategic management, corporate strategy has been one of the most successful and impactful domains of research as well as practice over the years, and research in directions such as these holds the potential to revisit core ideas in the field, unpack various types of synergies and their unique implications, and ultimately better inform the business exit and corporate restructuring choices that executives make.

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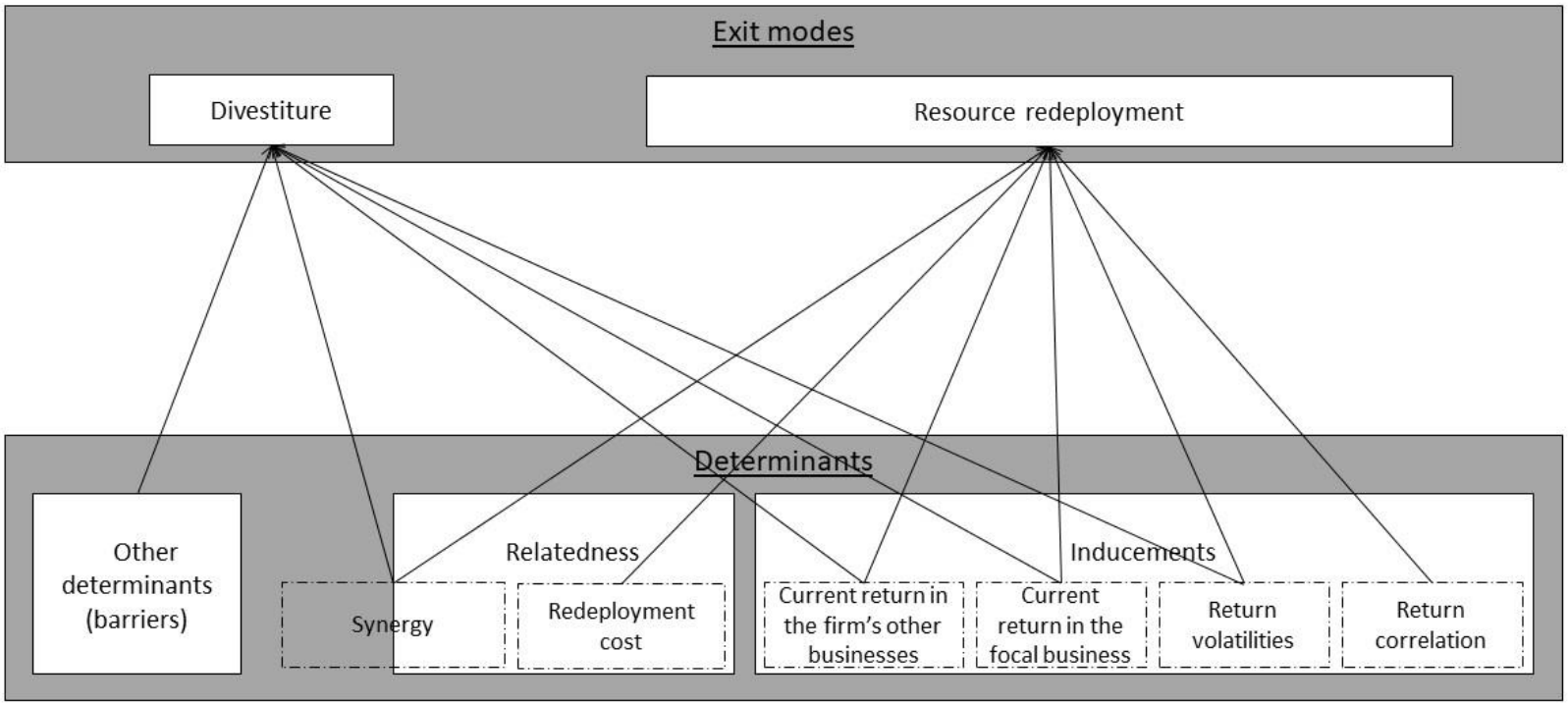


Figure 1. Determinants of business exit

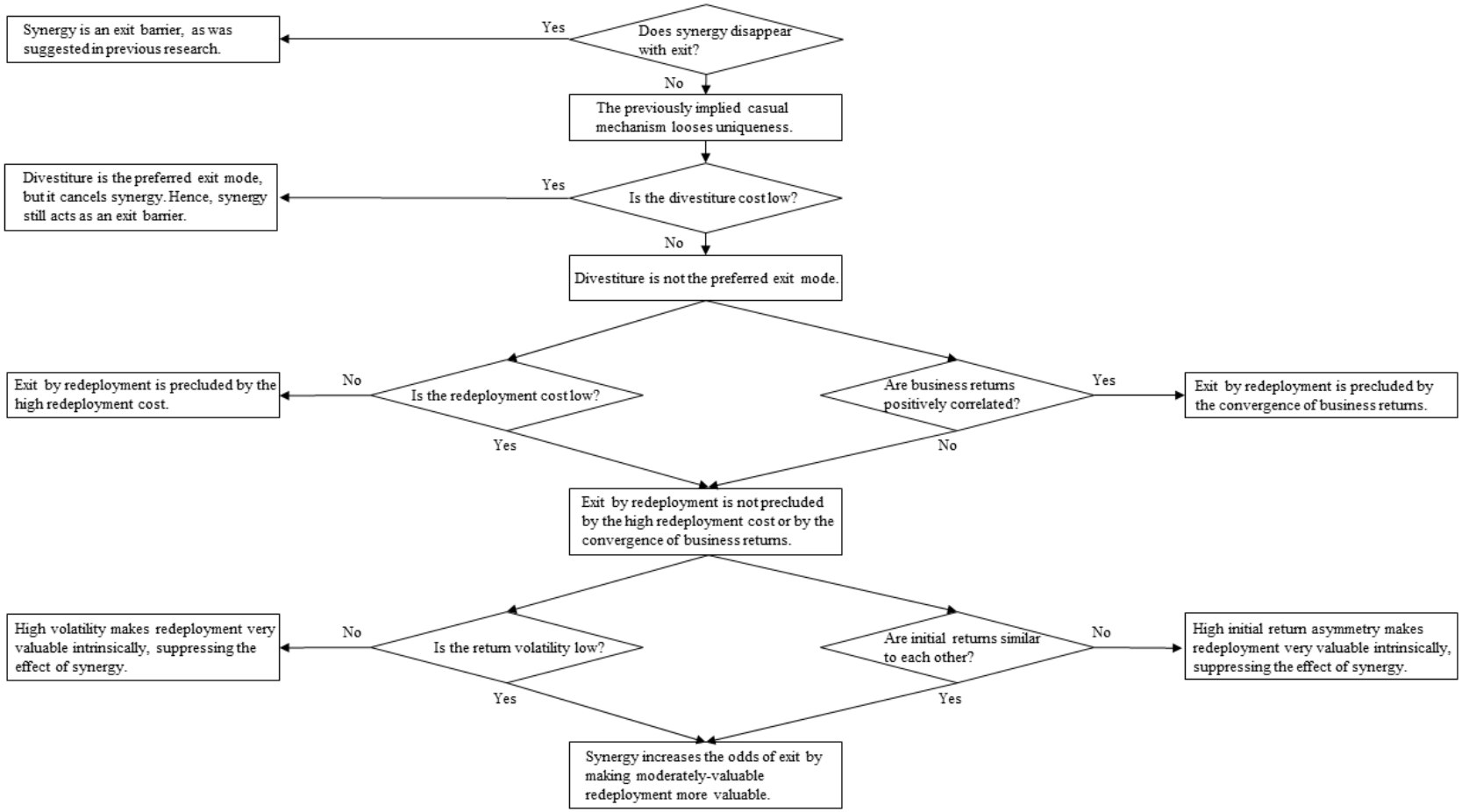


Figure 2. Path for the positive casual effect of synergy on business exit

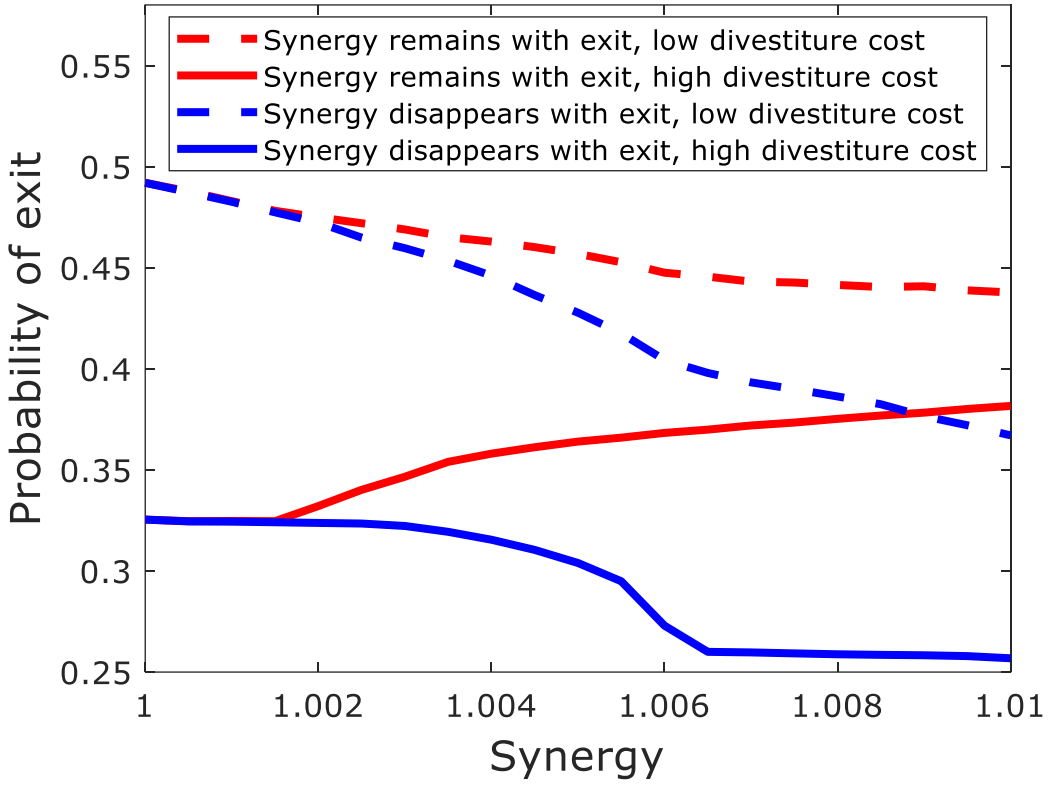
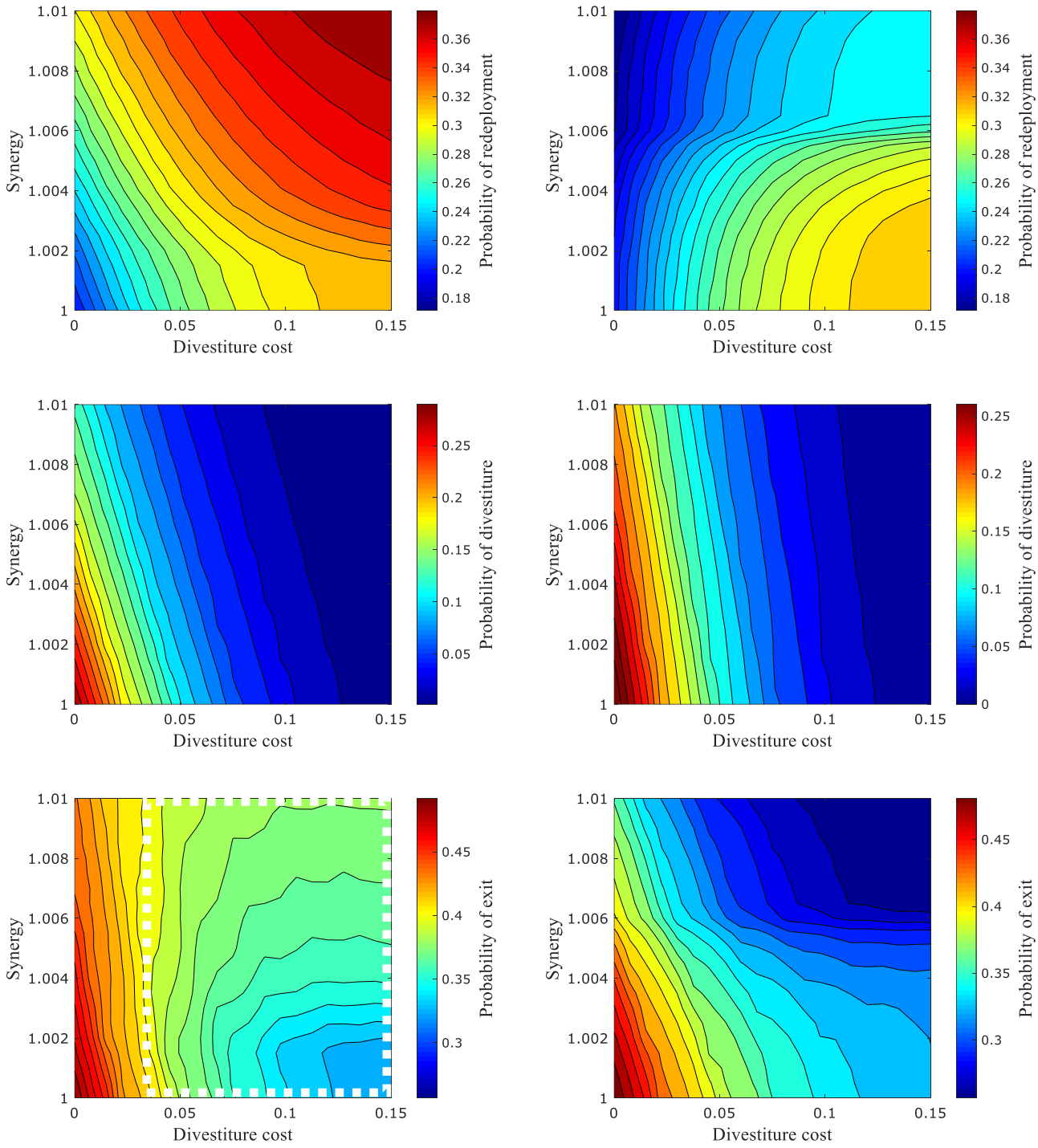


Figure 3. Relationship between cumulative odds of exit and synergy with various levels of divestiture cost



Panel A. Synergy remains with exit **Panel B. Synergy disappears with exit**

Figure 4. Cumulative odds of exit with various combinations of synergy and divestiture cost

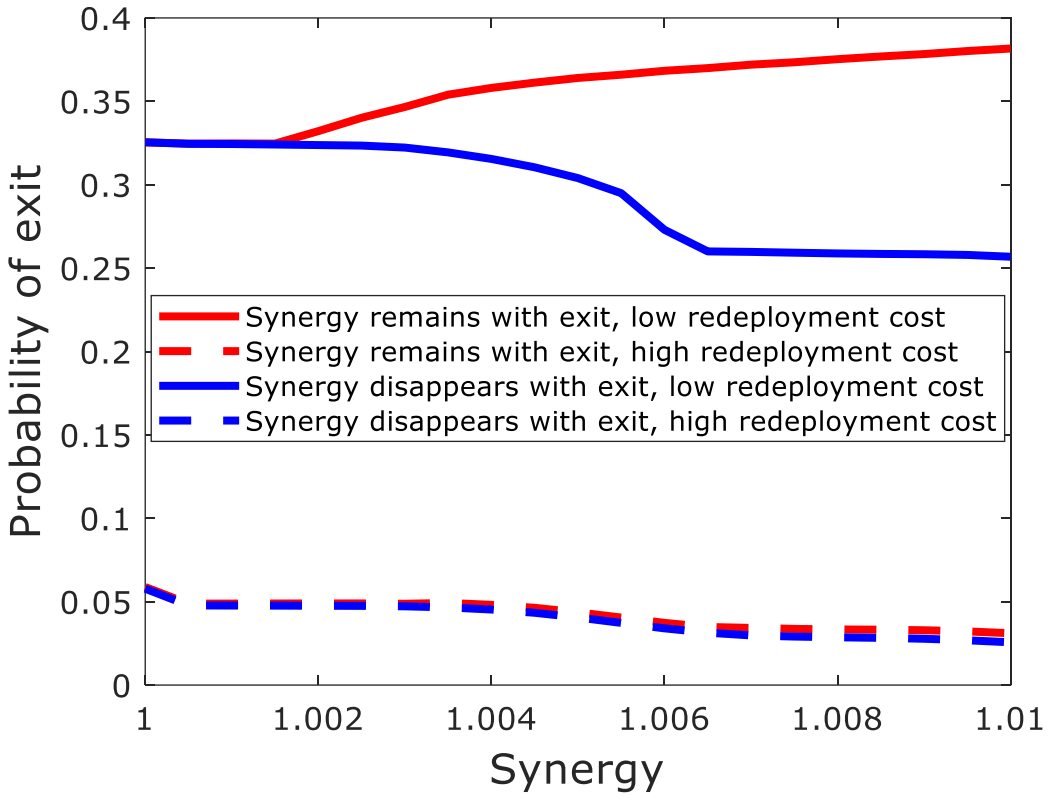
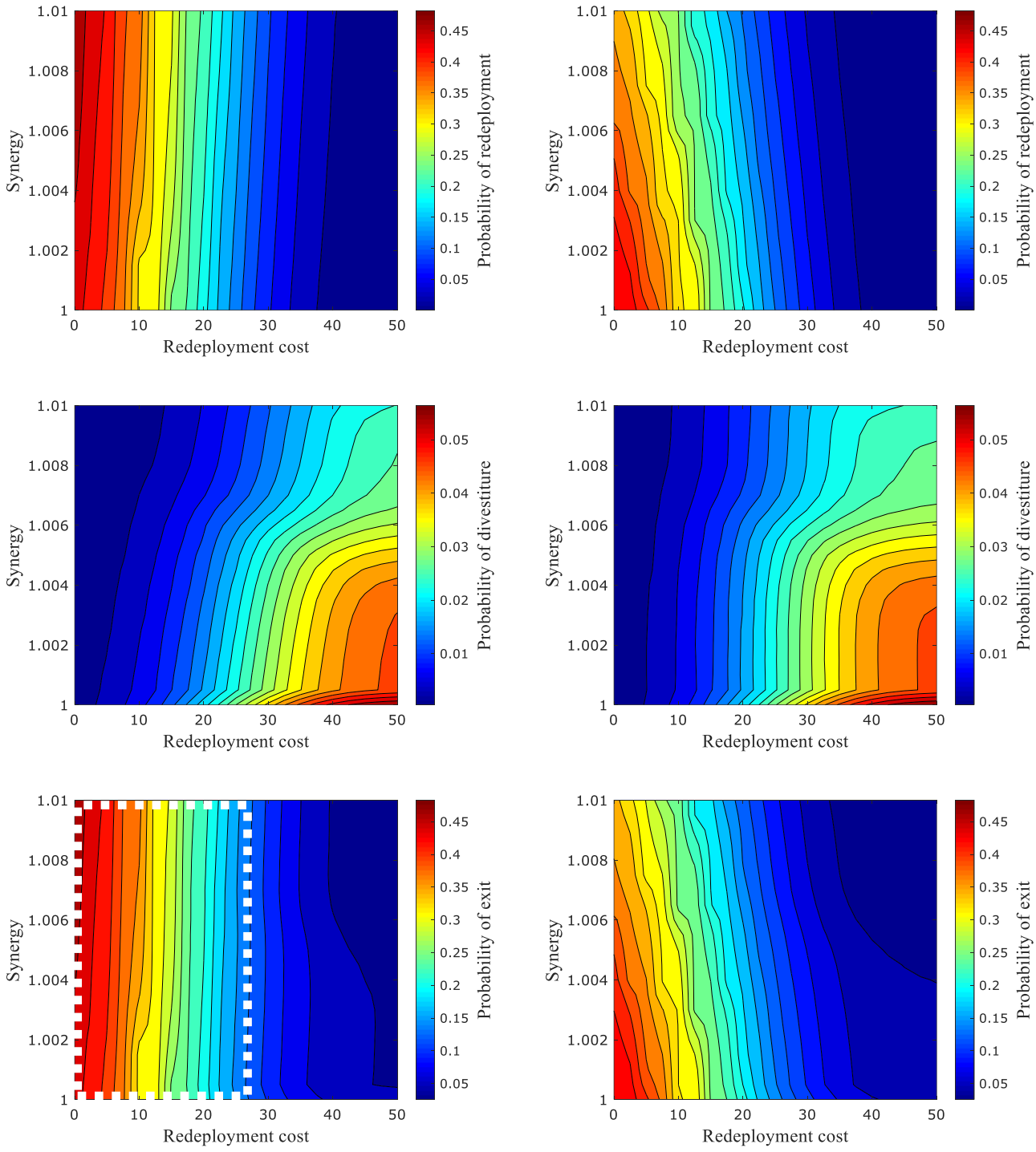


Figure 5. Relationship between cumulative odds of exit and synergy with various levels of redeployment cost



Panel A. Synergy remains with exit **Panel B. Synergy disappears with exit**

Figure 6. Cumulative odds of exit with various combinations of synergy and redeployment cost

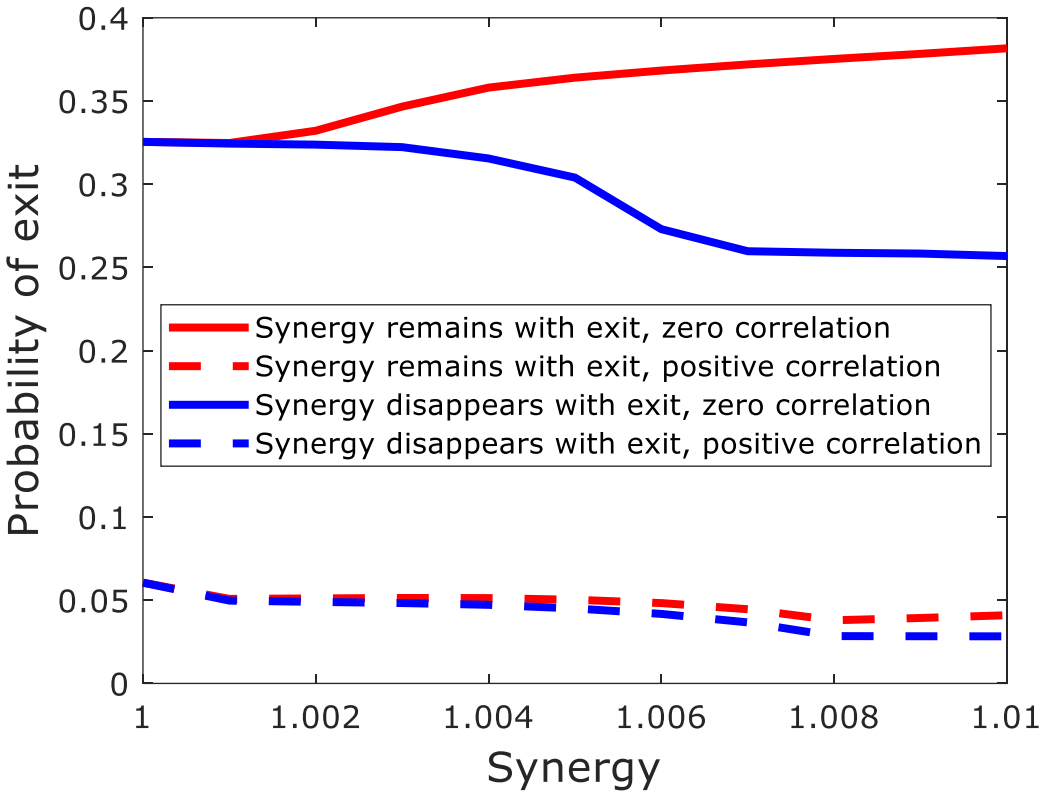
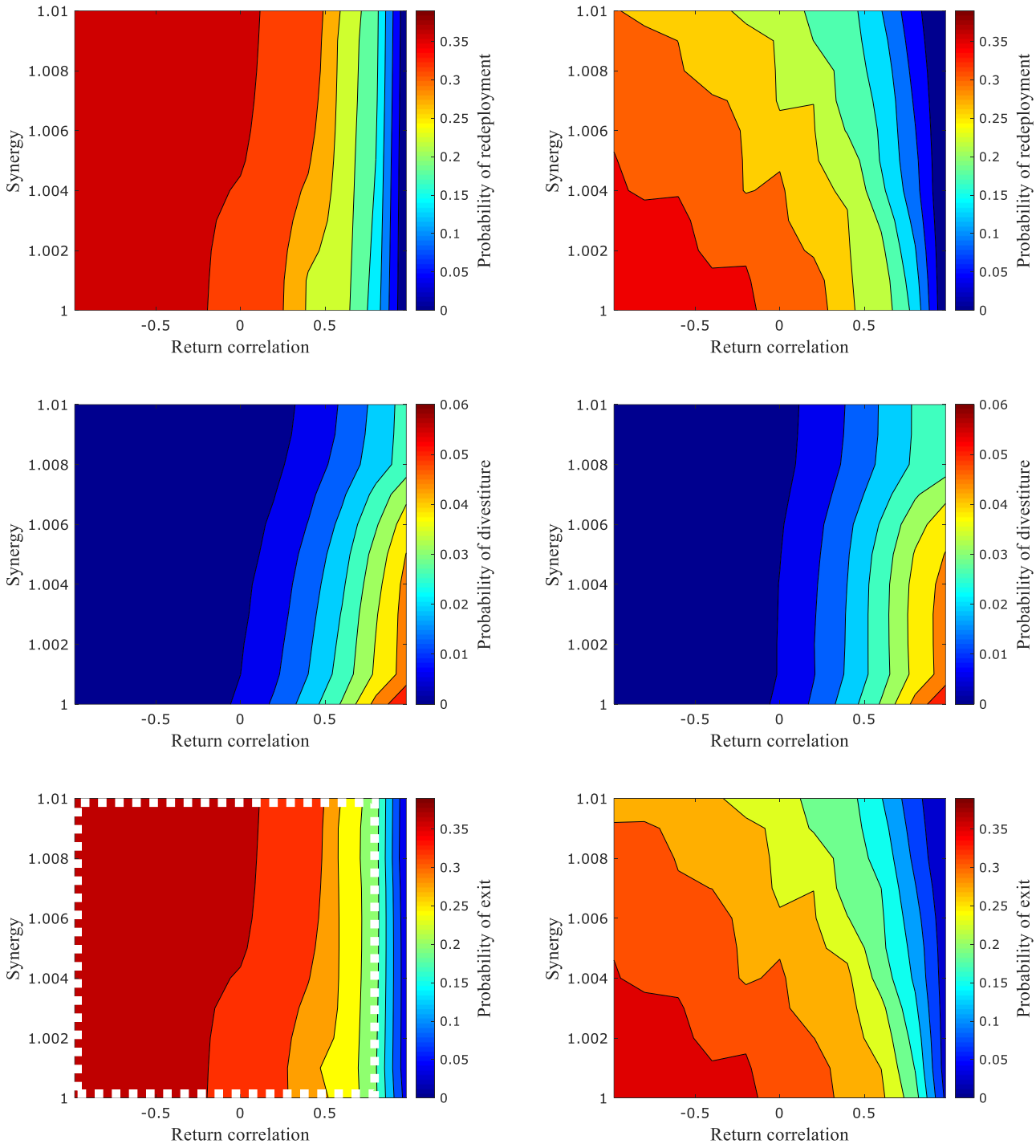


Figure 7. Relationship between cumulative odds of exit and synergy with various levels of return correlation



Panel A. Synergy remains with exit **Panel B. Synergy disappears with exit**

Figure 8. Cumulative odds of exit with various combinations of synergy and return correlation

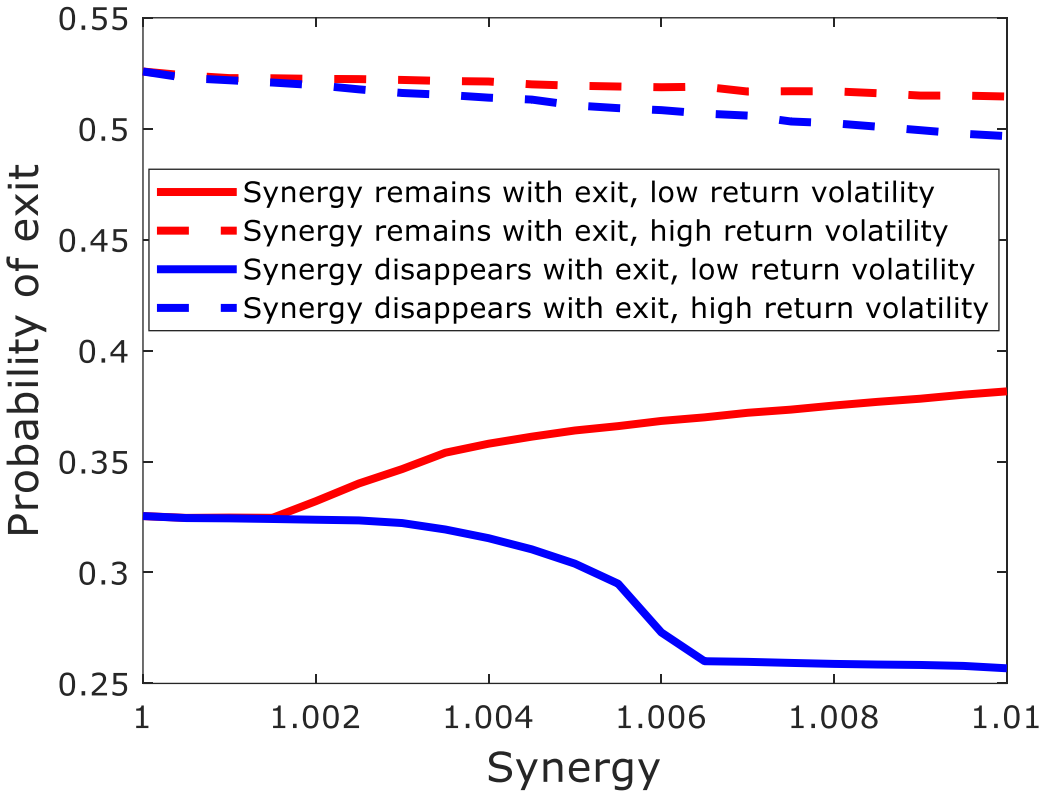
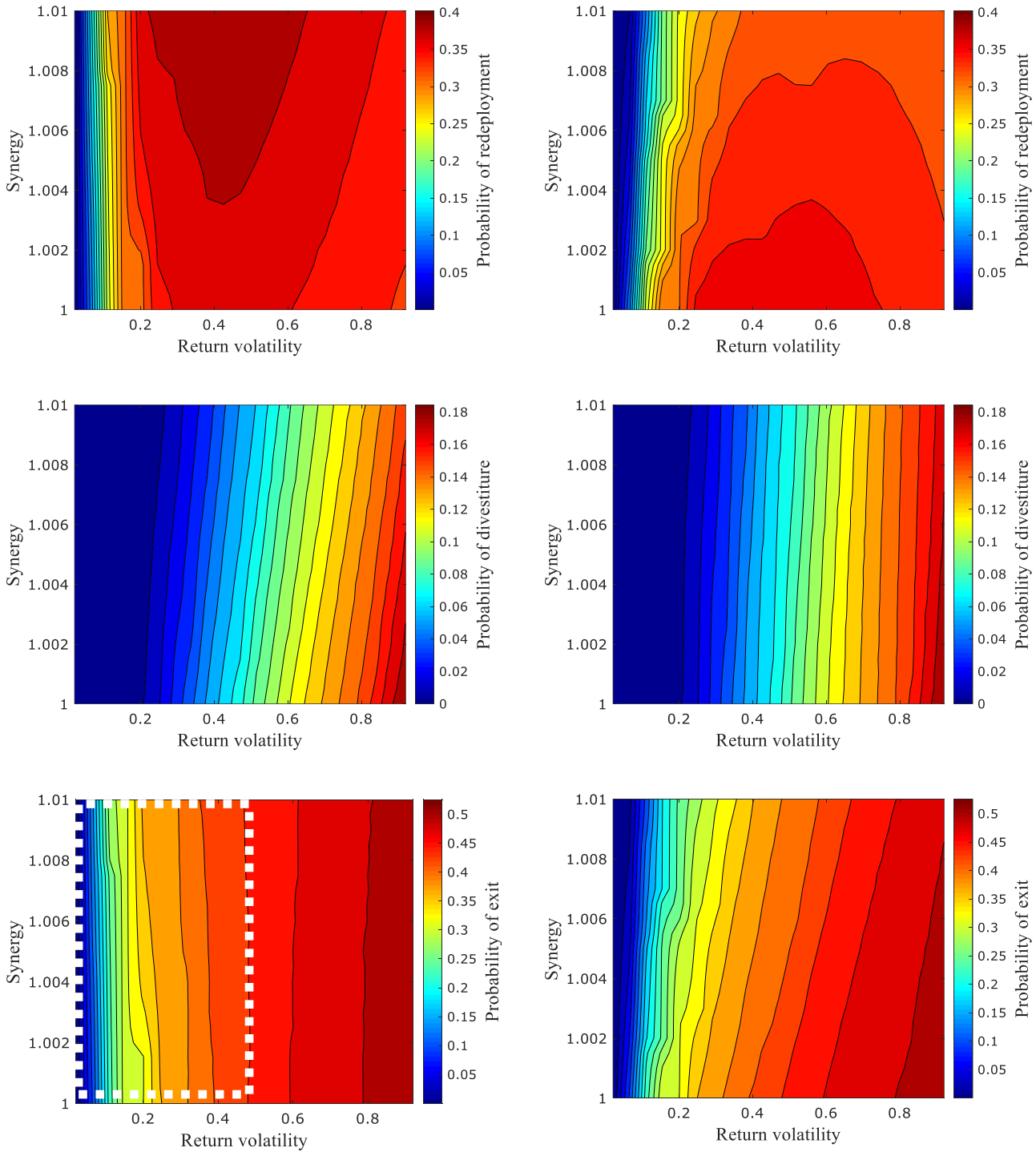


Figure 9. Relationship between cumulative odds of exit and synergy with various levels of return volatility



Panel A. Synergy remains with exit

Panel B. Synergy disappears with exit

Figure 10. Cumulative odds of exit with various combinations of synergy and return volatility

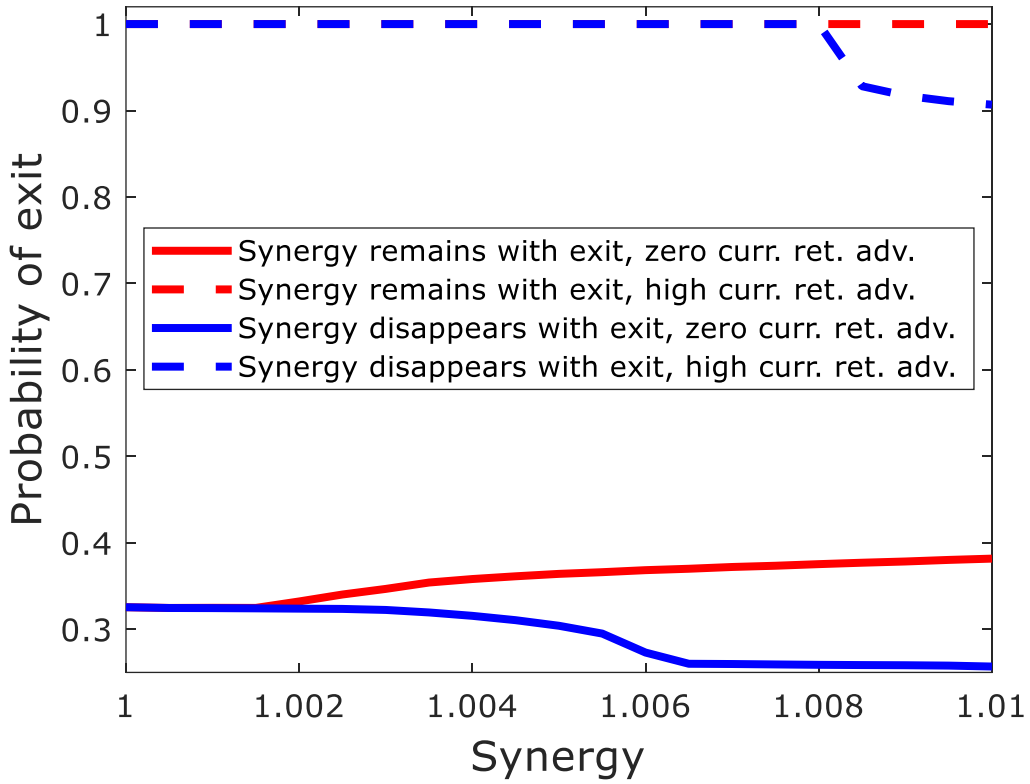
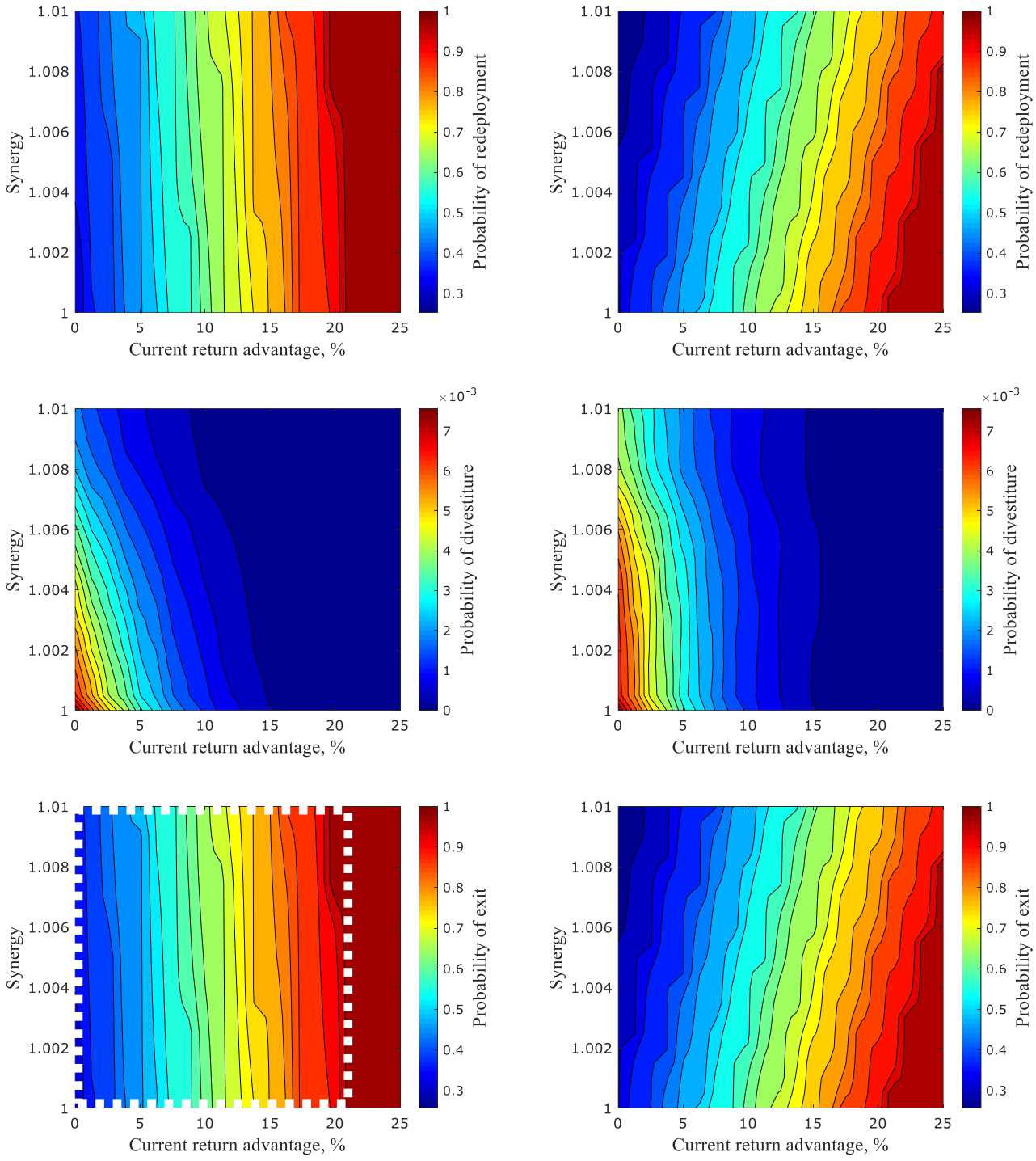


Figure 11. Relationship between cumulative odds of exit and synergy with various levels of current return advantage



Panel A. Synergy remains with exit **Panel B. Synergy disappears with exit**

Figure 12. Cumulative odds of exit with various combinations of synergy and current return advantage