WHEN TO BURN YOUR SHIPS:

THE FLEXIBILITY-COMMITMENT TRADEOFF IN RESOURCE REDEPLOYMENT

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ABSTRACT

The ability of multi-business firms to redeploy resources across businesses is a principal source of corporate advantage, as evidenced by a plethora of theoretical and empirical research. However, extant theory is silent in clarifying how resource redeployment might impact competitive behavior of rivals. Redeployability reduces irreversible commitments, which have long been recognized to deter rivalry, allow privileged access to scarce resources, and sustain a valuable strategic position. This raises a tension between the flexibility advantages and potential commitment disadvantages from redeployability. Using a dynamic model, we explore the competitive conditions under which redeployability can be advantageous or detrimental to long-term firm value. In addition to enhancing our understanding of the boundary conditions around resource redeployability, this study also has implications for real option models and the broader dynamic capabilities literature.

Keywords: Corporate strategy, Competitive dynamics, Resource redeployment, Dynamic capabilities, Markov models

1 INTRODUCTION

A plethora of recent research considers whether corporate advantage might be tied to having flexibility to internally redeploy resources across businesses (e.g., Helfat and Eisenhardt, 2004; Levinthal and Wu, 2010; Sakhartov and Folta, 2014, 2015; Folta, Helfat, and Karim, 2016). Emergent evidence suggests internal resource markets may enable more efficient expansion of and retrenchment from opportunities relative to rivals using external markets to buy and sell resources (Dickler and Folta, 2020), while also facilitating quicker exit from markets (Lieberman, Lee, and Folta, 2017; Sohl and Folta, 2021). The expectation is that redeployability takes on greater value under uncertainty, and again there is evidence consistent with this thesis (Dickler, Folta, Giarratana, and Santalo, 2022). While decidedly comparative in distinguishing between flexible firms and relatively inflexible ones, the theory is silent in clarifying how flexibility might impact competitive behavior of rivals. This oversight may be consequential because rivals may escalate aggressive pursuit of a market if they recognize their flexible counterparts can efficiently vacate markets. Exploring this consideration is the focus of this paper, which aims to illuminate important boundary conditions to the understanding of when redeployability creates or destroys corporate value.

Exploring competitive implications of redeployability exposes a critical tradeoff between flexibility and commitment that has hitherto been ignored in studies of resource redeployment. A long tradition in economics and strategy recognizes commitment to strategic positions impacts strategic outcomes**,** just as Hernán Cortés recognized that burning his ships may inspire his own army to fight harder or die at the hands of natives. Irreversible commitments may deter rivalry, allow privileged access to scarce resources, and sustain a valuable strategic position (Milgrom & Roberts 1982; Ghemawat, 1991). It is therefore noteworthy that irreversible commitments are lowered by having an ability to redeploy resources (Sakhartov and Folta, 2014), driving firms to exit at higher levels of performance than firms unable to redeploy (Lieberman et al., 2017; Sohl and Folta, 2021). It stands to reason that lower commitment may adversely affect a firm's competitive position. It remains ambiguous whether the negative competitive consequences are offset by gains to flexibility. Might redeployability put a firm at a disadvantage if it cannot credibly commit to a market? Using a dynamic model, this paper attempts to reconcile this tension that is largely absent from the literature on resource redeployment. Even if current empirical evidence suggests benefits to resource redeployment, it is possible these benefits are tempered by competition, or bounded by the competitive environment.

A number of interesting results emerge from the dynamic model in this study. Under low competition, resource redeployability nearly always leads to corporate advantage, as implied in the prior literature. However, under higher competition the relationship between redeployability and corporate advantage is less obvious. If competition is intense and redeployment costs are high, redeployability may result in corporate disadvantage because more committed rivals can force flexible firms to retreat. In contrast, if competition is intense, but redeployment costs are low, a firm with resource redeployability may credibly commit to multiple markets. Additionally, there are important implications for industry evolution, since one of these scenarios leads to rivals dividing markets, while the other may lead to a dominant firm across markets. The results suggest boundary conditions for a theory of corporate advantage around resource redeployability, going beyond prior literature emphasizing uncertainty, redeployment costs, external transaction costs, and inducements. Finally, the model also implies that the commitment effects of redeployability have substantive effects on corporate advantage, regardless of whether redeployment actually occurs. These and other findings are explained below, as are the important implications for the understanding of when resource redeployability leads to corporate advantage.

In addition to enhancing our understanding of the boundary conditions around resource redeployability, our paper contributes in two other ways. First, to the extent that redeployability represents a dynamic capability, our paper speaks to that broader literature emphasizing the type of organizational "agility" enabling firms to seize opportunities as internal and external environments undergo rapid changes (e.g., Helfat et al., 2007; Teece, 2007; Teece, Peteraf, & Leih, 2016). Adaptability may have a downside. Capabilities emphasizing adaptability may been seen by rivals as lacking commitment, exposing them to rivals recognizing it. A second contribution is to the real option literature. While others examine the tension between flexibility and commitment in the option to wait, no prior work has explored this tension in the switching option so pertinent in corporate strategy and attempts to derive value from fungible resource portfolios. Both contributions are further elaborated in the Discussion.

2 LITERATURE REVIEW

Understanding how redeployability might affect competitive behavior requires a brief glimpse of the redeployment and competitive commitment literatures.

2.1 Redeployability and Competition

It is increasingly recognized that having the potential to redeploy resources across businesses might be a source of corporate advantage (e.g., Helfat and Eisenhardt, 2004; Sakhartov and Folta, 2014; Dickler et al., 2022). The literature contrasts resource redeployability with actual redeployment, where the former represents a switching option taking on value under uncertainty

(Bernardo & Chowdhry, 2002; Sakhartov and Folta, 2014).[1] It unambiguously stresses that in the presence of uncertainty, redeployability should enhance firm ability to compete with rivals. Emphasis has been on comparing firms with more redeployability to firms with less, rather than on explaining how redeployability might affect the competitive behavior of rivals. For example, Lieberman and co-authors (2017) argue that firms with more-related portfolio businesses should exit sooner from those businesses because their resources can be reallocated to their other portfolio businesses at low adjustment costs. Sohl and Folta (2021) provide empirical support for these claims. Both papers explicitly compare more-related firms with less-related firms, without giving consideration to how competitive behavior may emerge as a result of rivals having divergent degrees of redeployability. Another example is Belenzon and Tsolmon (2016), who show that group-affiliated businesses perform better than other businesses in geographies with labor market frictions (i.e., high external transaction costs), presumably because of their stronger internal labor markets. While not an exhaustive review, it is representative of a wider set of papers failing to consider competitive responses to redeployability.

One paper giving some consideration to competition is Giarratana and Santaló (2020), studying allocation of shelf space in the beverage industry. They find that multi-niche firms facing adverse demand shocks in a particular product niche (e.g., increasing taxes on beer), are likely to reallocate their shelf space *away* to other unaffected niches, especially when the structure of the downstream buyer industry is concentrated. In this sense, less competitive markets may create an inducement to redeploy.

[1] Resource redeployability has been referred to as "inter-temporal economies of scope" by Helfat and Eisenhardt (2004) and as "redeployability" by Sakhartov and Folta (2014). Actual redeployment represents the exercise of the switching option, and generally requires resource adjustment costs. These costs represent an irreversible investment, and if they are less than external transaction costs the option exercise decision is valuable. Redeployment does not exhaust the switching option because it is possible to redeploy resources back to their original use.

In summary, redeployment is viewed as an alternative to the purchase or sale of resources in external markets. There is compelling evidence that redeployability creates advantages for multi-business firms relative to single business firms in performance (e.g., Dickler et al., 2022), and the ability for strategic change (e.g., Wu, 2013; Belenzon and Tsolman, 2016; Dickler and Folta, 2020; Sohl and Folta, 2021), sometimes by at least temporarily "escaping" competition until conditions are more favorable (Giarratana and Santaló, 2020). What has not received attention is whether a potential to redeploy has strategic implications on competitor behavior. As such, the literature seems to be either largely agnostic about competitive forces, or study resource redeployment under the condition of "benign competition". It is unclear whether the theory's predictions hold or need adaptation after considering how redeployability influences competition, and how competition influences the corporate advantage derivable from redeployability.

2.2 Competition among Multi-market Firms

In contrast to the redeployment literature, the competitive commitment literature shows how the ability to enter and exit markets drastically affects the nature of competition in those markets and, consequently, payoffs in those markets. The power of commitment to a market has dynamic implications on the nature of competition in that market. Military history provides illustrative examples in this regard. In his book "Art of War" Chinese military general Sun Tzu (6^{th}-5^{th} century B.C.) taught armies to burn their ships behind them as they advanced into new territory. Similarly, Spanish Conquistador Hernán Cortés ordered nine out of his twelve ships to be destroyed in an effort to motivate his men in his conquest of the Aztec empire. In contemporary strategy research, literature on multi-market competition (Karnani & Wernerfelt, 1985; Gimeno and Woo, 1996; Ghemawat & Thomas, 2008) overlaps with the domain of multi-unit firms and offers important insights.

One implication is that competition is mitigated if both firms are credibly committed to a market (Gimeno and Woo, 1996, 1999; Gimeno, 1999; Ghemawat & Thomas, 2008). This is because more multi-market contact creates interdependencies and increasingly links competitors across markets, resulting in the phenomenon of mutual forbearance, where rivals limit aggressive competitive actions (Edwards, 1955; Feinberg, 1984). For example, Gimeno and Woo (1996) find multi-market contact reduces the intensity of rivalry across U.S. airline markets, whereas Ghemawat and Thomas (2008) show how multi-national firms in the cement industry sustain higher prices through multi-market contact. Because greater redeployability may imply less credible commitment, mutual forbearance may not obtain, leading to greater competition, lower profitability, and lower competitive stability. Thus, it is crucial to consider whether and when these potential negative effects offset any gains from resource redeployability. Moreover, doing so in a formal way is appropriate because calibrating interdependent effects of redeployability and credible commitment is not obvious through informal reasoning. The next section introduces a formal model to examine whether and how the benefits of resource redeployability are tempered by competition, or bounded by the competitive environment.

3 MODEL

The dynamics of resource redeployability are modeled under oligopolistic competition using a Markov perfect equilibrium (MPE) model (Besanko and Doraszelski 2004; Ericson and Pakes, 1995). This class of models is well-suited to study resource dynamics under uncertainty (Wibbens, 2023). The setup of the model is similar to Wibbens (2021), with three key additions for the study of resource redeployability under oligopolistic competition. First, two markets are modeled instead of one, allowing potential for redeployment between markets. Second, each market faces demand shocks, creating an inducement to redeploy resources to a market when it becomes relatively more attractive and away from it when it becomes relatively less attractive. Third, a value-based strategy (VBS) model is employed to model product-market competition, with a parameter α that allows scaling up or down the competitiveness of a market. This parameter also helps diagnose whether under low competitiveness the main results of the extant literature can be replicated.

Insert Figure 1 about here

Figure 1 provides a schematic overview of the model. It consists of two parts: product market competition, which at any given moment in time determines each firm's profits; and MPE dynamics, which determine the optimal investment levels and the resulting evolution over time. Central to both parts is the industry state. It consists of six variables: the number of resources each firm has in each market (x_{1A}, x_{1B}, x_{2A}, x_{2B}) and the attractiveness of each market (Q_A, Q_B). Markets and firms are modelled symmetrically, with one exception: Firm 1 can redeploy resources between Markets A and B, while Firm 2 cannot. This enables a focus on Firm 1's corporate advantage resulting from redeployability. It also maps onto prior work that compares corporate advantage from resource redeployability in multi-business firms relative to single-business firms without the potential to redeploy (e.g., Dickler et al., 2022) and ascertains diversification premiums (and discounts) in general (e.g., Berger and Ofek, 1995; Villalonga, 2004).

Incorporating inherent uncertainty, the model provides a probabilistic description of the industry evolution. Given the MPE solution, the probability distribution of the state X at a certain time t determines its probability distribution at a later time $t + \Delta t$. The remainder of this section describes how the state determines each firm's profits (product market competition) as well as the optimal investment levels and the evolution of the state over time (MPE dynamics).

3.1 Product market competition

Markets A and B have identical competitive characteristics. Firms 1 and 2 engage in competition of differentiated products, modeled using the framework of value-based strategy (VBS; Brandenburger and Stuart, 1996; Gans and Ryall, 2017). This is a common setup in the strategy literature to model product market competition (e.g., Adner and Zemsky 2006).

Specifically, each market consists of Q customers. Each customer has a demand for at most one product of each firm. As is common in the economics literature, a linearly decreasing demand function is assumed, resulting in linearly decreasing potential for value creation (utility minus marginal cost) from some initial value $v_0 > 0$ to zero. The marginal value created per customer q is thus $v_0\ (1 - q/Q)$.

To keep the model parsimonious, we model only a single type of resource per market. The more resources x_i Firm i has in a market, the higher its production capacity. A resource might, for example, represent a plant. Accordingly, the potential value creation (VC) for Firm i is the integral over the marginal value created per customer,

$$VC_i = \int_0^{x_i} v_0 \left(1 - \frac{q}{Q}\right) dq = v_0 x_i \left(1 - \frac{x_i}{2Q}\right). \tag{1}$$

A market's competitiveness is modeled using a product substitution parameter α. In the extreme case of $\alpha = 0$, products are non-substitutable (i.e., completely differentiated), so both firms can create a total value of $VC_1 + VC_2$ in the market. In the other extreme $\alpha = 1$, products are fully substitutable, so the total value creation is $\max(VC_1, VC_2)$. When $VC_1 \geq VC_2$, the total value creation (TVC) for intermediate levels of α is $TVC = VC_1 + (1 - \alpha)\ VC_2$ (and *mutatis mutandis* for $VC_1 < VC_2$). The added value for each player is the total potential value creation in the market minus the value creation of all other players in the market. For instance, Firm 1's added value is

$AV_1 = TVC - VC_2$. Following Adner and Zemsky (2006), a firm's profit π equals its added value, resulting in

$$\pi_i = VC_i - \alpha \min(VC_1, VC_2). \quad (2)$$

To illustrate the model's product market competition, Figure 2 shows the resulting profit for Firm 1 as a function of the number of resources for both firms, for different combinations of Q and α. The market size Q can vary over time to model demand shocks leading to different levels of attractiveness. The parameter α is kept fixed and captures the level of competitiveness in each market. Under conditions of low competitiveness (α = 0.3), the rival's resource position has little effect on the Firm 1's profit. Under higher competitiveness (α = 0.7), when faced with a rival having more resources, Firm 1 profits are more adversely affected. Firm 2's profitability is affected in a similar way by Firm 1's resource positions.

Insert Figure 2 about here

3.2 MPE dynamics

Firms invest in resources to build capacity to compete in markets A and B. More resources yield more capacity. It is assumed that a separate type of resource is used in each market, but it is possible to adjust resources for redeployment to the alternative market. Resource investments occur in two ways: invest y_a to acquire resources in the external market at resource cost c_a, or invest y_r to redeploy resources at adjustment cost c_r. Thus, c represents the costs that have to be incurred upon acquisition or redeployment of a single resource, while y represents how much firms invest in total in a given year, either by acquiring or exercising the redeployment option. It is assumed that once investments y are made, they cannot be recovered outside the industry, so they are sunk costs. Resource adjustment costs c_r might be determined by many things, but have predominantly been assumed to be an inverse function of the relatedness between markets A and B (e.g., Sakhartov and Folta, 2014; Lieberman et al., 2017). The expected resource gain for both types of investment follows the same functional form, which is standard in MPE models (e.g., Besanko and Doraszelski, 2004; Wibbens, 2021, 2023):

$$f(y) = \frac{gy}{cg + y}. \tag{3}$$

Over a short time Δt, the probability of gaining a resource is $f(y)\,\Delta t$. Zero investment leads to zero resource gain. Higher investment leads to higher expected resource gain, although with diminishing returns to capture convex adjustment cost or time-compression diseconomies of resource investments (Dierickx and Cool, 1989). No matter how much a firm invests, g is the maximum resource gain rate a firm can attain ($f(y) \approx g$ for $y >> cg$), whereas c represents the cost of a single resource for small investments ($f(y) \approx y / c$ for $y << cg$). Throughout the paper c is specified as a fraction of maximum potential resource value[2], implying that $c < 1$ is required for rational firms to invest at all.

Each firm chooses its investment rate y such that it optimizes long-term value—this is the Markov-perfect equilibrium condition. The resulting optimal investment policies are functions of the industry state X (see Figure 1). In a given realization of the evolution, the industry at time t is in some state X_t that is observable to both firms.

Over time, the state X_t evolves based on the investment levels. A continuous-time model is used (Sakhartov & Folta, 2015; Wibbens, 2023). Uncertainty is captured by $p\,(Q_{\text{high}} - Q_{\text{low}})$, where p is the probability rate that market attractiveness Q flips between a low and high value. Thus, this definition incorporates internal inducements. Each resource depreciates over time at a depreciation rate δ. The probability that a resource position increases follows from the gain rate given by the

[2] Defined as the sum of maximum potential discounted cash flows from a resource, $V_{\max} = v_0 / (\rho + \delta)$.

investment policy functions. For instance, the rate at which x_{1A} increases is given by $f(y_{a1A})$ + $f(y_{r1A})$, the gain rate from investment in resource acquisition plus that from resource redeployment. Because Firm 2 cannot redeploy, the gain rate for x_{2A} is simply $f(y_{a2A})$.

Note that the evolution of X_t depends on the investment level y, while conversely the investment level y depends on the optimization of future value, which depends on the expected evolution of X_t. The MPE consists of a solution for the optimal investment policy $y(X)$, evolution of X_t, and value function $V(X)$ consistent with one another. This solution is found through an iterative procedure (Wibbens 2023).

4 RESULTS

This section illuminates how the model, designed to capture the endogenous nature of market competitiveness, provides insight about the relationship between resource redeployability and corporate advantage. Corporate advantage is defined as the relative difference in value between Firm 1 and Firm 2:

$$Corporate\ advantage = \frac{V_1 - V_2}{V_2}. \tag{4}$$

Recall that Firm 1 is a multi-business firm able to redeploy across markets A and B, while Firm 2 consists of two divisions and cannot redeploy across the two markets. Accordingly, the latter might be characterized as two single-business firms (say, 2A and 2B). Therefore, the definition identified in Equation (4) is identical to how diversification premiums (and discounts) are characterized in the literature (e.g., Berger and Ofek, 1995; Villalonga, 2004). It also has the advantage of isolating value stemming from redeployability, without regard to other sources of corporate advantage.

Consistent with Sakhartov & Folta (2015) corporate advantage is analyzed at time zero, when firms are starting to compete with zero resources (and thus zero profits) in both markets. This is the purest way to analyze corporate advantage, because at this moment the only difference between the two firms is in their redeployability. The corporate advantage at $t = 0$ reflects the change in net present value (NPV) of future expected profit (π) net of investment (y) due to redeployability. At later stages, other asymmetries would affect firms' values due to differences in the number of resources acquired over time.

4.1 Corporate advantage or disadvantage from redeployment

A starting point is to ensure the model replicates theoretical expectations and empirical findings emanating from prior studies on resource redeployability and real options. Because prior literature has not incorporated the endogenous nature of oligopolistic competition, the model is initially fitted with low levels of competitiveness, $\alpha = 0.1$ (see Table 1 for an overview of the full set of parameters used in this Base case). Under these Base case conditions, it is expected that redeployability might create more corporate advantage when lower redeployment costs make resource investment through redeployment relatively more attractive (Helfat and Eisenhardt, 2004); higher resource acquisition costs in external markets make resource investment through redeployment relatively more attractive (Folta and O'Brien, 2006); and greater uncertainty escalates the value of the more reversible resource investment alternative, which will always be redeployment because of its optional nature (Sakhartov and Folta, 2014). The results illustrated in Figure 3 confirm expectations and findings elaborated in prior literature.

Insert Table 1 and Figure 3 about here

Figure 4 illustrates the effect of competition on corporate advantage for 27 parameter combinations, varying competitiveness α, resource acquisition cost c_a, and redeployment cost c_r.

The Base case (low competition) scenario identified in the previous paragraph is labelled (a), where there are low resource redeployment costs, intermediate resource acquisition costs, and low competitiveness.

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  Insert Figure 4 about here
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First, note that the relation between competitiveness and corporate advantage is non-monotone. In some cases, competitiveness leads to increased corporate advantage (e.g. in the top left chart), sometimes to a corporate disadvantage (all charts in the right column), and sometimes the relation is U-shaped (bottom left). Also, note that the Base case effects (when competitiveness is low), no longer hold under high competition. For instance, when $\alpha = 0.9$ (righthand bars), increasing resource acquisition costs from $c_a = 0.15$ to 0.2 (middle to bottom rows) leads to a lower corporate advantage.

Second, the effect of competition appears particularly strong for $c_a = 0.15$ and $c_r = 0.01$ (left column, middle row), identified as high competitiveness case (b). In subsequent analyses, it will be shown that in case (b) commitment plays an important role in creating this advantage. While in the Base case (a), the corporate advantage primarily derives from Firm 1's ability to redeploy resources in response to market shocks, in case (b) it also derives from its ability to create more advantageous competitive positions. It can do so because inexpensive redeployment allows the firm with redeployability to credibly commit resources to the market in which they are needed most to fend off competition. Thus, (b) represents a case with commitment advantages.

There are also several cases where redeployability produces corporate disadvantage. This is the "burning ships" effect alluded to earlier. The effect is most pronounced in case (c), representing high competitiveness, high resource acquisition cost, and high resource redeployment cost. It will be shown that in this case redeployment is too expensive to easily fight a two-frontier war, as it can in case (b). In case (c), Firm 1 can be forced to retreat from markets in which Firm 2 attacks it successfully. This often leads to a divide and conquer outcome, in which Firm 1 and Firm 2 gain dominant positions in different markets. Though this outcome is favorable for both firms, Firm 1 has to bear the redeployment cost to reach it (for example, including adjusting machinery or retraining employees). Lacking redeployability, Firm 2 is committed to stay in whichever market it is successful. Thus (c) represents a case with commitment disadvantages for the firm with redeployability.

4.2 Redeployment under low versus high competitiveness

This section examines mechanisms driving corporate advantage outcomes in cases (a), (b) and (c), as illuminated in Figure 4. The analyses begin by exploring mechanisms driving the outcomes in the low competitiveness case (a) versus the high competitiveness cases (b) and (c). Subsequent analyses explore mechanisms driving the different outcomes between commitment advantage case (b) and disadvantage case (c).

Figure 5 shows differences in firm resource states under low (a) versus high competitiveness (b and c), after a long time of competition. Darker shading indicates higher probability that a resource state will obtain. This is the stationary distribution, which in this model is uniquely defined regardless of initial condition (Wibbens 2023). Because of the symmetry in the model, the stationary distribution is the same for markets A and B.

Insert Figure 5 about here

In Base case (a), each firm is most likely to end up with two resources, regardless of how many other resources the other firm has. This is a result of the low competitiveness, in which one firm's resources have little effect on the other firm's profits (see Figure 2). By contrast, in cases (b) and (c) one firm is likely to dominate the other. The most likely outcome is that one firm has two (or three) resources while the other firm has zero. This is a result of the amplification driven by higher competitiveness and sunk acquisition cost. Under these circumstances a firm gaining an advantage has a stronger incentive to invest in resource acquisition than its competitor, leading to an asymmetric outcome (Wibbens 2021). Note that in case (b), the firm with redeployability (i.e., Firm 1) is more likely to ultimately gain three instead of two resources. This important insight is further investigated below.

Figure 6 illustrates differences in redeployment behavior for Firm 1 across the three cases, as a function of market attractiveness, Q, and Firm 1's resource position, x_1. In general, firms redeploy from (to) markets with lower (higher) attractiveness, as is consistent with mechanisms explored in prior literature. This impact of market attractiveness on redeployment is strong and monotonic in the low competitiveness case (a), where it is also more likely that a firm redeploys from a market in which it has many resources into a market in which it has few. [3]

Insert Figure 6 about here

Under high competitiveness, this monotonic relation between resource positions x_1 and redeployment breaks down. In both cases (b) and (c) redeployment is more likely from a market with one resource than from a market with two, three or four resources. The relation between resources and redeployment into a market follows an inverted-U.

Insert Figure 7 about here

To further explore the reasons for these non-monotonic relations, Figure 7 shows Firm 1's redeployment behavior as a function of the strength of resource positions (x_1 and x_2) for both firms.

[3] The expectations in Figure 6 and Figure 7 are calculated using stationary probabilities, reflecting the probability distribution of X_t in the limit of large t.

Under high competitiveness (cases b and c), apparently Firm 1's resource redeployment decision is largely determined on relative resource positions. If Firm 1 has fewer resources than Firm 2 it is likely to redeploy its resources away. Conversely, it is most likely to redeploy into a market if Firm 2 has a weak competitive position, having few resources. This is in stark contrast to the low competitiveness case (a), for which Firm 2's resources hardly influence Firm 1's redeployment.

In summary, the reasons to engage in redeployment differ markedly under low versus high competitiveness. Under low competitiveness, a corporation primarily redeploys to take advantage of more attractive market conditions. Under high competitiveness, it primarily redeploys to evade markets with weak competitive positions and take advantage of more promising ones.

4.3 Corporate advantage or disadvantage?

The analysis presented above does not illuminate why having redeployability leads to a corporate advantage in case (b) but a disadvantage in case (c), as was apparent from Figure 4. The mechanisms driving these distinct effects are explored below.

Insert Figure 8 about here

Figure 8 shows that in case (b) Firm 1 gains significantly more resources than Firm 2, while in cases (a) and (c) it only gains marginally more. In case (a) the corporate advantage derives from Firm 1's flexibility to redeploy its comparable resources to more favorable market conditions, the mechanism clarified in the resource redeployment literature. In case (b) the corporate advantage derives from Firm 1's ability to use redeployability and the prospect for favorable competitive positions in both markets to warrant greater investment in resources. In case (c), redeployment is too expensive to profitably enhance its resource position, but Firm 1 can be induced to redeploy anyway to vacate markets in which it has a weak competitive position. Not having access to redeployability, Firm 2 is committed to stay in the market, forcing Firm 1 to be the responsible actor and retreat. These latter two mechanisms have not been elaborated within the resource redeployment literature.

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Figure 9 corroborates these mechanisms. This figure shows the sources of corporate advantage, defined as Firm 1's minus Firm 2's net present value (NPV) deriving from one of the three cash flows as a percentage of total value. Specifically, each bar shows the following decomposition of corporate advantage[4]:

Corporate advantage

$$= \frac{V_1 - V_2}{V_2}$$

$$= \frac{1}{V_2} \int_0^{\infty} dt \, e^{-\rho t} \left(\left[\pi_{1,t} - y_{\mathrm{a}1,t} - y_{\mathrm{r}1,t} \right] - \left[\pi_{2,t} - y_{\mathrm{a}2,t} - y_{\mathrm{r}2,t} \right] \right)$$

$$= \frac{1}{V_2} \int_0^{\infty} dt \, e^{-\rho t} \left(\left[\pi_{1,t} - \pi_{2,t} \right] + \left[-y_{\mathrm{a}1,t} + y_{\mathrm{a}2,t} \right] + \left[-y_{\mathrm{r}1,t} + y_{\mathrm{r}2,t} \right] \right)$$

$$= \frac{\Delta V_{\pi}}{\mathrm{V}_2} + \frac{\Delta V_{\mathrm{a}}}{\mathrm{V}_2} + \frac{\Delta V_{\mathrm{r}}}{\mathrm{V}_2} \qquad (5)$$

Here, ΔV represents the difference in value between Firm 1 and Firm 2 due to differences in expected profit, resource acquisition costs, and resource redeployment costs, respectively.

The figure illustrates the different mechanisms behind the corporate (dis-) advantage from redeployment. In case (a), Firm 1 redeploys the same number of resources to more favorable market conditions. In case (b), Firm 1 uses redeployability as a commitment to gain more

[4] All time-varying variables in this derivation are defined in expectation, $\pi_t = \mathrm{E}\pi(X_t)$.

resources. In case (c), Firm 1 must pay significant redeployment cost without apparent benefits. The final analysis provides additional insights why this is the case.

Insert Figure 10 about here

Figure 10 is an interpretation and example of the type of favorable competitive situations that yield a corporate advantage in case (b). Though in the left-hand chart the competitive positions are symmetric (each firm has one resource, in different markets), Firm 1's optimal investment is considerably higher, both in the market where it has a resource (3.7 versus 3.2) and in the market where it has none (2.5 versus 1.6). This allows Firm 1 to gain considerably more resources, as was apparent from Figure 8. The reason is that its ability to cheaply redeploy across both markets allows it to fight a two-frontier war. Consider, for instance, the case in which Firm 1 successfully acquires a resource in Market B (right-hand chart). In this case it still has a chance to dominate Market B, or otherwise cheaply redeploy its resource (at investment $y_r = 0.8$) to further strengthen its competitive advantage in Market A. Thus, in case (b) having redeployability provides Firm 1 a credible commitment to fight in both markets and thus invest more in gaining resources even in symmetric competitive positions.

Insert Figure 11 about here

By contrast, the left-hand chart in Figure 11 gives an example of an unfavorable competitive position (for Firm 1) in case (c). For both firms it is much better to divide and conquer the two markets, with each firm dominating one market (right-hand chart). Since Firm 2 cannot redeploy, it has a credible commitment to stay and invest in Market A, and the burden falls on Firm 1 to redeploy. In the left-hand situation, the total investment of Firm 1 (2.7+4.4+1.9 = 9.0) is much higher than that of Firm 2 (3.3+3.8 = 7.1). This higher investment does not lead to more resources, though. In fact, Firm 1's total expected resource gain is lower than Firm 2's (0.410 versus 0.414). Thus, in case (c) the redeployability yields a commitment disadvantage for Firm 1, forcing it to invest in redeployment without directly benefitting from it. Because Firm 1 lacks a credible commitment, it is forced to act as the responsible market actor, leading to a corporate disadvantage.

5 DISCUSSION

This paper considers the competitive implications of flexibility to redeploy resources. In doing so, it extends a vibrant and emergent literature emphasizing the benefits to resource redeployability in multi-unit firms, but ignoring the strategic benefits of commitment. A fundamental tension between resource flexibility and commitment arises since irreversible commitments are crucial for maintaining a valuable strategic position (Milgrom & Roberts, 1982; Ghemawat, 1991), while the ability to redeploy resources diminishes such irreversible commitments (Sakhartov & Folta, 2014), and grants firms organizational "agility" (e.g., Helfat et al., 2007; Teece, 2007; Teece, Peteraf, & Leih, 2016). Our results offer several stimulating insights for research in Corporate and Competitive Strategy.

Our paper illuminates important boundary conditions to our understanding of when redeployment flexibility creates or destroys corporate value. Prior work emphasizes the important roles of uncertainty, redeployment costs, external transaction costs, and inducements in influencing value derived from redeployability. Consistent with prior research implicitly assuming benign competitive conditions, we find under conditions of low competition, the ability to redeploy resources is consistently advantageous.

When considering that flexibility interacts with and is affected by the competitive behavior of rivals, we find the effect of redeployability is not as straightforward. Moreover, our work clarifies another determinant of value creation—that redeployment flexibility endogenously determines competition and the ability to credibly commit to a market. It shows that redeployability may be value-destructive for firms competing against rivals having made irreversible investments. Specifically, much like how Cortés's men escalated their battle intensity after their ships were burned, firms lacking redeployability may exhibit a credible commitment to succeed in a particular market and out-invest rivals that possess resource redeployability, thus leaving flexible firms with the option to retreat to alternative markets. This finding underscores the significance of strategic commitment and focused investments in competitive markets, highlighting situations where the ability to flexibly reallocate resources might destroy, rather than confer competitive advantage.

Greater competitive intensity, however, does not uniformly disadvantage firms with redeployability. If they have low redeployment costs and are endowed with a strong enough resource position, they can credibly commit to effectively fighting a multiple-frontier war, and ultimately out-invest less capable rivals. It seems that small initial disparities in competitive advantages are magnified over time, potentially leading to substantial advantages for the firm with redeployability. These findings resonate with prior literature emphasizing the importance of resource amplification driving sustained performance heterogeneity (Wibbens, 2021), but have hitherto been undiagnosed with regard to redeployability.

Another interesting finding pertains to how redeployability influences industry evolution and structure. In particular, in the presence of intense competition and high redeployment costs, rivals choose to divide markets, leading to a diminished competitive landscape. On the other hand, when competition is intense but redeployment costs are low, a dominant firm emerges across all markets. Remarkably, the mere existence of redeployment as an option, even without its execution and the associated costs, drives the outcome where markets are monopolized by a single firm. Accordingly, our work reinforces that when focusing on either firm-level effects or industry-level effects, a focus on redeployability, rather than executed redeployment, is appropriate, as noted by Dickler et al. (2022). It is therefore appropriate to emphasize redeployability akin to a switching option (e.g., Bernardo & Chowdhry, 2002; Sakhartov & Folta, 2014, 2015).

Our study provides insights on a fundamental issue in Corporate Strategy literature: understanding advantages of multi-business firms over focused firms. While our study compares two firms—with and without a resource redeployability—another way to envision this approach is that these firms represent a multi-business firm and multiple single-business firms. As such, our results highlight the conditions under which it might be valuable to operate as a multi-business firm with the flexibility to redeploy resources between the focal businesses compared to remaining a focused single-business firm committed to just one market. An implicit assumption in the literature is that Corporate Strategy is important because it enhances firms' Competitive Strategy. In turn, an important implication of our study is that a more nuanced examination of the interplay between Corporate and Competitive strategy is warranted as under some conditions (i.e., intense competition), the flexibility that appears to grant multi-business firms a corporate advantage can in fact be detrimental to their value creation relative to focused counterparts.

It is worth noting that many of our findings are not obvious to deduce with informal reasoning. In addition to illuminating important boundary conditions to our understanding of when redeployment flexibility creates or destroys corporate value, there are other significant implications of our model and findings.

5.1 Implications for Dynamic Capabilities

We believe our model has important implications for the broader literature on dynamic capabilities (Helfat et al., 2007; Teece, 2007; Teece, Peteraf, & Leih, 2016), emphasizing the importance of resource flexibility and organizational "agility" as crucial capabilities in helping firms adapt to their environment. While it is widely acknowledged that developing and maintaining these capabilities can be costly, the absence of such capabilities is perceived to be even more detrimental for firms (Helfat & Peteraf, 2003; Teece et al., 2016), leading to the implication that firms should strive to cultivate dynamic capabilities over time. As we have shown in our model, however, adaptability may have negative competitive consequences if it signals a lack of commitment, willing to shift attention at the first sign of difficulty. Although our model speaks to one type of dynamic capability—resource redeployability—it is important for future research to explore the more general case. Competitive repercussions may undermine some of the value of dynamic capabilities, and understanding when and how is critical for advancing theory. The reason is that while dynamic capabilities may raise the prospect for competitive advantage, they may also reduce commitment to a market. In this sense, greater dynamic capabilities may raise performance thresholds (Gimeno, et al., 1997), which could make it more likely for firms to exit a market at a given level of poor performance. To the extent that rivals recognize this lack of commitment, we believe it is dangerous to disregard the competitive implications of adaptability, even if it is convenient to do so.[5]

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[5] Teece, Pisano, and Shuen (1997: 512) note "Firms that have a tremendous cost or other competitive advantage vis-à-vis their rivals ought not to be transfixed by the moves and countermoves of their rivals. Their competitive fortunes will swing more on total demand conditions, not on how competitors deploy and redeploy their competitive assets. Put differently, when there are gross asymmetries in competitive advantage between firms, the results of game-theoretic analysis are likely to be obvious and uninteresting."

5.2 Implications for Real Options

Our model also complements other work showing how competition affects real option valuations (e.g., Grenadier, 2000; Smit and Trigeorgis, 1995), but has not explicitly examined how competition affects switching options in multi-business firms. Prior research has implemented option pricing models (Sakhartov and Folta, 2014, 2015) to estimate the value of redeployability for a single firm. We model two firms under oligopolistic competition. Our modeling approach to simultaneous consideration of both real options and competition has two distinct advantages over traditional real option approaches. First, real option pricing is ill-suited to incorporating competition because a firm's decision to exercise the redeployment option (i.e., to redeploy a resource to another market) depends on the future value of the option, which in turn depends on its competitor's decision to redeploy. This, of course, depends again on the focal firm's decision to redeploy, leading to an infinite loop of decisions depending on one another. The MPE approach that we employ resolves this conundrum. The equilibrium solution yields investment policies for both firms that are mutually consistent with each other. Each firm's investments optimize long-term value given the other firm's investments.

Another advantage of using an MPE model is its infinite time horizon; whereas option models assume a fixed time period $t = 0$ to T after which the resource is deemed useless and has no remaining value (Sakhartov & Folta 2015: 1786). Additionally, whereas real option models usually pertain to a single resource, in our model firms can acquire multiple resources. This more realistically captures market dynamics. The infinite time horizon also has a technical modeling advantage. Time in the MPE model is homogenous, in the sense that the dynamic equations and parameters are the same at each time t. This implies that only one equilibrium needs to be solved, which is valid for every time $t \geq 0$. The only differences over time stem from different realizations of the state X_t.

The biggest disadvantage of our model is that its greater complexity increases computational burden. Accordingly, we have purposely kept the model parsimonious as to limit the state space of possible values for our parameters.[6] We did however explore many different values of the parameter space and focused the analysis in this paper on those parameter combinations with the most interesting strategic insights.

5.3 Practical implications

Based on our study's insights, practical implications arise, particularly for industries characterized by high sunk costs and competitiveness, such as the high-tech sector. To make informed strategic decisions regarding resource redeployment, managers must understand the level of competition and their rivals' behavior. This includes acknowledging the potential value destruction caused by having the flexibility to redeploy when competitors have made irreversible investments. Moreover, the industry's competitiveness, the sunkness of industry investments, and (the relatedness of) a firm's business portfolio shape the preference for flexibility or commitment. In highly competitive industries with substantial sunk costs, committed single-business firms that demonstrate a credible commitment to a specific market may gain an advantage. However, such industries are also rapidly evolving and demand frequent adaptation, leaving multi-business firms equipped with resource redeployment capabilities potentially better positioned. Overall, our study provides implications for corporate strategists in high-tech firms, offering guidance on effectively leveraging resource

[6] We allow each resource position (x_{1A}, x_{1B}, x_{2A}, x_{2B}) to take on six different values (0, …, 5) and the attractiveness of each market (Q_A, Q_B) can take on two (Q_{low} or Q_{high}). Hence the size of the resulting state space is $6^4 \cdot 2^2 = 5{,}184$. With this manageable size of the state space, the computational time required for each model is less than a second on a regular personal computer.

redeployment capabilities while navigating the challenges posed by high sunk costs and intense competition in their industry.

5.4 Limitations and possible extensions

We intentionally maintained a parsimonious structure for the model, aligning most assumptions with prior literature to ensure a cohesive interpretation of results in relation to earlier studies. However, these assumptions may impose constraints on the extent to which the findings can be generalized. Nonetheless, these limitations offer avenues for future research, as many of them can be readily mitigated within the framework of the MPE model. For instance:

1. The current model encompasses two firms, which can be thought of as a focal firm and its primary competitor. Expanding this framework to incorporate additional firms, as well as entry and exit dynamics (Ericson & Pakes, 1995) could provide a more comprehensive depiction of industry dynamics. In its current form, however, our model with two firms operating across two markets in which only one firm has the potential to redeploy effectively incorporates prior work's focus on corporate advantage from resource redeployability in multi-business firms relative to single-business firms (e.g., Dickler et al., 2022).

2. The MPE as presently implemented centers on competition for a single type of resource; it could be extended to include multiple (heterogenous) resources. Whether and how these resources interact with one another might offer further insights into the competitive implications of having the flexibility to redeploy them. For instance, multiple resources can act as substitutes (Barney, 1986) or complements (Adegbesan, 2009; Teece, 1986) and could undergo transformations due to technological evolution and deliberate strategic actions of the firm. Our model accounts for resource characteristics to the extent that they impact the cost to redeploy and adjust resources to be used in alternative markets. Specifically, this means that the resources

implicitly considered in the current MPE are non-scale free (capacity-constrained) and fungible to the extent that it allows for use across different areas in the firm and across time at different levels of adjustment costs (Helfat & Eisenhardt, 2004; Levinthal & Wu, 2010; Sakhartov & Folta, 2014). Extensions of the model could further consider, for example, a combination of scale-free resources that can be simultaneously shared and exploited across the two markets and non-scale free resources that suffer opportunity costs if misallocation occurs.

3. Our model incorporates any and all acquisition and redeployment costs that are sunk. Transaction costs resulting from the purchase of resources in the external market represent one form of sunk cost, but the implications of these costs have not been separately diagnosed, even if prior research emphasizes that greater external transaction costs will increase the benefits from redeployment (Giarratana and Santalo, 2020; Sohl and Folta, 2021). Future research might explore how these costs influence the relative payoffs of redeployment flexibility versus commitment.

4. Whether competition mitigates corporate advantage tied to redeployability will surely hinge on whether rivals observe redeployability. The present implementation of our model assumes perfect observability, and more generally, a strong form of forward-looking rationality practiced by firms. Specifically, firms are presumed to consider both their own and their competitors' optimal investment strategies in future decisions. However, Sakhartov (2018) predicts market participants may find it difficult to observe redeployability. So, in this sense, it is possible our model misvalues redeployability. Future work might try to incorporate these considerations.

6 CONCLUSION

The purpose of this research is to clarify the boundary conditions for when resource redeployability creates value. We do so by considering whether and how competition bears upon value derived from redeployability. This approach differs from prior research considering redeployment in cases of benign competition. Our results confirm that under most conditions, an ability to redeploy is valuable. However, it also confirms that it may destroy value if competition is intense and redeployment costs and acquisition costs are sufficiently high. We believe these, and other insights clarified by our model, help better understand when redeployability creates value. We further believe these implications are also pertinent to the broader literature on dynamic capabilities.

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TABLES

Table 1
Model parameters

Symbol	Parameter	Base case (a)
α	Competitiveness	0.1
c_a	Resource acquisition cost level	0.15
c_r	Redeployment cost level	0.01
g	Maximum growth rate	0.5
δ	Depreciation rate per resource	0.1
Q_{low}	Market size (unattractive state)	3
Q_{high}	Market size (attractive state)	5
p	Probability of change in market attractiveness	0.1
ρ	Discount rate	0.1
v_0	Maximum profit per resource	10

Note: Acquisition and redeployment cost are specified as a fraction of maximum resource value.

FIGURES

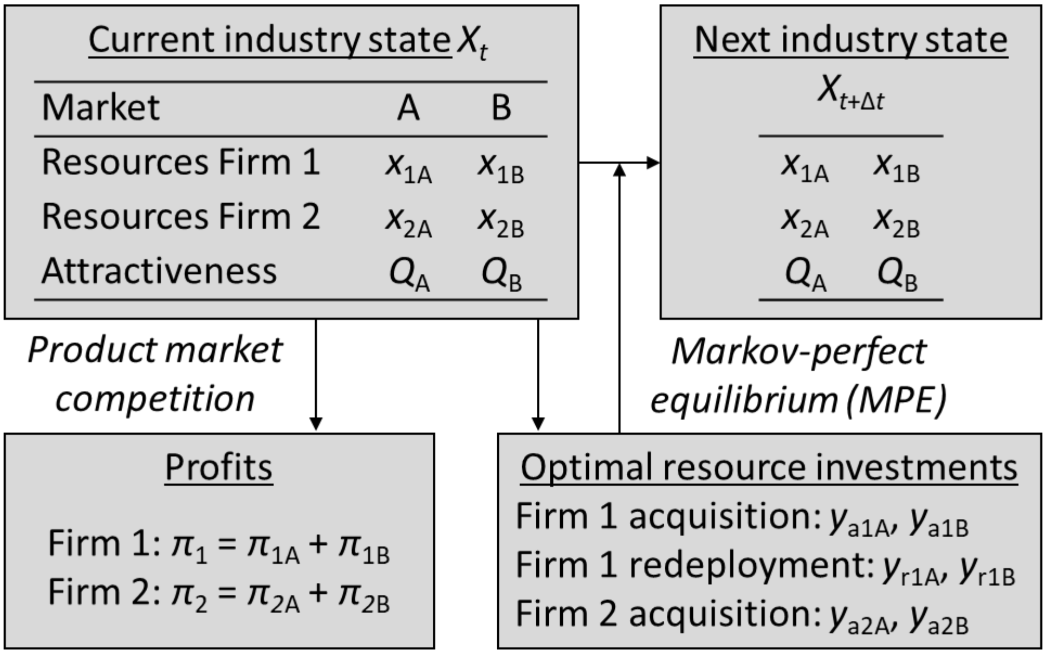

Figure 1
Schematic overview of the model dynamics. Firm 1 can redeploy its resources between Market A and B. Firm 2 consists of two independent divisions which cannot redeploy. Given the MPE solution, the probability distribution of the state X at a certain time t determines its probability distribution at a later time $t + \Delta t$.

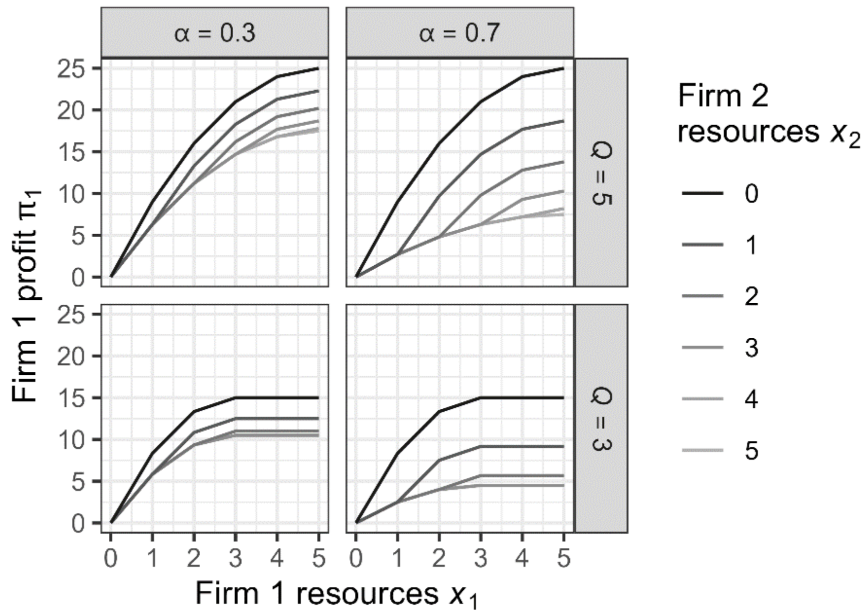

Figure 2
Effect of competitiveness α and market attractiveness Q on the profit π_1 resulting from the focal firm's resources x_1 as well as its competitor's x_2. More resources x_1 always lead to higher profits, albeit with diminishing returns. Under high attractiveness Q, the maximum attainable profit is significantly higher than for low Q. Under high competitiveness α, the competitor's resources x_2 strongly diminish the focal firm's profit, while under low competitiveness they have little effect on it. These results are the same for both Market A and Market B, because they are modelled symmetrically.

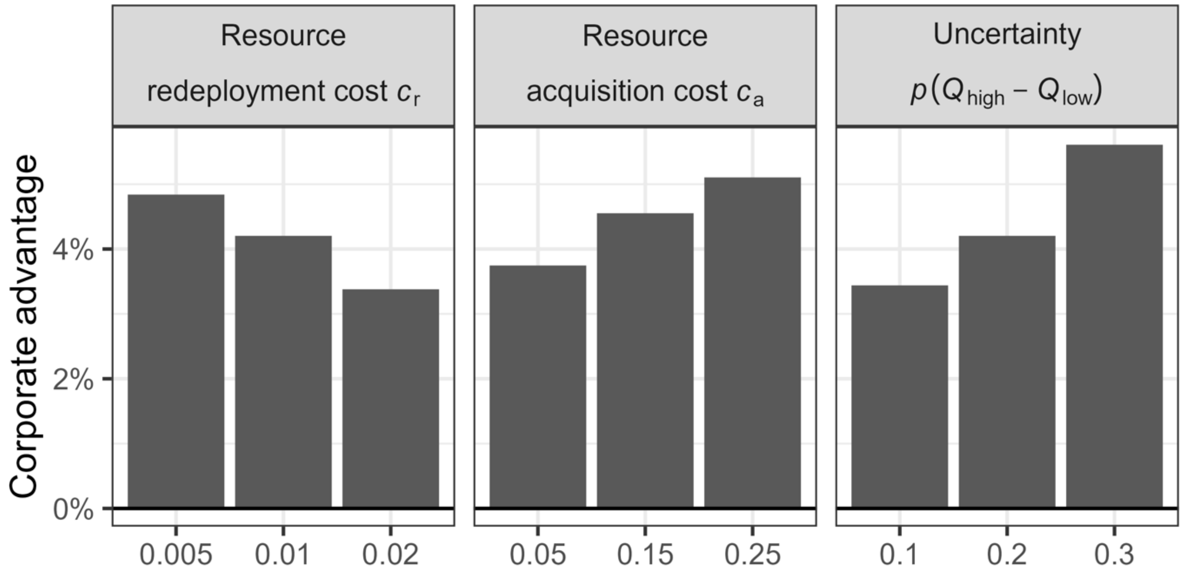

Figure 3
Replication of key findings from prior literature. The middle bar in each chart reflects the Base case parameters in Table 1. The other bars in each chart show the effect of changing a single parameter compared to the Base case. As expected, under low competitiveness (α = 0.1 in all charts), the corporate advantage from redeployability is higher under lower redeployment cost, higher acquisition cost, and higher uncertainty.

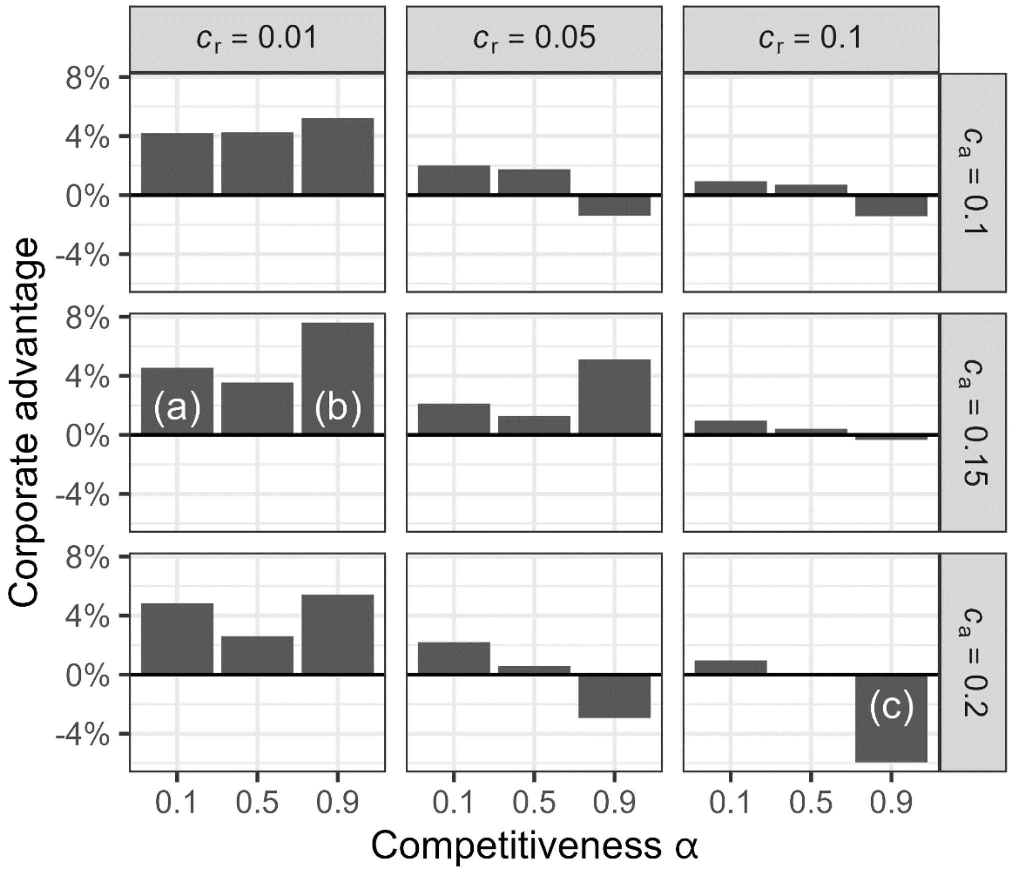

Figure 4
Higher competitiveness can lead to both increased and decreased corporate advantage from redeployability—and even to a corporate disadvantage. Case (a) represents the Base case analyzed earlier (Table 1 and Figure 3); (b) represents a case in which commitment effects increase the corporate advantage from redeployment; (c) represents a case with a commitment disadvantage.

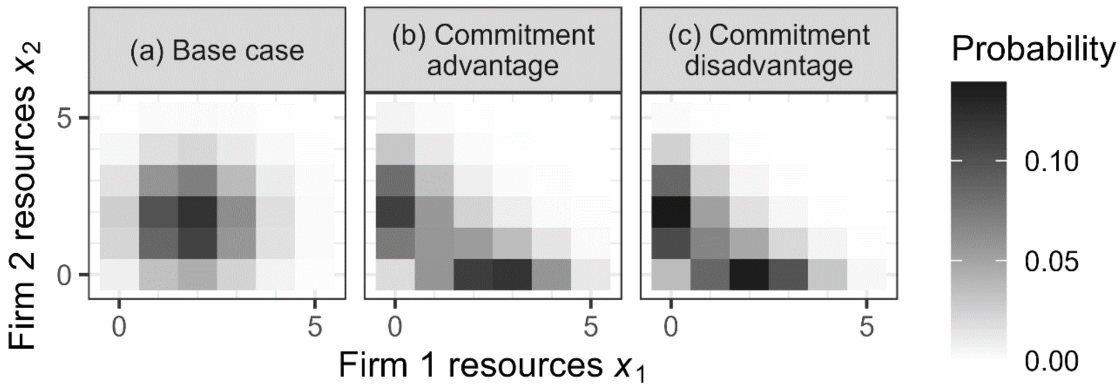

Figure 5
Differences in market outcomes under low (a) versus high competitiveness (b and c). The shading indicates the probability of each combination of resource states after a long time of competition (the stationary distribution). Under low competitiveness both firms are most likely to end up with two resources (a). Under high competitiveness, the most likely outcome is that one firm has two or three resources while the other has zero (b and c).

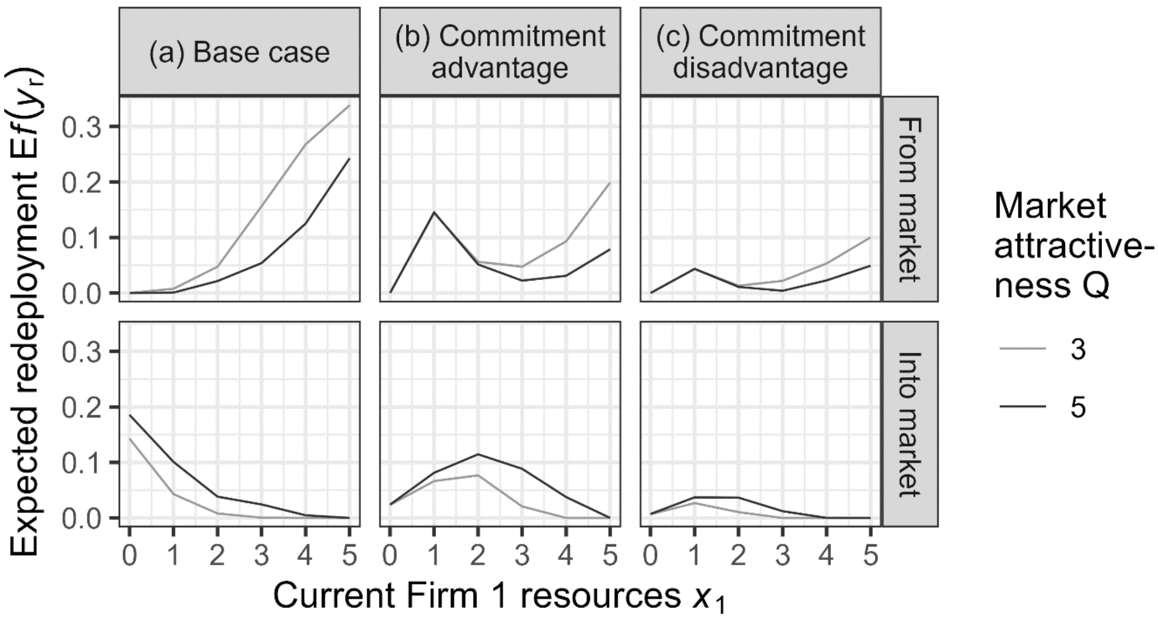

Figure 6
Impact of market attractiveness on resource redeployment under low competitiveness and monotonic relation with the number of resources (a). Under high competitiveness this monotonicity breaks down (b and c).

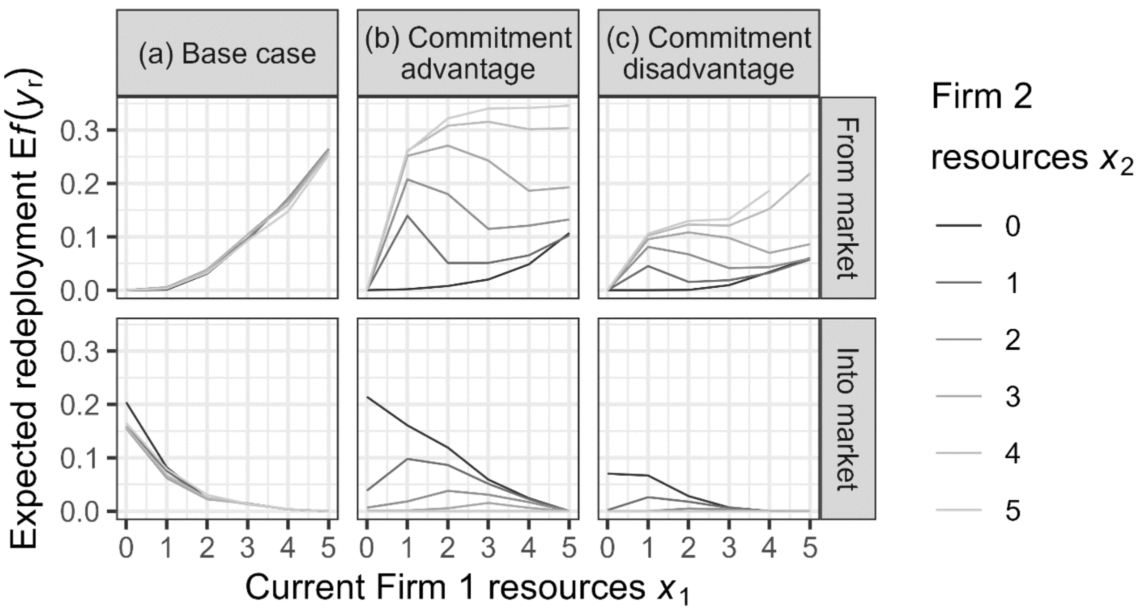

Figure 7
Strong impact of relative resource positions under high competitiveness (b and c). In these cases, Firm 1 is most likely to redeploy from markets in which it has fewer resources than Firm 2 and into markets in which it has more. Under low competitiveness (a), Firm 2's resources hardly matter.

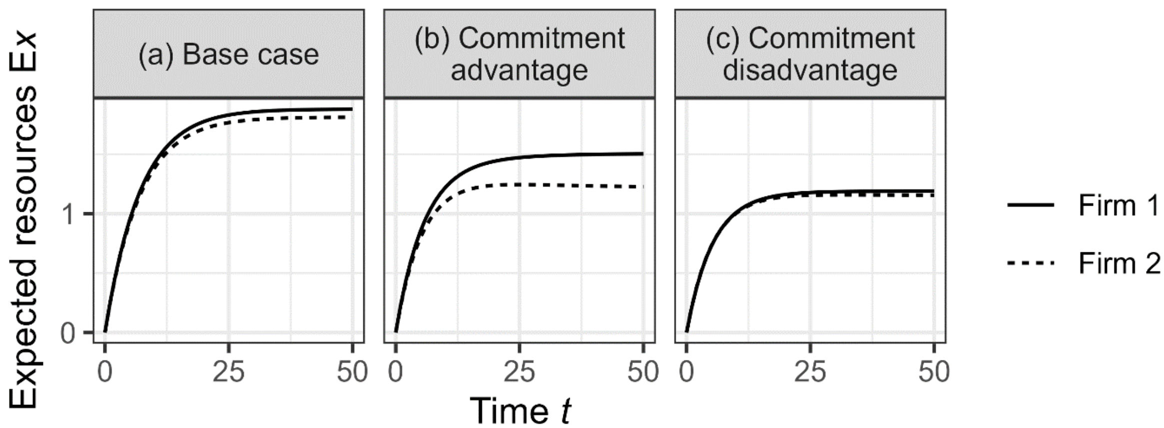

Figure 8
Evolution of resource advantage in case (b). By contrast, in cases (a) and (c) Firm 1 only gains marginally more resources than Firm 2.

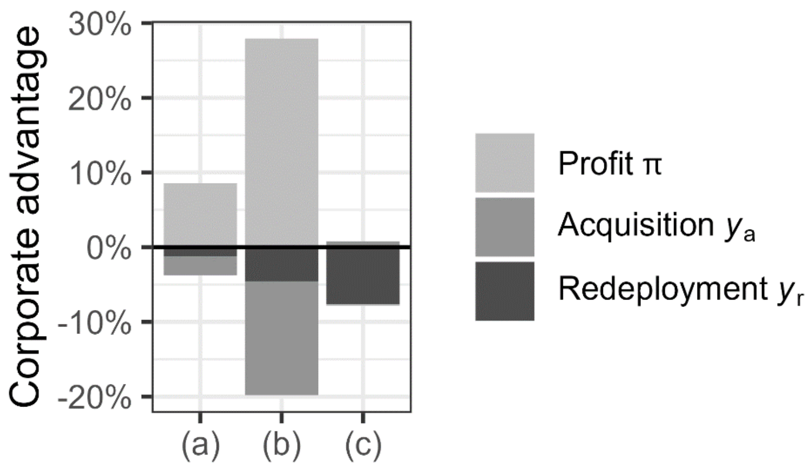

Figure 9
Sources of corporate advantage, defined as Firm 1's minus Firm 2's net present value (NPV) deriving from one of the three cash flows (profit, investment in resource acquisition, and investment in redeployment) as a percentage of total value. The sum of these three sources corresponds with the respective totals for (a), (b) and (c) in Figure 4. In case (a), Firm 1 redeploys the same number of resources to more favorable market conditions. In case (b), Firm 1 uses redeployment as a commitment to gain more resources. In case (c), Firm 1 must pay significant redeployment costs without apparent benefits for itself.

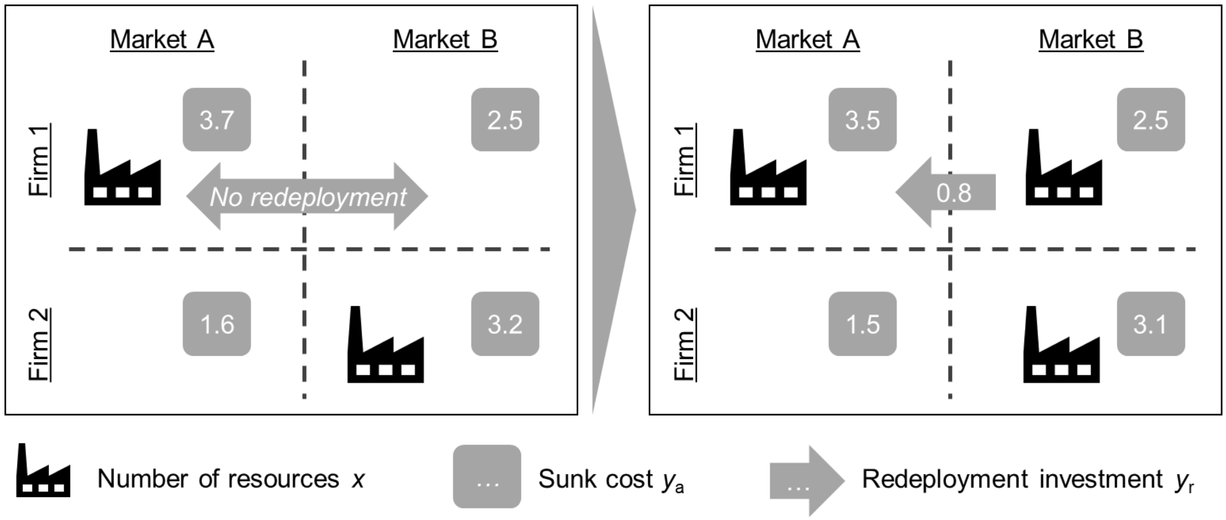

Figure 10
Example of favorable competitive position in case (b). Though in the left-hand chart the competitive positions are symmetric (each firm has one resource, in different markets), Firm 1's optimal investment is considerably higher. If it is successful in acquiring a resource in Market B (right-hand side) it still can try to win in that market, or otherwise cheaply redeploy its resource to further strengthen its competitive advantage in Market A. Thus, in case (b) the redeployability provides Firm 1 a credible commitment to fight in both markets and thus invest more in gaining resources even in symmetric competitive positions.

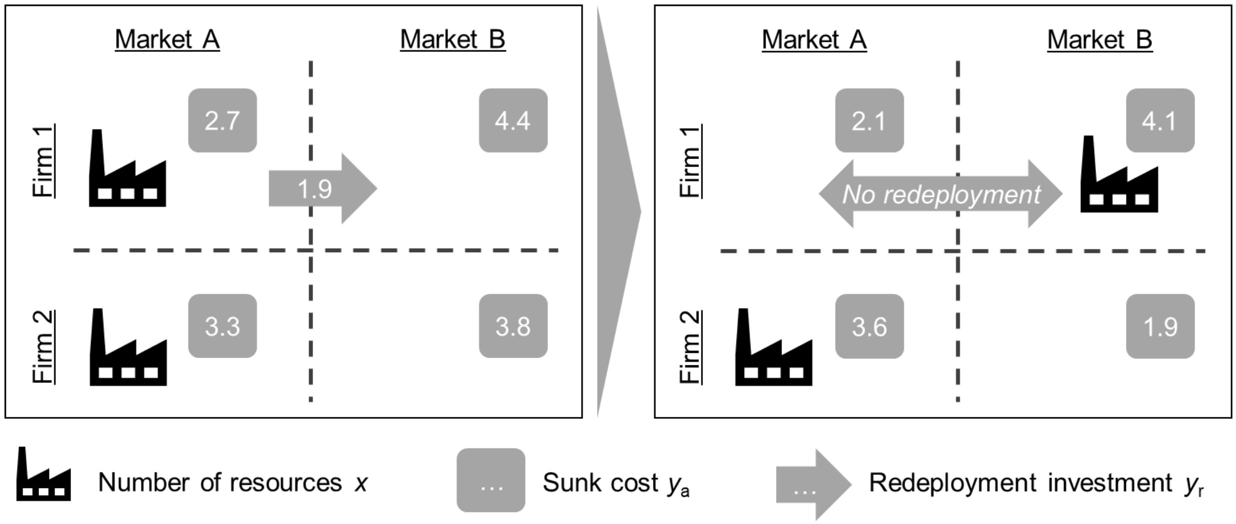

Figure 11
Example of unfavorable competitive position in case (c).