Subsidiary Financing:
Risk-Shifting as a Commitment Device*

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Abstract

We study how firms can design their organizational structures to overcome dynamic commitment problems when entering new markets. A manager exerts costly effort to first develop and subsequently manage an investment opportunity. Ex post, the firm underinvests in projects that generate high management rents. However, the prospect of those rents helps offset the manager's initial project development cost, making ex ante commitment to invest optimal. Levered subsidiaries mitigate this time-consistency problem by introducing risk-shifting incentives that counteract underinvestment. Subsidiaries are most valuable for projects that are costly to develop, have moderate management costs, and yield returns uncorrelated with existing business.

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1 Introduction

Firms seeking to expand into new markets, develop new products, or adopt new technologies often face a fundamental organizational decision: whether to retain new investments within the existing firm structure or to establish legally separate subsidiaries. This choice is not merely a matter of legal or administrative convenience; it plays a central role in shaping incentives for project development, managerial effort, and project continuation. In many cases, firms must rely on specialized managers to explore and develop new viable opportunities and supervise their subsequent management. A key commitment problem arises at the outset: firms cannot guarantee the continuation of a project after costly development efforts have been made. We highlight a novel benefit of the subsidiary structure with limited liability in mitigating this commitment problem: By issuing risky subsidiary debt backed solely by the expansion opportunity, the firm creates an ex post risk-shifting incentive that favors project continuation. We develop a formal theory of optimal organizational form, characterizing how and when subsidiaries can mitigate commitment frictions and ensure the efficient implementation of expansion projects.

A large body of literature in economics and finance studies how organizational structure can promote efficient investment. Organizational design becomes particularly important when incomplete contracting makes the allocation of residual control rights critical (Hart and Moore, 1990). In such environments, corporate structure can be used to allocate decision rights so as to incentivize managerial innovation (Ayotte, 2017). Likewise, contracts that would be unenforceable within a firm may become enforceable across firm boundaries, allowing firms to constrain managerial actions better (Robinson, 2008). Finally, appropriately drawn boundaries can shield managers from debt overhang problems, thereby enhancing their willingness to undertake new investments (Hackbarth et al., 2014).

However, this literature does not consider situations in which a single agent must undertake a series of tasks in order for a new investment to get off the ground. For example, when a firm enters a new market, it may rely upon the same experts both to investigate the potential demand for a project and then, conditional upon finding a big enough market, to implement the project. This paper attempts to address this gap. We present a theory in which the firm selects the organizational structure that it uses for expansion in order to ensure that it opts to accept investments uncovered by a costly search whenever, from an ex ante perspective, it is desirable that it should do so.

We study a firm with a valuable asset-in-place and a profitable expansion opportunity. In order to realize its opportunity, the firm must invest in the necessary organizational infrastructure and must hire a specialist manager. The manager exerts costly effort in two stages. In the first, development stage, the manager exerts "search" effort to explore and develop the expansion opportunity. If the manager does not search, only non-viable projects are available. If the manager's search effort yields a viable project, the manager must exert "monitoring" effort during the second, implementation stage to realize its full potential. Project monitoring cost is uncertain ex ante: projects can be either "easy," incurring low effort cost, or "hard," incurring high effort cost, with the realization of this cost observed only after the project is developed. The value of the firm's investment opportunity is maximized if the firm continues and the manager monitors all viable projects, and abandons all non-viable projects for a salvage value.

There are three key frictions in this set-up. First, the manager's project search and monitoring efforts are unobservable, creating a standard moral hazard problem. Second, the viability of the project is observable, but not verifiable. Third, the firm owner cannot commit ex ante to continue with a project after the development phase.

The frictions give rise to a time-inconsistency problem in the continuation of a hard viable project. Because monitoring effort is unobservable, when continuing a viable project, the firm has to leave some rent to the manager. From an ex ante point of view, the firm may deem the continuation of all viable projects optimal, because the expected managerial rent incentivizes and compensates the manager for his initial search effort. However, once the search cost is sunk and the project turns out to be hard, the firm owner prefers to abandon it if the monitoring rent exceeds the project's continuation value.

We show that this time-consistency problem shapes the firm's optimal organizational structure of expansion. We consider two structures. Under a *branch structure*, the firm's asset-in-place and the expansion opportunity share the same legal entity and jointly back any debt raised. Under a *subsidiary structure*, the expansion is placed in a legally separate, wholly owned entity with its own balance sheet. The establishment of a subsidiary involves a set-up cost, as it requires duplicating parts of the parent's infrastructure.

Under branch expansion, the firm's time-consistency problem reduces its profit. This can be for two reasons. First, the firm may choose to offer the manager an abandonment wage when the project is terminated to restore its incentive to continue hard projects. This, however, distorts the manager's ex ante search incentives since the manager would receive the abandonment wage also when he does not search and the project is non-viable. The abandonment wage thus increases the total managerial rents and reduces overall firm profits. Second, the firm may simply forgo hard projects to avoid paying managerial rents, resulting in underinvestment.

Expanding via a subsidiary provides the firm with greater flexibility in financing. By allowing the firm to issue subsidiary debt that is backed solely by the expansion opportunity, the firm benefits from limited liability, especially when the firm continues its risky expansion project. This generates risk-shifting incentives that encourage the firm to continue projects that might otherwise be abandoned. Subsidiary expansion thus allows the firm to pursue the efficient investment strategy while incurring lower managerial rents. Notably, subsidiary debt is fairly priced ex ante and does not impose additional costs on the firm. The firm's optimal organizational structure for expansion trades off the setup cost of a subsidiary against its benefit in mitigating the firm's time-inconsistency problem.

We extend our analysis to consider the cases where the firm's existing assets are (i) risky, and (ii) not too large compared to the firm's expansion opportunity. In both cases, a firm operating via a branch structure can also benefit from limited liability. If a project fails, the firm defaults on its debt also under a branch structure if the asset-in-place also fails or if the asset-in-place is insufficient to repay the debt. These possibilities also create risk-shifting incentives that alleviate the firm's time-inconsistency problem under a branch structure compared to the baseline setting with safe assets. However, even in this case, a subsidiary structure provides more limited liability protection compared to a branch structure as long as the asset-in-place is not perfectly correlated with the new project or the asset-in-place is sufficiently large compared to the firm's expansion opportunity.

In another extension of our model, we explore the robustness of our mechanism to delegating the continuation decision to the manager. While delegation allows the firm to circumvent its commitment problem that can result in underinvestment, it creates the opposite distortion of overinvestment: the manager may choose to continue non-viable projects. Moreover, since the manager derives private benefits even from non-viable projects encountered without active search, his incentive to engage in costly search is further weakened. Consequently, delegation requires the firm to pay the manager a rent that increases with the magnitude of the manager's private benefits. We demonstrate that when these private benefits are sufficiently large, the subsidiary structure is still the more cost-effective mechanism for resolving the firm's time-consistency problem.

Our model offers a framework that generates empirical predictions on how firms' optimal organizational form of expansion might be shaped by the interplay between search costs, monitoring costs, and the correlation between returns on existing and new investments. Higher search costs, arising from the difficulty of exploring unfamiliar markets and developing viable new projects, can increase the value of committing ex ante to project continuation. This renders subsidiary expansion potentially more attractive. Monitoring costs capture the difficulty of effectively managing a project after development and are shaped by factors such as the quality of legal institutions, the firm's industry expertise, and the reliability of local managerial talent. When monitoring costs are moderate, subsidiaries tend to be preferred again.

Finally, a low correlation between the returns on existing assets and new projects can increase the value of separating the financing structures of the parent and the new investment, further strengthening the case for subsidiary expansion. Taken together, these mechanisms imply that subsidiary structures are most likely to be optimal when expansion opportunities are costly to develop, face moderate management challenges, and produce returns that are not correlated with existing business. Furthermore, our results suggest that firms expanding through a subsidiary structure tend to maintain a larger scope of projects than those that expand through a branch structure.

Our framework also helps interpret why subsidiaries appear frequently in industries adopting new technologies, such as clean energy and electric vehicles. Clean energy projects by traditional energy companies involve high technical and regulatory complexity, scarce specialized talent, and uncertain timelines and returns. Firms must assess emerging technologies and local constraints at the outset, and manage performance and compliance throughout execution, making these investments especially prone to the time-inconsistency problem highlighted in our model.

In line with our framework, several major energy companies have used subsidiaries to organize their clean energy investments. These subsidiaries typically operate as legally distinct entities and raise their own debt to finance capital-intensive renewable energy projects.[1] A similar pattern appears in the automotive sector, where traditional manufacturers isolate high-risk electric and autonomous vehicle initiatives in separate subsidiaries with independent financing.[2]

In our setting, subsidiary expansion can also be interpreted as a spin-off or a carve-out. Consequently, the model predicts that subsidiary investment, carve-outs, and spin-offs are more likely in newly emerging markets characterized by technological change, whereas branch expansion tends to occur in established or mature markets.[3]

Our work extends the literature that studies the firms' optimal organizational choices under various frictions. One strand of the literature explores how debt-related agency problems influence optimal organizational structure. John (1993) and John and John (1991) show that debt overhang leads to underinvestment and derive optimal organizational structures by trading off this effect against the tax advantages of debt. Flannery et al. (1993) analyze a setting with endogenous project choice, incorporating debt overhang, asset substitution,

[1]For example, TotalEnergies has pursued solar and wind via subsidiaries such as SunPower and VBS Group (https://totalenergies.com/media/news/press-releases/USA-totalEnergies-to-Acquire-SunPower-s-CIS-Business and https://totalenergies.com/news/press-releases/integrated-power-renewables-totalenergies-implements-its-strategy-capital; https://www.ft.com/content/a56a5841-8840-4560-84d9-9ad57123c9a3). Enel launched Enel Green Power as a standalone entity for renewables (https://www.enelgreenpower.com/who-we-are/our-company), and Eni created Plenitude and Enilive to focus on renewables and biofuels (https://corporate.eniplenitude.com/en/media/press-release/21-12-2023-Plenitude-progresses-its-strategy-with-the-investment-of-Energy-Infrastructure-Partners).

[2]These examples illustrate settings where our mechanism is most likely to operate, while firms' organizational choices may also be shaped by other well-established factors such as tax considerations, legal motives, or historical practices (Desai et al., 2004; Huizinga and Laeven, 2008; Kandel et al., 2018).

[3]Hackbarth et al. (2014), like our paper, studies organizational choices in response to a new investment opportunity. In their real-options framework, greater competitive (or obsolescence) risk—that is, a higher threat of preemption—favors integration, as it induces earlier investment to protect existing assets. In contrast, greater cash-flow uncertainty increases the value of financial flexibility, thereby favoring non-integration, where new opportunities are developed by specialized or stand-alone firms. Fulghieri and Sevilir (2011) highlights a different trade-off: while spin-offs can intensify product market competition, they alleviate a Hart and Moore (1990)-type hold-up problem and therefore strengthen employee incentives. In both papers, as in ours, the optimal organizational form balances competing frictions.

and tax benefits. Kahn and Winton (2004) note that credit institutions often use separate subsidiaries to house loans with different risk profiles, justifying this through organizational choices that address risk-shifting incentives. In contrast, in our model, organizational structure mitigates dynamic commitment problems faced by the firm when it hires an agent to perform sequential tasks rather than a single task. Our framework highlights a potential benefit of the ex post risk-shifting incentives created by subsidiary debt with limited liability.[4]

A second strand of the literature examines how internal agency problems shape organizational form. Laux (2001) considers a setting with a single managerial effort decision, showing that subsidiarization can make the threat of project termination credible and thereby prevent overinvestment. Instead, our model focuses on underinvestment in a dynamic setting involving a series of managerial decisions rather than a one-time choice. Robinson (2008) and Ayotte (2017) demonstrate that delegating decision rights to subsidiaries can strengthen managerial incentives. In Robinson (2008), strategic alliances alleviate distortions in internal capital markets that would otherwise weaken effort incentives. Ayotte (2017) shows that subsidiaries enhance innovation incentives by exposing managers to greater risk of bankruptcy and reducing the interference of the headquarters. In our framework, in contrast, the firm retains control over decisions, and commitment is achieved by structuring debt at the subsidiary level.

Starting with Lewellen (1971), a large literature studies how firms structure multiple activities to balance debt tax shields against bankruptcy costs.[5] Leland (2007) explores how cashflow correlation and risk shape this trade-off. Building on his framework, Luciano and Nicodano (2014) analyzes loan guarantees between parent and subsidiary firms, showing that, using our terminology, branch structures dominate subsidiaries when return correlations are high. Banal-Estanol et al. (2013) focuses on the bankruptcy costs of debt financing and predicts the optimality of joint project financing when projects are more correlated due to

[4]Segura and Zeng (2020) show that voluntary support for debt issued by a separate, limited liability structure can mitigate future adverse selection but introduces new moral hazard. The optimal structure balances this trade-off.

[5]See also Higgins and Schall (1975), Kim and McConnell (1977), and Stapleton (1982). Chemmanur and John (1996) studies an entrepreneur who values control right, and chooses between joint and separate incorporation to protect itself against loss of control rights due to takeovers or distress.

contagion concerns.[6] Their prediction appears to contrast with our finding that a subsidiary structure—and thus separate project financing—is optimal under low or negative correlation. This is because our analysis is not concerned with the benefits of a particular debt structure ex ante, but rather with its incentive effects ex post. The inefficiency we address stems from a time-inconsistency problem driven by ex post agency rents, and the optimal debt structure is designed to provide ex post counteracting incentives.

Our work also connects to the broader literature on business groups and multi-divisional firms. Khanna and Yafeh (2007) provides a comprehensive review of the empirical evidence on business groups, emphasizing how institutional and historical factors shape their prevalence and internal functioning. On the theory side, Almeida and Wolfenzon (2006) develops a model of pyramidal ownership and family business groups, in which internal financing constraints and control considerations—rather than managerial incentives—drive the formation of subsidiary structures. A related line of research, exemplified by Cestone and Fumagalli (2005), analyzes how internal capital markets operate within business groups made up of legally distinct subsidiaries. In their framework, limited liability and resource flexibility allow headquarters to reallocate funds across subsidiaries facing different product-market conditions, making cross-subsidization across units strategically optimal in some settings. Their analysis highlights how legal separation among subsidiaries alters internal capital market dynamics relative to multi-divisional firms, where all units share a common balance sheet and limited liability does not apply. Our model complements this work by focusing on how subsidiary-level limited liability shapes dynamic commitment and managerial incentives in a multi-stage product expansion setting.

2 Model

We analyze a model with three dates, $t = 0, 1, 2$, in which every agent is risk-neutral and the interest rate is normalized to zero. There is an unlevered firm with an existing asset-in-place that pays off $Y \geq 1$ at time 2. The firm has limited liability and is run by its sole shareholder; that is, all decisions are taken in order to maximize shareholder value. For convenience, we

[6] Classical result in Diamond (1984) based on mechanisms of cross-pledging also predicts the optimality of joint project financing in such cases.

will refer to actions taken by the shareholders as decisions of the firm. The firm has no funds at time 0.

2.1 Expansion opportunity

At time 0, the firm has access to a new business expansion opportunity that requires an up-front investment of 1. Note that the firm's asset-in-place ensures that it can raise external funds to cover the cost of its expansion. The expansion opportunity entails two phases: A first development phase and a second implementation phase. The expansion opportunity can be interpreted as, e.g., shifting to a new technology, or expansion into a new product or geographical market, whose technological and commercial potential can only be realized after some initial exploration and development.

Expansion requires that the firm hires a specialist manager whose skills are critical in both phases of the business expansion. In the first period, the manager makes an unobservable decision to explore and develop the expansion opportunity; we refer to the manager's activity at time 0 as "search". Search encompasses the development phase and may involve exploring the new market and establishing the necessary technological and regulatory groundwork. The manager incurs a private disutility $\zeta > 0$ from search. If the manager does not search, then a non-viable project is available in the second period with probability 1; if he searches, then a viable project is available with probability $\pi > 0$, and a non-viable project with probability $1 - \pi$. The viability of the project is observable but cannot be verified.

At time 1, the firm decides whether to continue the project uncovered by the manager. This represents the implementation phase that ultimately transforms the expansion opportunity into a commercial success. If the firm does not continue the project, it can salvage its time 0 investment to return $L \leq 1$.

If the firm continues a non-viable project, the project returns 0 at time 2 but the manager receives a private benefit B. We assume that $B < L$, so it is efficient to liquidate a non-viable project.

If the firm continues a viable project, then the manager makes an unobservable decision to exert effort to manage the project; we refer to the manager's activity at time 1 as "monitor". The project returns $\tilde{R} \in \{R, 0\}$ at time 2, which depends on the manager's monitoring effort.

If the manager monitors, the project succeeds ($\tilde{R} = R$) with probability p and fails ($\tilde{R} = 0$) otherwise; if the manager does not monitor, the project succeeds with probability $p - \delta$. The manager incurs a private disutility m_σ from monitoring, which depends on the state of the world $\sigma \in \{h, e\}$ realised at time 1: $m_h = M > 0$ and $m_e = 0$. We refer to the viable project as *hard* and *easy* in case the state σ is h and e, respectively. The state of the world is observable and contractible. The prior probability that $\sigma = h$ is λ.

We impose the following parametric restrictions regarding the expansion opportunity.

Assumption 1. $pR - M - 1 \geq 0$.

Assumption 1 states that a hard viable project has a positive NPV if the manager exerts effort. This then implies that an easy viable project also has a positive NPV.

Assumption 2. $(p - \delta)R < L(1 - \delta)$.

Assumption 2 implies that it is efficient to liquidate a viable project if the manager does not exert effort $(p - \delta)R < L$.[7]

Assumption 3. $\zeta \leq \bar{\zeta} \equiv (L - 1) + \pi(1 - \lambda)(pR - L)$.

Assumption 3 states that a strategy of developing the opportunity (searching) and then continuing only easy viable projects has a positive NPV. Assumptions 1 and 3 then imply that a strategy of searching and then continuing (with monitoring) all viable projects also has a positive NPV:

$$\zeta \leq (1 - \pi)(L - 1) + \pi(pR - 1 - M\lambda). \tag{1}$$

Under these assumptions, the efficient investment strategy for the firm is (i) to invest in the expansion opportunity and to engage in search at time 0, and (ii) to continue and monitor every viable project, and to liquidate all non-viable projects at time 1. The time 0 expected NPV Π^{FB} of the firm under efficient investment decisions is therefore given by Equation (2):

$$\Pi^{FB} = Y + (1 - \pi)(L - 1) + \pi(pR - 1 - \lambda M) - \zeta. \tag{2}$$

[7] We impose the slightly stronger condition stated in Assumption 2, which significantly reduces the number of cases that we have to present in our formal analysis, but does not materially affect any of our intuitions.

2.2 Organizational structure and financing

At time 0, the firm selects the organizational structure that it uses for its expansion and borrows one unit for investment from competitive deep-pocketed investors. The firm can adopt a *branch* or a *subsidiary* structure.

If the firm opts to expand using a branch structure, then all of the investments into the expansion opportunity share the firm's legal personality. They therefore sit on the same balance sheet, and any debt that the firm issues at time 0 is backed by returns from both the new business and the firm's asset-in-place. In this case, the firm issues debt with face value D_B to raise 1.

If the firm uses a subsidiary structure, then it creates a subsidiary firm that has a separate legal personality from the original firm, which we refer to in this case as the "parent." Creating and maintaining the subsidiary firm requires the parent to cover running costs, such as duplicated IT and accounting system overheads, which amount to $C > 0$.

The subsidiary firm owns the expansion opportunity and any project it generates, if continued. In turn, the subsidiary's equity is entirely owned by the parent firm, which is protected by limited liability from subsidiary losses. In this case, the parent firm issues debt with face value D_P to raise d_P and the subsidiary issues debt with face value D_S to raise d_S, where $d_P + d_S = 1$. The parent debt is backed by its asset-in-place and its equity holding in the subsidiary firm, while the subsidiary is backed by the returns from the expansion opportunity and any project it generates, if continued.

In our model, the critical difference between branch and subsidiary expansion is that subsidiarization allows the parent to partition its assets and to borrow against only some of them, while branch expansion allows for debt backed by all of the firm's assets. In practice, subsidiary asset partitioning is achieved because the subsidiary has a separate legal personality, but it could be partially unwound by contract: for example, the parent firm could commit to cover the subsidiary's losses. Similarly, the firm may be able to limit its exposure to its branch's activities by buying protection from a third party. However, the fact that this type of contracting is possible simply serves to highlight the fact that there are several ways to achieve the separation accomplished through a straightforward subsidiary structure. The fact that firms use subsidiaries for this purpose is strong prima facie evidence that alternative approaches would incur higher costs.

2.3 Compensation contracts

The relationship between the manager and the firm is governed by a compensation contract. The manager's time 0 search decision and time 1 monitoring decision are unobservable and so cannot feature in the contract. Similarly, the contract cannot be contingent upon the viability of the project at $t = 1$ because it is non-verifiable. The state of the world $\sigma \in \{h, e\}$, whether a project is continued at time 1, and the project return $\tilde{R}$ at time 2 (if continued) are contractible, and we therefore consider contracts of the form

$$(w_\sigma^R, w_\sigma^0, a_\sigma), \tag{3}$$

where w_σ^R and w_σ^0 are the payments to the manager in case the project is continued at time 1 and then returns R or 0 at time 2 in state σ, respectively, and the abandonment wage a_σ is the payment to the manager in case the project is abandoned at time 1 in state σ. The manager is protected by limited liability:

$$w_\sigma^R \geq 0,\ w_\sigma^0 \geq 0,\ a_\sigma \geq 0. \tag{4}$$

For simplicity, we assume that the firm has unlimited liability towards the manager's compensation contract. This is without loss of generality, as we show in Appendix A.9 that the firm indeed has sufficient funds to pay the manager according to the optimal compensation contract.

2.4 Timeline

Figure 1 illustrates the timeline for our model. At time 0, the firm decides whether to expand via a branch or a subsidiary structure, and issues debt to raise 1 unit of investment. The firm then offers a compensation contract $(w_\sigma^R, w_\sigma^0, a_\sigma)$ to the manager. If the manager accepts the contract, he decides whether to search.

At time 1, the viability of the project and the state of the world $\sigma \in \{e, h\}$ are realized. The firm decides whether or not to continue the project. The manager makes an unobservable effort choice if the project is continued.

At time 2, the returns are realized and all wage and financing contracts are settled.

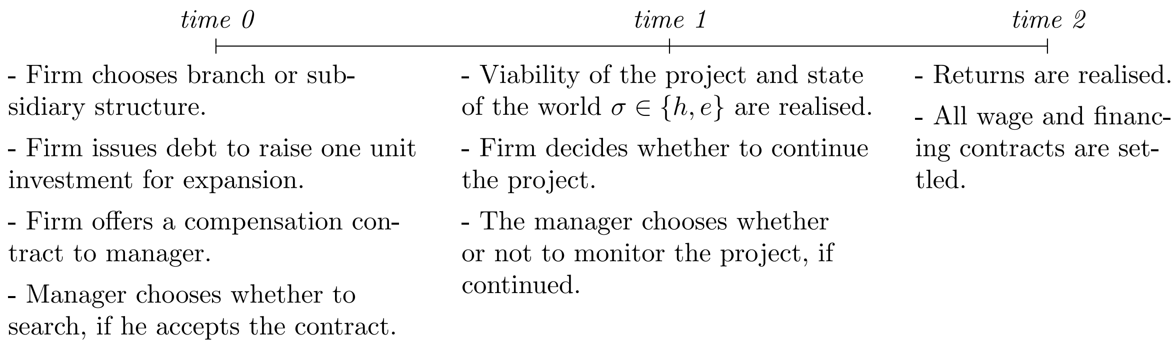

Figure 1: Model timeline.
Alt text: Timeline of the model, listing the events and actions taken by players at each time 0, 1, and 2.

3 Commitment benchmark

We start by solving the firm's optimal decisions in the benchmark case in which the firm is able to commit at time 0 to an investment strategy with respect to the continuation of the projects at time 1. The firm makes three choices: (i) its investment strategy, (ii) its organizational form, and (iii) an optimal compensation contract that implements the chosen investment strategy.

3.1 Investment strategies

At time 1, the firm learns the viability of its project and the state σ, and decides whether to continue the project.

Since a non-viable project realizes a zero payoff, the firm never continues a non-viable project. If the project is viable, the firm always finds it optimal to continue if it is easy. This is because it does not require any *additional* compensation costs to induce managerial effort for an easy project. However, since it is costly to induce managerial effort for a hard project, the firm may not find it optimal to continue a hard viable project. Therefore, two equilibrium investment strategies are possible, as stated in the following lemma.

Lemma 1. *In any equilibrium, the firm adopts one of two investment strategies:*

- *the selective strategy, in which case it continues easy viable projects but not hard viable projects, or*

- *the unselective strategy, in which case it continues every viable project.*

The firm does not continue non-viable projects.

3.2 Optimal expansion form and contracts for a given investment strategy

This section examines the optimal choices of the firm, conditional on a given investment strategy, with respect to (i) the organizational form of expansion and (ii) the managerial compensation contract.

Consider first the case of the selective investment strategy. Since monitoring is costless for an easy project, we assume that the manager always exerts effort. Given that the firm issues fairly priced securities at time 0 to raise 1 for investment, the firm's expected profit Π_{sel} can be expressed as follows:

$$\Pi_{sel} = \Pi^{FB} - \underbrace{\pi\lambda(pR - M - L)}_{\textit{forgone hard project NPV}} - \underbrace{\rho_{sel}}_{\textit{managerial rent}} - \underbrace{c}_{\textit{set-up cost}}. \tag{5}$$

This expression shows the firm's profit deviates from the expected NPV under the first-best for three reasons. First, by implementing the selective investment strategy, the firm forgoes the NPV associated with continuing a hard viable project (which occurs with probability $\pi\lambda$). Second, the manager obtains a rent ρ_{sel} that is equal to his expected compensation less the search cost. The rent can be expressed as follows:

$$\rho_{sel} = \underbrace{[\lambda a_h + (1-\lambda)a_e]}_{\textit{rent from not searching}} + \underbrace{\left[(1-\lambda)\pi\left(p\, w_e^R + (1-p)\, w_e^0 - a_e\right) - \zeta\right]}_{\textit{marginal rent from searching}}. \tag{6}$$

The rent consists of two parts: the manager's rent from not searching (the first term), and the marginal rent from searching (the second term). If the manager does not search for a project, then he uncovers a non-viable project with probability 1 and is then paid the abandonment wage a_σ. If the manager searches, then he earns a marginal rent equal to the expected marginal compensation from a viable easy project (with probability $(1-\lambda)\pi$) less the search cost ζ. Finally, the firm incurs a cost c to establish its organizational structure, which is equal to 0 for a branch structure and $C > 0$ for a subsidiary structure.

The compensation contract must provide incentives for the manager to search for a viable project at time 0, which requires that the expected marginal compensation from continuing an easy viable project exceeds the search cost. That is, the manager must derive a weakly positive marginal rent from searching, given by the second term of Equation (6):

$$(IC_{sel}^{search}): \quad (1-\lambda)\pi \left[p w_e^R + (1-p) w_e^0 - a_e \right] - \zeta \geq 0. \tag{7}$$

We first establish that it is optimal for the firm to expand via a branch structure. This result follows from the observation that, under commitment, the firm's financing decision - specifically, where the debt is issued - does not affect its optimization problem. Since all debt is fairly priced, financing choices do not influence the firm's profit, nor do they interact with the design of the optimal managerial compensation contract as characterized by Equation (7). Consequently, the firm optimally selects the branch structure to minimize set-up costs.

Maximizing firm profit given the selective investment strategy then boils down to minimizing managerial rent. The firm does so by setting the abandonment wages to $a_h = a_e = 0$ and project payments w_e^R and w_e^0 to bind the manager's search IC constraint given by Equation (7), leaving the manager no rents. The following lemma formally presents the firm's optimal decisions given the selective investment strategy under commitment.

Lemma 2. *Suppose the firm commits to the selective investment strategy. Then it selects a branch structure for expansion. Any optimal contract pays the manager no abandonment wages $a_h = a_e = 0$ and leaves no managerial rent $\rho_{sel} = 0$. The firm's profit is given by*

$$\Pi_{sel}^C = \Pi^{FB} - \underbrace{\lambda\pi(pR - M - L)}_{\text{forgone hard project NPV}}. \tag{8}$$

Next, consider the case of the unselective investment strategy. By Assumption 2, unmonitored projects have negative NPV. It follows that any optimal contract must ensure that the manager engages in monitoring of the hard project at time 1, conditional on being continued. As a result, the firm's expected profit Π_{unsel} under the unselective investment strategy can be expressed as follows:

$$\Pi_{unsel} = \Pi^{FB} - \rho_{unsel} - c, \tag{9}$$

This expression mirrors the selective investment case, with the key difference that the firm's investment strategy is efficient and generates the full first-best NPV. Under the unselective investment strategy, the managerial rent is given by

$$\rho_{unsel} = \underbrace{[\lambda a_h + (1-\lambda) a_e]}_{\text{rent from not searching}} + \underbrace{\left[\begin{array}{l} \lambda\pi \left(p\, w_h^R + (1-p)\, w_h^0 - a_h - M \right) \\ \quad +(1-\lambda)\pi \left(p\, w_e^R + (1-p)\, w_e^0 - a_e \right) - \zeta \end{array} \right]}_{\text{marginal rent from searching}} \tag{10}$$

Compared to the selective strategy case in Equation (6), the manager may earn additional rent when the firm continues the hard viable project (with probability $\lambda\pi$). This extra rent, captured by the first line of the second term of Equation (10), is equal to the expected marginal continuation wage in the hard state minus the monitoring cost.

As in the case of the selective investment strategy, the compensation contract must incentivize the manager to search for a viable project at time 0. This requires that the total marginal compensation associated with continuing both easy and hard viable projects, net of the monitoring cost, exceeds the search cost. This is equivalent to requiring that the marginal rent from searching, given by the second term of Equation (10), is weakly positive:

$$(IC_{unsel}^{search}): \quad \lambda\pi \left[p w_h^R + (1-p) w_h^0 - a_h - M \right] + (1-\lambda)\pi \left[p w_e^R + (1-p) w_e^0 - a_e \right] - \zeta \geq 0. \tag{11}$$

In addition, the compensation contract must satisfy the incentive compatibility constraint for the manager to exert monitoring effort when pursuing a hard viable project at time 1:

$$(IC^{monitor}): \quad p \left(w_h^R - w_h^0 \right) - M \geq (p-\delta) \left(w_h^R - w_h^0 \right) \quad \Leftrightarrow \quad w_h^R - w_h^0 \geq \frac{M}{\delta}. \tag{12}$$

As in the case of the selective investment strategy, the firm pays no abandonment wage $a_h = a_e = 0$ to minimize managerial rent, and optimally chooses a branch structure to avoid the set-up cost.

Crucially, however, and in contrast to the selective strategy case, the manager may earn a strictly positive rent ρ_{unsel}. This is because, Equation (12) implies that, in order to ensure the manager is willing to monitor the hard viable project, continuing that project must increase the manager's expected rent by at least $\frac{p-\delta}{\delta} M$. This rent is realised only with probability $\lambda\pi$, and is at least partially offset by the search cost ζ incurred at time 0 (see Equation (10)). As a result, the manager earns a strictly positive rent ρ_{unsel} if the monitoring cost M

of the hard project is sufficiently high and the search cost ζ is sufficiently low. This result is formalized in the following lemma.

Lemma 3. *Suppose the firm commits to the unselective investment strategy. Then it selects a branch structure for expansion. Any optimal contract pays the manager no abandonment wages $a_h = a_e = 0$ and leaves a managerial rent ρ^C_{unsel} that is increasing in M and decreasing in ζ. The firm's profit is given by*

$$\Pi^C_{unsel} = \Pi^{FB} - \underbrace{\max\{\lambda\pi\frac{p-\delta}{\delta}M - \zeta, 0\}}_{managerial\ rent\ \rho^C_{unsel}}. \tag{13}$$

3.3 Optimal investment strategy under commitment

We now characterize the firm's optimal strategy under commitment. First, recall that the firm always expands via a branch structure to minimize the set-up cost.

Moreover, Lemmas 2 and 3 highlight the trade-off the firm faces when choosing its optimal investment strategy. On the one hand, committing to the selective investment strategy allows the firm to avoid paying managerial rents, but entails forgoing the NPV associated with the hard viable project. On the other hand, committing to the unselective investment strategy enables the firm to generate the full NPV of all viable projects, including the hard ones, but may require leaving the manager a strictly positive rent to incentivize monitoring effort. The value of the forgone hard project under the selective strategy is decreasing in the monitoring cost M (Lemma 2), whereas the time 0 managerial rent under the unselective strategy is increasing in M and decreasing in the search cost ζ (Lemma 3). Consequently, the firm optimally chooses the selective investment strategy when the monitoring cost M is sufficiently high and/or the search cost ζ is sufficiently low. The following proposition formally characterizes the firm's optimal investment strategy:

Proposition 1. *Suppose that the firm can commit to an investment strategy. Then it selects a branch structure for expansion. There exists $\mu^C(\zeta)$, such that the firm chooses the selective investment strategy if $M \geq \mu^C(\zeta)$ and the unselective investment strategy otherwise, where $\mu^C(\zeta)$ is increasing in ζ.*

4 Equilibrium without commitment

We now consider the case in which the firm is unable to commit at time 0 to a time 1 investment strategy.

In the absence of commitment, the firm may encounter a time-inconsistency problem, particularly concerning the continuation of a hard viable project. As shown in Section 3, it may be optimal ex ante—at time 0—for the firm to adopt the unselective investment strategy that includes the continuation of such projects. At this point, the firm may regard the high continuation rent required to induce monitoring of the hard project as a cost worth incurring, since the prospect of this rent also encourages the manager to undertake costly search. However, once the managerial search cost is sunk at time 1 and the project is revealed to be hard, the continuation rents may be sufficiently large to discourage the firm from proceeding.

Formally, in the no-commitment setting, the optimal contract must satisfy additional incentive compatibility constraints to ensure that the firm adheres at time 1 to the investment strategy preferred at time 0. Specifically, if the strategy prescribes continuation in state σ, the firm's income from continuation in that state must exceed its income from project abandonment.

In what follows, we solve for the firm's optimal contract without commitment under the branch and subsidiary structures. We then characterize the firm's optimal organizational form for expansion.

4.1 Time-consistent branch firm investment strategies

Consider first the case in which the firm expands via a branch structure. In this case, the firm has outstanding debt D_B, which must be repaid using the payoff either from its asset-in-place or its project. For a given investment strategy, the firm must find it profitable at time 1 to invest accordingly: continuing a viable project in state $\sigma \in \{h, e\}$ is incentive-compatible if and only if the firm's income from the asset-in-place and the project, net of debt repayment and managerial compensation, is greater under continuation than abandonment:

$$Y + pR - D_B - \left[pw_\sigma^R + (1-p)w_\sigma^0\right] \geq Y + L - D_B - a_\sigma. \tag{14}$$

Under a branch structure, because the asset-in-place yields $Y \geq 1$, the firm's debt is repaid with certainty regardless of whether it continues or abandons the project.[8] As a result, debt repayment D_B drops out of the expression, and Equation (14) can be expressed as follows:

$$(IC^{continuation}_{branch}): \quad \underbrace{pw^R_\sigma + (1-p)w^0_\sigma - a_\sigma}_{\text{marginal continuation wage}} \leq \underbrace{pR - L}_{\text{marginal payoff from continuation}}. \qquad (15)$$

That is, the firm finds it incentive compatible to continue a viable project if and only if the manager's marginal continuation wage is less than the NPV of project continuation.

In what follows, we first consider the firm's optimal contract for a given investment strategy, and then analyse the firm's equilibrium investment strategy.

The firm's optimal contract under the selective investment strategy with commitment (Lemma 2) is time-consistent. This is because the manager's expected marginal continuation wage from an easy viable project (once found) exactly offsets the search cost. Given that continuing only an easy viable project yields a strictly positive net present value, even after accounting for the search cost, the firm's continuation income exceeds the manager's required compensation. At the same time, the firm can always specify a sufficiently high marginal continuation wage for the hard viable project to render abandonment incentive compatible. As a result, the firm's profit under the time-consistent selective strategy, denoted Π^B_{sel}, is the same as its profit under commitment, Π^C_{sel}, as characterized in Lemma 2.

Next, consider the firm's optimal contract for the unselective investment strategy. The continuation constraint given by Equation (15) requires that the manager's marginal continuation wage is not too high so that the firm finds it profitable to continue the hard project. At the same time, the monitoring constraint given by Equation (12) implies that the manager must earn sufficiently high wages from pursuing the hard project in order to ensure monitoring. The optimal contract under commitment, which sets abandonment wages to 0, provides the manager with a marginal continuation wage of at least $\frac{p}{\delta}M$. However, this level of compensation may violate the firm's continuation constraint when the monitoring cost M is sufficiently high, specifically when $M \geq \frac{\delta}{p}(pR - L)$.

In these cases, the time-consistent optimal contract must increase the abandonment wage a_h, which makes abandonment less attractive, in order to preserve the firm's incentive to

[8]In Section 5.1.1 we consider the case in which the firm's asset-in-place does not always pay off $Y \geq 1$, resulting in risky debt. Our main results continue to hold.

continue a hard project. A higher abandonment wage a_h, however, increases the managerial rent ρ_{unsel} as of time 0 (see Equation (11)). This result is summarized in the following lemma.

Lemma 4. *Under a branch expansion with a time-consistent unselective strategy, the optimal contract sets $a_e = 0$ and $a_h \geq 0$, and yields a managerial rent $\rho^B_{unsel} \geq \rho^C_{unsel}$, with strict inequality if and only if $M \geq \frac{\delta}{p}(pR - L)$. The firm's profit is given by*

$$\Pi^B_{unsel} = \Pi^{FB} - \rho^B_{unsel}, \tag{16}$$

where ρ^B_{unsel} is increasing in M and decreasing in ζ and is given by

$$\rho^B_{unsel} = \begin{cases} \rho^C_{unsel} = \max\{\lambda\pi\frac{p-\delta}{\delta}M - \zeta, 0\}, & \text{if } M \leq \frac{\delta}{p}(pR - L); \\ \lambda\left[\frac{p}{\delta}M - (pR - L)\right] + \max\{\lambda\pi(pR - M - L) - \zeta, 0\}, & \text{if } M > \frac{\delta}{p}(pR - L). \end{cases} \tag{17}$$

Moreover, the following corollary characterizes the increase in managerial rent ρ_{unsel}—and the corresponding reduction in the firm's profit Π_{unsel}—that arises from the firm's inability to commit.

Corollary 1. *Consider a branch expansion. The increase in managerial rent under the unselective investment strategy due to the firm's time-consistency problem, $\rho^B_{unsel} - \rho^C_{unsel}$, is increasing in M and ζ.*

First, the abandonment wage a_h, and thus the rent difference $\rho^B_{unsel} - \rho^C_{unsel}$, is increasing in the hard project's monitoring cost M. This is because a higher monitoring cost M increases the continuation wage needed to satisfy the manager's monitoring incentive (Equation (12)), which in turn requires a higher abandonment wage to maintain the firm's incentive to continue (Equation (15)). Second, the rent difference $\rho^B_{unsel} - \rho^C_{unsel}$ is increasing in ζ because the abandonment wage a_h affects the managerial rent ρ_{unsel} through two channels. On the one hand, it raises the managerial rent from not searching (the first term of (10)). On the other hand, it potentially reduces the marginal rent from searching (the second term of (10)). This latter effect only occurs if the manager's search constraint given by Equation (11) is slack, which is when the search cost ζ is not too high. As a result, the overall rent difference $\rho^B_{unsel} - \rho^C_{unsel}$ is larger when the search cost ζ is higher, in which case the second (negative) channel becomes muted.

The firm's optimal investment strategy then follows a similar trade-off as in the commitment case, between the forgone hard project NPV under the selective strategy and the higher managerial rent under the unselective strategy. The following proposition characterizes the firm's optimal investment strategy.

Proposition 2. *Suppose the firm expands via a branch structure and cannot commit to an investment strategy. There exists $\mu^B(\zeta) < \mu^C(\zeta)$ for all $\zeta > 0$, such that the firm chooses the selective investment strategy if $M \geq \mu^B(\zeta)$ and the unselective investment strategy otherwise, where $\mu^B(\zeta)$ is increasing in ζ.*

Proposition 2 shows that, relative to the commitment case, the firm prefers the selective investment strategy for a strictly larger set of parameter values, since the lack of commitment reduces the firm's expected profit from the unselective investment strategy (Corollary 1). This result is illustrated in Figure 2. The gray-shaded region above the black dashed line $\mu^C(\zeta)$ represents the parameter space in which the firm optimally commits to the selective strategy. The striped region above the solid blue line $\mu^B(\zeta)$ represents the parameter space in which the firm chooses the selective strategy without commitment under a branch structure. The unshaded striped region between the two curves represents the parameter space in which underinvestment arises due to the lack of commitment.

This underinvestment arises directly from the firm's time-inconsistency problem. When the monitoring cost M is high, Lemma 4 shows that implementing the unselective investment strategy without commitment requires the firm to offer the manager a higher rent than under commitment. This occurs for all $M \geq \frac{\delta}{p}(pR - L)$, corresponding to the region above the dotted line in Figure 2. The resulting increase in managerial rent reduces the firm's profit, leading it to prefer the selective strategy over a broader set of parameters.

4.2 Time-consistent subsidiary firm investment strategies

Unlike under a branch structure, the firm's optimal investment strategy under a subsidiary structure depends on its financing mix. Recall that the parent firm issues debt with face value D_P to raise d_P, and the subsidiary issues debt with face value D_S to raise d_S, where $d_P + d_S = 1$. At time 1, the firm finds it incentive compatible to continue a viable project

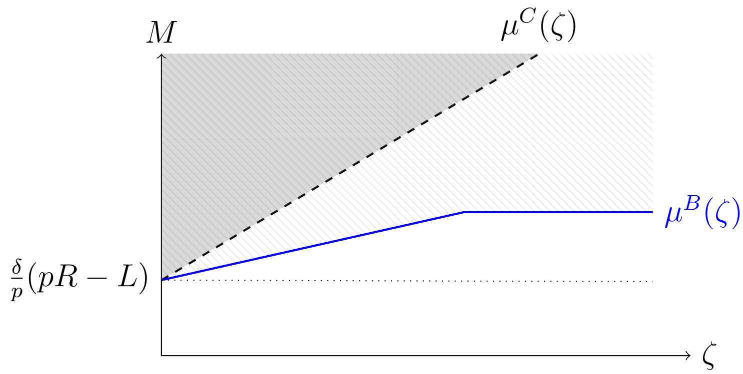

Figure 2: Investment strategy without commitment under a branch structure. The black dashed line plots the boundary $\mu^C(\zeta)$ given by Proposition 1, and the blue solid line plots the boundary $\mu^B(\zeta)$ given by Proposition 2. The gray shaded area above the black dashed line $\mu^C(\zeta)$ represents the parameter space in which the firm optimally commits to the selective strategy. The striped area above the solid blue line $\mu^B(\zeta)$ represents the parameter space for which the firm chooses the selective strategy without commitment under a branch structure. The unshaded striped area between the two curves represents the parameter space in which underinvestment arises due to the lack of commitment under a branch structure.

Alt text: Illustration of firm investment strategy without commitment under a branch structure in the (ζ, M) space, showing that the lack of commitment leads to underinvestment for higher ζ and intermediate M compared to the commitment benchmark.

in state $\sigma \in \{h, e\}$ if and only if

$$Y - D_P + p(R - D_S) - \left[pw_\sigma^R + (1-p)w_\sigma^0\right] \geq Y - D_P + \max\{L - D_S, 0\} - a_\sigma. \qquad (18)$$

Comparing Equation (18) to the analogous condition under a branch structure (Equation (14)) highlights the effect of limited liability under a subsidiary structure. Specifically, the firm is only obligated to repay subsidiary debt if the project's returns are sufficient, and its asset-in-place remains protected from subsidiary creditors. Consequently, if the firm continues the project, the subsidiary debt is repaid with probability p—that is, only if the project succeeds. If the firm instead abandons the project, repayment is limited to the liquidation value L, as captured by the max operator on the right-hand side of Equation (18). This condition can be restated as follows.

$$(IC_{subsidiary}^{continuation}): \quad \underbrace{\left[pw_\sigma^R + (1-p)w_\sigma^0\right] - a_\sigma}_{\text{marginal continuation wage}} \leq \underbrace{pR - L}_{\text{marginal payoff from continuation}} + \underbrace{\left[\min\{D_S, L\} - pD_S\right]}_{\text{marginal debt servicing cost saving}}. \qquad (19)$$

In contrast to the case under a branch structure (see Equation (15)), the firm's continuation incentives are influenced by its financing structure, as captured by the last term on the right-hand side of (19). For D_S not too high, this term is positive, and the firm is more likely to continue a project. This is because pursuing the project increases the riskiness of the subsidiary's payoff compared to abandonment. As a result, the firm's debt servicing cost decreases due to the subsidiary's limited liability: While the firm repays the debt with certainty (up to L) upon abandonment, it only repays the debt with probability p (when the project succeeds) if it continues the project. This difference then provides the firm with an additional incentive to continue the project at time 1 compared to the case under a branch structure.

Since the firm's debt is fairly priced, the firm's time-0 profit is not directly affected by the allocation of debt between the parent and the subsidiary. However, the firm's continuation constraint given by Equation (19) is slackest when the face value of subsidiary debt is set to $D_S = L$, providing the strongest incentive to continue the project. In this case, the right-hand side of Equation (19) becomes $p(R - L)$, which exceeds the corresponding expression under a branch structure by $L(1-p)$. Under Assumption 2, which implies a sufficiently high liquidation value L, issuing subsidiary debt $D_S = L$ relaxes the firm's continuation constraint sufficiently that it does not bind under the optimal contract with commitment. As a result, the firm can implement the unselective investment strategy under a subsidiary structure using the same contract as in the commitment case, incurring a managerial rent equal to ρ^C_{unsel}.

We have thus far established that the firm can overcome its commitment problem by strategically allocating debt to the subsidiary, thereby leveraging limited liability. This enables the firm to implement its desired investment strategy using managerial compensation contracts that generate the same rent as in the commitment case. However, this enhanced commitment comes at a cost C, reflecting the fixed expense of establishing a subsidiary structure. The following proposition formally characterizes the firm's optimal investment strategy and associated profit under a subsidiary structure.

Proposition 3. *Suppose the firm expands via a subsidiary structure and cannot commit to an investment strategy. The firm's choice of investment is identical to the case with commitment. That is, it chooses the selective strategy if $M \geq \mu^C(\zeta)$ and the unselective strategy otherwise, where $\mu^C(\zeta)$ is as defined in Proposition 1. The firm's profit is $\Pi^S_{sel} = \Pi^C_{sel} - C$ under the selective strategy and $\Pi^S_{unsel} = \Pi^C_{unsel} - C$ under the unselective strategy, where Π^C_{sel} and Π^C_{unsel} are defined in Lemmas 2 and 3, respectively.*

4.3 Optimal organizational structure without commitment

We now turn to the firm's choice between expanding via a branch or a subsidiary structure. While branch expansion avoids the set-up cost C, Lemma 4 and Proposition 2 show that costs may arise due to the time-inconsistency problem regarding the continuation of hard viable projects. Specifically, under a branch structure, implementing the unselective investment strategy may require the firm to pay a high abandonment wage to preserve continuation incentives, particularly when monitoring costs are high. Since this wage is paid regardless of whether the manager searches, it raises the total managerial rent ρ_{unsel}, reducing the firm's profit under the unselective investment strategy and potentially leading to underinvestment.

In contrast, Proposition 3 shows that allocating debt to a subsidiary mitigates this time-consistency problem, enabling the firm to implement constrained-efficient investment strategies. Under limited liability, continuing a risky hard project lowers the expected debt repayment, strengthening the firm's continuation incentives. Because debt is fairly priced ex ante, using subsidiary debt as a commitment device imposes no cost beyond the fixed set-up cost C.

We first establish in the following lemma that if the set-up cost of a subsidiary is too high, then the firm always expands via a branch structure:

Lemma 5. *Suppose the firm cannot commit to an investment strategy. If $C \geq \bar{C}$, where*

$$\bar{C} \equiv \lambda\pi \frac{p-\delta}{p+\delta\pi}(pR-L), \tag{20}$$

the firm chooses to expand via a branch structure for all (ζ, M) and follows the investment strategy described in Proposition 2.

When the subsidiary set-up cost is sufficiently low (i.e., $C \leq \bar{C}$), subsidiary expansion becomes optimal for some combinations of the search cost ζ and the monitoring cost M. The following proposition characterizes the firm's optimal organizational structure in the absence of commitment.

Proposition 4. *Suppose the firm cannot commit to an investment strategy. If $C < \bar{C}$, there exists $\zeta^* > 0$, such that*

- *for $\zeta \leq \zeta^*$, the firm expands via a branch, and chooses the selective investment strategy if $M \geq \mu^B(\zeta)$, where $\mu^B(\zeta)$ is defined in Proposition 2, and the unselective investment strategy otherwise;*

- *for $\zeta > \zeta^*$, there exist $\overline{\mu}^S(\zeta)$ and $\underline{\mu}^S(\zeta)$, where $\mu^C(\zeta) > \overline{\mu}^S(\zeta) > \mu^B(\zeta) > \underline{\mu}^S(\zeta)$, such that*

  - *for $M \geq \overline{\mu}^S(\zeta)$, the firm expands via a branch and chooses the selective investment strategy;*

  - *for $M \in (\underline{\mu}^S(\zeta), \overline{\mu}^S(\zeta))$, the firm expands via a subsidiary and chooses the unselective investment strategy;*

– *for $M \leq \underline{\mu}^S(\zeta)$, the firm expands via a branch and chooses the unselective investment strategy.*

This result is illustrated in Figure 3. To gain intuition, observe that the selective subsidiary is never optimal: a branch can implement the same investment outcome while avoiding the set-up cost. An unselective subsidiary, however, becomes optimal when the set-up cost is sufficiently low relative to the benefit it offers in mitigating the firm's time-inconsistency problem under a branch structure. This benefit manifests itself in two ways.

First, when the monitoring cost is not too high ($M \leq \mu^B(\zeta)$), the firm chooses the unselective strategy under a branch structure (see Proposition 2). As shown in Corollary 1, this leads to higher managerial rent ρ_{unsel} compared to a subsidiary, due to the time-consistency problem. The rent difference is strictly positive for $M > \frac{\delta}{p}(pR-L)$ and increases with both ζ and M. The firm thus weighs the set-up cost of a subsidiary against the savings in managerial rent and finds it optimal to expand via an unselective subsidiary when ζ and M are sufficiently high (i.e., $M \geq \underline{\mu}^S(\zeta)$ for $\zeta > \zeta^*$). This region is depicted in Figure 3, above the lower thick red curve $\underline{\mu}^S(\zeta)$ and below the blue curve $\mu^B(\zeta)$.

Second, when the monitoring cost is sufficiently high ($M \in (\mu^B(\zeta), \mu^C(\zeta)]$), the branch firm opts for the selective strategy to avoid the high managerial rent, despite the unselective strategy being efficient (see Propositions 1 and 2). The associated loss—the forgone NPV of the hard project—is decreasing in M. By contrast, the firm can expand via an unselective subsidiary (see Proposition 3), incurring the set-up cost C and a managerial rent ρ^C_{unsel} that decreases in ζ and increases in M. The firm thus finds it optimal to expand via a subsidiary when ζ is large and M is not too high (i.e., $M \leq \overline{\mu}^S(\mu)$ for $\zeta > \zeta^*$). This region is illustrated in Figure 3 as the area below the upper thick red curve $\overline{\mu}^S(\zeta)$ and the blue curve $\mu^B(\zeta)$. Importantly, in this region, subsidiary expansion restores (constrained-)efficient investment, whereas branch expansion results in underinvestment.

5 Extensions

In this section, we demonstrate the robustness of our main results to two extensions of our baseline model. First, we consider the case in which the firm's asset-in-place no longer pays

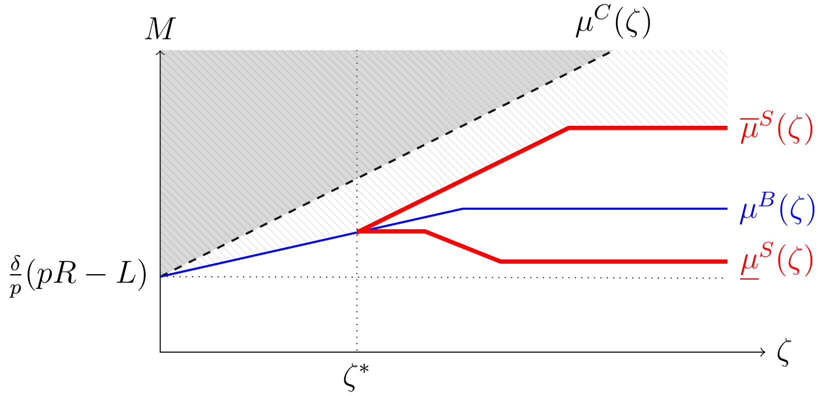

Figure 3: Optimal organizational structure and investment strategy without commitment for $C < \bar{C}$, where $\bar{C}$ is defined in Lemma 5. The black dashed line denotes the commitment threshold $\mu^C(\zeta)$ (Proposition 1); the solid blue line shows the no-commitment branch threshold $\mu^B(\zeta)$ (Proposition 2); and the thick red lines represent the upper and lower subsidiary thresholds $\overline{\mu}^S(\zeta)$ and $\underline{\mu}^S(\zeta)$ (Proposition 4). The firm chooses the selective branch strategy when $M \geq \overline{\mu}^S(\zeta)$, an unselective subsidiary when $M \in (\underline{\mu}^S(\zeta), \overline{\mu}^S(\zeta))$, and an unselective branch when $M \leq \underline{\mu}^S(\zeta)$. The gray shaded area above $\mu^C(\zeta)$ indicates where the selective strategy is optimal under commitment. The striped area above $\overline{\mu}^S(\zeta)$ marks where the selective strategy is chosen without commitment under the optimal organizational structure. The unshaded striped area between the $\mu^C(\zeta)$ and $\overline{\mu}^S(\zeta)$ reflects underinvestment arising from the lack of commitment.

Alt text: Illustration of the optimal organizational structure and investment strategy without commitment in the (ζ, M) space for $C < \bar{C}$, showing that subsidiary expansion is optimal for high ζ and intermediate M.

off $Y \geq 1$ with certainty. Second, we consider the possibility that the firm could choose to delegate the time 1 continuation decision to the manager.

5.1 Risky debt under a branch structure

Recall that in the baseline case, the firm's asset-in-place pays off $Y \geq 1$ with certainty, which ensures that debt issued by the branch is always repaid in full. In this extension, we modify the firm's asset-in-place in two ways: First, we assume that the firm's asset-in-place is risky and pays off either $\bar{Y} \geq 1$ or 0, and second, we assume that the firm's asset-in-place is safe but pays off $Y < 1$. In both cases, the firm must issue risky debt under a branch structure to finance its expansion opportunity. This allows a branch firm to also benefit from limited liability towards its debt, especially when it continues a project at time 1 which then fails at time 2. As a result, the firm's debt servicing cost under a branch structure can also decrease upon continuation due to limited liability. This, in turn, enhances the firm's continuation incentives at time 1 and alleviates the firm's time-inconsistency problem under a branch structure compared to the baseline case.

In this section, we show that even when the firm issues risky debt under a branch structure (either because the firm's asset-in-place is risky, or because it is safe but pays off $Y < 1$), the subsidiary structure may still be the optimal form of expansion. This is because it provides stronger continuation incentives than the branch structure by protecting the firm's asset-in-place from claims by subsidiary creditors. Specifically, whenever the project fails and the firm's asset-in-place pays off a positive payoff, the firm can default on the subsidiary debt due to limited liability, but must at least partially repay its debt under a branch structure. This protection provides additional continuation incentives and mitigates the time-consistency problem under a subsidiary structure. The firm thus faces the same fundamental trade-off as in the baseline model.

Moreover, the two extensions generate additional insights on how a firm's optimal organizational structure of expansion is shaped by, respectively, (i) the correlation between the firm's asset-in-place and the expansion opportunity, and (ii) the relative size of the firm's expansion opportunity compared to its existing business.

		Asset-in-place $\tilde{Y}$	
		$\bar{Y}$	0
Project $\tilde{R}$	R	pq^R	$p(1-q^R)$
	0	$q-pq^R$	$(1-q)-p(1-q^R)$

Table 1: The joint distribution between the firm's risky asset-in-place and project payoffs.

5.1.1 Risky asset-in-place

We first consider the case in which the firm's asset-in-place is risky. Concretely, we model the value of the firm's asset-in-place as a binary random variable $\tilde{Y} \in \{0, \bar{Y}\}$, where $\tilde{Y} = \bar{Y}$ with probability p and $\tilde{Y} = 0$ with probability $(1-p)$. The correlation between the firm's asset-in-place and its project is captured by the probability q^R, defined as the probability that $\tilde{Y} = \bar{Y}$ conditional on the project yielding R. A higher q^R indicates stronger positive correlation, with $q^R = 0$ denoting maximal negative correlation and $q^R = \min\{1, \frac{q}{p}\}$ denoting maximal positive correlation. The joint distribution of asset-in-place and project payoffs is summarized in Table 1. As we will show, the severity of the firm's time-consistency problem—and thus the optimal organizational structure—depends critically on this correlation.

We define $\mathbb{E}[\tilde{Y}] = q\bar{Y} = Y$, so that the firm's asset-in-place in this extension has the same expected payoff as in the baseline model. We also allow managerial compensation contracts to depend on the realization of the firm's asset-in-place payoff $\tilde{Y}$ in addition to the project return $\tilde{R}$. That is, we consider contracts of the form $\left\{\left(w_\sigma^{R,\tilde{Y}}, w_\sigma^{0,\tilde{Y}}, a_\sigma^{\tilde{Y}}\right)\right\}_{\tilde{Y}\in\{0,\bar{Y}\}}$.

Under commitment, the firm's optimal expansion form and investment decisions remain identical to those in the baseline model (Proposition 1). This is because the firm faces only two relevant constraints—the managerial search constraint (Equations (7) for the selective strategy or (11) for the unselective strategy) and the monitoring constraint (12)—neither of which depends on the firm's asset-in-place.

In the absence of commitment, a viable project in state $\sigma \in \{h, e\}$ is continued if and only if the manager's marginal continuation wage—given by $\mathbb{E}^{\tilde{Y}}\left[pw_\sigma^{R,\tilde{Y}} + (1-p)w_\sigma^{0,\tilde{Y}} - a_\sigma^{\tilde{Y}}\right]$, with the expectation taken over the random variable $\tilde{Y}$—does not exceed the marginal benefit of continuation. This benefit, analogous to the right-hand side of the continuation constraint given by Equation (19), consists of the project's net payoff $(pR-L)$ and any marginal saving in expected debt repayment from continuing rather than abandoning the project, which we denote by $\Delta_D(\cdot)$. As in the baseline model, the firm's organizational structure shapes its time-consistency problem through its impact on the debt servicing cost saving $\Delta_D(\cdot)$, which we analyze below.

Consider a subsidiary expansion. For any debt structure (D_S, D_P) with $D_S \leq L$, the marginal debt service cost saving can be written as follows:

$$\Delta_D(D_S, D_P) = (1-p)D_S + (1-q)\min\{L - D_S, D_P\} - p(1-q^R)\min\{R - D_S, D_P\}. \tag{21}$$

The first term captures the debt servicing cost saving on subsidiary debt: since $D_S \leq L$, this debt is repaid with certainty if the project is abandoned, but only with probability p if the project is continued.

The second and third terms reflect the savings on the parent debt. This occurs only if the asset-in-place yields zero, because otherwise the parent debtholders are fully repaid regardless of the continuation decision on the project and no debt cost savings arises. If the asset-in-place yields zero, parent debtholders are repaid (up to D_P) from the subsidiary's residual cash flow, which is equal to $L - D_S$ if the project is abandoned and $R - D_S$ if the project is continued and then succeeds. These repayments are weighted by the probabilities of the respective events: $1 - q$ for abandonment and $p(1 - q^R)$ for continuation.

Notice that the debt repayment under a subsidiary structure with $D_S = 0$ coincides with that under a branch structure, since in that case the entire payoff of the project is accrued to the parent and combined with the firm's asset-in-place is to repay the parent's debt.[9] We can therefore assess the advantage of a subsidiary structure over a branch structure by considering the effect of a marginal increase in D_S on the firm's continuation incentives through the marginal debt servicing cost saving.

Specifically, for $D_P > R - D_S > L - D_S$, the marginal effect of an increase in subsidiary debt D_S on the marginal debt servicing cost saving is equal to

$$\frac{\partial \Delta_D(D_S, D_P)}{\partial D_S} = (1-p) - \left[(1-q) - p(1-q^R)\right] = q - pq^R. \tag{22}$$

[9] In contrast to the baseline model, when the firm's asset-in-place is risky, continuation of the project under a branch structure also provides a strictly positive debt service cost saving $\Delta_D(0, D_B) > 0$.

Equation (22) reveals the two effects of shifting the firm's debt from the parent to the subsidiary. First, a larger subsidiary debt increases the firm's continuation incentives (the first term) because the subsidiary debt is repaid with a lower probability under continuation (probability p) than under abandonment (probability 1). This is the same effect as that present in the baseline model, and arises with probability $(1 - p)$.

Second, a larger subsidiary debt implies a smaller residual profit of the subsidiary and thus smaller (partial) repayment to the parent debt, both when the project is abandoned and continued. Since the residual profit of the subsidiary accrues to the parent debtholders only when the firm's asset-in-place pays off 0, this effect is not present in the baseline model with safe asset-in-place. Furthermore, the reduction in parent debt repayment is greater under abandonment than under continuation: under abandonment, the residual profit of the subsidiary is used to repay the parent with probability $1 - q$ (when asset-in-place fails), while under continuation, this occurs only with probability $p(1 - q^R)$ (when the project is successful and asset-in-place fails). This creates a countervailing effect that weakens the firm's continuation incentives, captured by the second term in Equation (22). This effect arises with probability $(1 - q) - p(1 - q^R)$.

Importantly, the overall effect remains positive, and strictly positive as long as the project and asset-in-place are not perfectly correlated; that is, as long as the probability $q - pq^R \geq 0$, meaning there is a chance that the asset-in-place pays off when the project does not. As a result, the riskiness of the firm's asset-in-place dampens, but does not eliminate, the positive effect of limited liability on continuation incentives.

We show in the appendix that the same results and intuition hold for all possible cases of D_P. The following lemma formally states this result.

Lemma 6. *The marginal debt servicing cost saving and thus the firm's continuation incentives at time 1 are greater under a subsidiary structure than under a branch structure, and strictly so if the probability that the firm's asset-in-place pays off $\bar{Y}$ and the project pays off 0 is strictly positive, i.e, $q - pq^R > 0$. The difference between the two organizational structures decreases in the correlation between the firm's asset-in-place and the project payoffs, q^R.*

As a result, the firm faces a similar trade-off as in the baseline model in its decision to expand via a branch or subsidiary structure. Although branch expansion is cheaper as it avoids the set-up cost C, subsidiary expansion alleviates the firm's time-consistency problem with respect to the continuation of a hard viable project. Moreover, as demonstrated in Lemma 6, this effect is larger when the firm's asset-in-place and the project payoffs are less correlated. This result is formally stated in the following proposition.

Proposition 5. *There exist values of (C, ζ, M) such that the firm expands optimally via a subsidiary and chooses the unselective investment strategy. Moreover, the set of parameters for which the firm expands via a subsidiary is decreasing in the correlation between the firm's asset-in-place and the project payoffs, q^R.*

5.1.2 Safe asset-in-place with $Y < 1$

We now consider the case in which the firm's asset-in-place is safe but pays off $Y < 1$.

As in the baseline model and in the previous extension, the firm's organizational structure affects its time-consistency problem through its impact on the firm's debt servicing cost saving from continuing a project. We now revisit how allocating part of the debt to the subsidiary influences these savings.

Consider a subsidiary with debt structure (D_S, D_P) and $D_S \leq L$. If the asset-in-place payoff is sufficiently large ($Y \geq D_P$), the parent debt is safe and its repayment does not depend on the continuation of the project, as in the baseline model. In this case, shifting the firm's debt from the parent to the subsidiary allows the firm to benefit from the subsidiary's limited liability, which provides additional continuation incentives.

However, if the asset-in-place payoff is sufficiently small ($Y < D_P$), marginally shifting the firm's debt from the parent to the subsidiary has no effect on the firm's continuation incentives. This is because, when the firm's asset-in-place is not sufficient to make the parent debt safe, the portion of the parent debt D_P that exceeds the asset-in-place payoff Y is backed only by the residual payoff of the subsidiary. As a result, the marginal parent debt has the same riskiness as the subsidiary debt and provides the firm with the same limited liability protection.

Therefore, when the firm's asset-in-place is safe, a subsidiary structure alleviates the time-consistency problem only if the asset-in-place payoff is sufficiently large, i.e., when the parent debt would be repaid upon project failure, but subsidiary debt would not. The following lemma formally states this result.

Lemma 7. *There exists $Y^* < 1$, such that the marginal debt servicing cost saving and thus the firm's continuation incentives at time 1 are greater under a subsidiary structure than under a branch structure if and only if $Y \geq Y^*$. The difference between the two organizational structures is increasing in the firm's asset-in-place payoff Y.*

As a result, when the firm's asset-in-place payoff is sufficiently large, the firm's optimal organization structure trades off the set-up cost C of subsidiary expansion against the benefit it provides by alleviating the firm's time-inconsistency problem with respect to the continuation of a hard project, with the benefit increasing in the firm's asset-in-place payoff Y. The following proposition formally characterizes the parameter space for which the firm expands optimally via a subsidiary in this case.

Proposition 6. *For $Y \geq Y^*$, where $Y^* < 1$ is defined in Lemma 7, there exist values of (C, ζ, M) such that the firm expands optimally via a subsidiary and chooses the unselective investment strategy. Moreover, the parameter space for which the firm expands via a subsidiary is increasing in the firm's asset-in-place payoff Y.*

5.2 Delegation

In the baseline model, we demonstrated that, due to the firm's inability to commit to a time 1 investment strategy at time 0, it faces a time-consistency problem that can lead to underinvestment when operating under a branch structure. We have shown that expansion via a subsidiary structure can circumvent the firm's time-consistency problem by enabling the firm to exploit its limited liability option towards its subsidiary debt. The firm then trades off this benefit of subsidiary expansion against its set-up cost.

An alternative solution to the firm's time-inconsistency problem is to delegate the continuation decision at time 1 to the manager. However, delegation creates a different problem, as the manager may continue non-viable projects to obtain a private benefit B. In contrast, when the firm retains the decision right to project continuation, it liquidates non-viable projects (which is efficient as $L > B$), since the viability of the projects is observable but not contractible.

Under delegation, the firm must account for the manager's private incentives to continue non-viable projects when designing the manager's compensation contract. In this section, we show that the cost of delegation is increasing in the manager's private benefit from continuing non-viable projects. This is because the manager can always enjoy this private benefit even without searching, so the firm must incur a managerial rent that is at least as high. As a result, when the private benefit B is sufficiently large, subsidiary expansion is still optimal for some parameter space of the set-up cost C, search cost ζ, and monitoring cost M.

Specifically, suppose that the firm delegates the continuation decision to the manager in order to implement the unselective investment strategy to continue both easy and hard viable projects.[10] Since the continuation decision at time 1 is taken by the manager rather than by the firm, the continuation constraints differ from those in the baseline model for two reasons. First, the manager continues a viable project in state σ (with monitoring) if and only if the marginal continuation wage exceeds the monitoring cost:

$$(IC^{delegation}_{viable}): \quad pw^R_\sigma + (1-p)w^0_\sigma - a_\sigma \geq m_\sigma. \tag{23}$$

In contrast, the firm's continuation decision (given by Equation (15) under a branch structure and Equation (19) under a subsidiary structure) depends on the firm's profit.

Second, while the firm always abandons a non-viable project, which pays off 0 with certainty, the manager prefers to continue a non-viable project to receive the wage w^0_σ and enjoy a private benefit B unless he is paid a sufficiently large abandonment wage:

$$(IC^{delegation}_{non\text{-}viable}): \quad w^0_\sigma + B \geq a_\sigma. \tag{24}$$

The firm can choose to offer compensation contracts that induce either abandonment or continuation of non-viable projects. We first focus on the case in which the firm chooses to induce the abandonment of non-viable projects and thus implements the unselective investment strategy as in the baseline model. In this case, the compensation contract must satisfy Equation (23) to continue viable projects in both states, and Equation (24) with the reverse inequality to abandon non-viable projects. In addition, the compensation contract should

[10]Since the firm does not pay any managerial rent when implementing the selective investment strategy (by the arguments in Section 4.1), delegation does not provide any benefit if the firm implements the selective investment strategy.

incentivize the monitoring of the hard viable project (given by constraint (12)) at time 1 and the search for viable projects at time 0 (given by constraint (11)).

Importantly, notice that Equation (24) implies that the firm must offer an abandonment wage $a_\sigma \geq B$ in order to prevent the manager from continuing non-viable projects. We show in the appendix that, the managerial rent under the optimal contract that induces abandonment, which we denote by $\rho_{unsel}^{delegation}$, is given by Equation (10) with the abandonment wages $a_\sigma = B$, and the continuation wages set to equal to those in the baseline case.

As a result, the managerial rent $\rho_{unsel}^{delegation}$ is increasing and the firm profit $\Pi_{unsel}^{delegation} = \Pi^{FB} - \rho_{unsel}^{delegation}$ is decreasing in the private benefit of the manager B.

Alternatively, the firm can choose to offer compensation contracts that induce the (inefficient) continuation of non-viable projects in one or more states. We show in the proof of Proposition 7 that these investment strategies are suboptimal. This is because in these cases, the manager enjoys the same rent without searching, in the form of the private benefit B from continuing non-viable projects, and the firm must pay the manager the same marginal continuation wages to incentivize search. Yet, the firm incurs additional losses due to the inefficient continuation of non-viable projects, rendering these investment strategies suboptimal.

To summarize, delegation can resolve the firm's time-consistency problem with respect to the continuation of hard viable projects, but it is costly because the firm needs to pay the manager an abandonment wage B to deter the continuation of non-viable projects. Since the manager would be paid this abandonment wage even without searching, this increases the total managerial rent to the manager.

The following proposition establishes that, when the private benefit B is sufficiently large, the firm still finds it optimal to expand via a subsidiary for some parameter values:

Proposition 7. *There exists $B^* < L$, such that for $B \in (B^*, L)$, there exist values of (C, ζ, M) such that the firm expands optimally via a subsidiary and chooses the unselective investment strategy.*

6 Empirical predictions

In this section, we discuss the empirical implications of our theory. Our model highlights an incentive-based channel: By generating risk-shifting incentives, levered subsidiaries mitigate the firm's time inconsistency problem and the resulting underinvestment in projects with high managerial rents. This channel operates alongside other well-established determinants of the choice of organizational form or capital structure, such as taxes, legal motives (Desai et al. (2004) and Huizinga and Laeven (2008)), or historical practices (Kandel et al. (2018)).[11] Below, we derive empirical implications for firms' organizational form and for firms' investment strategies, and discuss contexts in which our mechanism is most likely to apply.

6.1 Organizational form of business expansion

Our main result (Proposition 4, illustrated in Figure 3) relates a firm's optimal organizational choice of business expansion to (i) the costs of exploring and developing the expansion opportunity (ζ), and (ii) the managerial effort costs required to subsequently implement the projects (M). This yields the following two empirical predictions.

Prediction 1. *Firms are more likely to expand via a subsidiary for expansion opportunities that entail higher costs during the initial exploration and development phase.*

Prediction 2. *Firms are more likely to expand via a subsidiary for expansion opportunities that involve intermediate management costs during the implementation phase.*

Foreign-market entry provides a natural empirical setting to examine these predictions. In the context of international banking, Cerutti et al. (2007) find that the decision to operate abroad as a branch or subsidiary depends on host-country characteristics such as tax regimes, regulatory environments, and political risks, as well as the desired level of market penetration.

[11]For example, U.S. and U.K. takeover and corporate law have historically restricted partially owned subsidiaries, encouraging branch or full-acquisition structures (Kandel et al. (2018)). Regarding the existence of subsidiary debt, Desai et al. (2004) and Huizinga and Laeven (2008)) find that the choice between issuing debt in a foreign subsidiary or in the parent company is shaped by both international tax differences and cross-country variation in creditor protection and bankruptcy codes.

In the context of international trade, Helpman et al. (2004) and Yeaple (2009) show that firms' choices between exporting (akin to a branch structure in our model) and establishing a subsidiary are driven by a proximity-concentration trade-off: firms face a choice between producing close to customers to save on trade costs (proximity) and concentrating production at home to avoid the fixed costs of setting up foreign affiliates. Yeaple (2009) further shows that heterogeneity in firm capabilities and production technologies shapes this sorting pattern within industries, with more productive firms selecting the subsidiary mode of foreign expansion.

To empirically test Predictions 1 and 2 on firms' foreign-market entry modes, one can proxy costs during the initial exploration and development phase (ζ) by *institutional or cultural distance* between the home and host countries—for instance, differences in legal origin, regulatory frameworks, or prevailing cultural norms. Costs during the implementation phase (M) can be proxied by *host country institutional quality*, such as the rule of law, contract enforcement, or governance indices. Using these proxies allows one to test whether variation in institutional distance and the strength of host-country governance and contract-enforcement institutions systematically predict firms' use of subsidiaries versus branches, as implied by the model.

The aforementioned predictions are also applicable to firms' domestic expansion into new products or new markets. However, when a new product is kept within an existing division of the firm, this organizational choice is more difficult to observe. As a result, empirical evidence on the choice between a branch (akin to a division) and a subsidiary in this context remains limited. Nevertheless, industries deploying new technologies, such as clean energy and electric vehicles (discussed below), provide illustrative examples of our predictions, as their projects typically involve significant technical and regulatory complexity (high ζ), scarce specialized talent (high M), and uncertain payoffs.

Traditional oil and gas companies frequently use subsidiaries when entering new technological domains—such as floating wind or green hydrogen—or when operating in unfamiliar geographies like U.S. offshore wind or emerging solar markets. Projects in these sectors typically involve complex engineering challenges and require intensive coordination with governments and contractors. Early-stage management involves identifying technically viable solutions under significant product and regulatory uncertainty, while later stages demand ongoing oversight, including cost control and compliance adaptation. In line with our framework, these investments are commonly structured as subsidiaries, which often raise project-specific debt independently.

A similar pattern emerges in the automotive sector's investment in electric batteries. These projects require a highly specialized and expensive workforce. Managers are responsible for overseeing hardware-software integration, responding to evolving environmental and safety standards, and building new distribution and service networks. Reflecting the predictions of our model, companies often use subsidiaries, which also serve as vehicles to raise external financing customized to the project's risks and capital needs.[12]

6.2 Organizational form of business expansion and parent assets

We next derive predictions on how the relationship between a firm's existing assets and its expansion opportunities shapes the organizational form of business expansion.

First, Proposition 5 states that subsidiary expansion becomes more advantageous when the firm's new investment has a low correlation with its existing assets-in-place. In such cases, the limited liability option embedded in the subsidiary structure has a higher value than under branch expansion and more effectively mitigates the firm's commitment problem.

Prediction 3. *Firms are more likely to expand via a subsidiary when the correlation between the returns on new investments and existing assets is lower.*

Our model offers a new perspective on the role of correlations in organizational design. The literature on firm integration and internal capital markets emphasizes that diversification across imperfectly correlated cash flows can be beneficial, as it lowers bankruptcy risk and relaxes financing constraints (Lewellen, 1971; Stein, 1997).[13] In our framework, however, correlation reduces the value of integration: branches, by being fully integrated, benefit

[12]For example, Automotive Cells Company (Stellantis–Mercedes–TotalEnergies) raised €4.4B in 2024 to fund EU gigafactories (https://www.acc-emotion.com/node/2877). BlueOval SK (Ford–SK On) secured USD 9.2B from the US DOE for battery plants in three manufacturing sites (https://www.energy.gov/lpo/blueoval-sk).

[13]While Stein (1997) is often cited for inefficiencies in internal capital markets, his model also shows that imperfectly correlated cash flows can ease financing frictions through internal liquidity transfers, akin to the diversification effect of Lewellen (1971).

from diversification, but this weakens continuation incentives for projects with significant management costs. The friction we focus on is therefore distinct from that in the existing literature and provides a counterforce against diversification. In practice, full integration may relax *ex ante* financing constraints while simultaneously undermining *ex post* commitment to continue costly projects.

These considerations suggest two auxiliary predictions that can help distinguish the mechanisms at play. If low correlation favors subsidiaries because it strengthens continuation incentives rather than easing financing constraints, this effect should be stronger (i) for financially unconstrained firms—where financing benefits are less relevant—and (ii) in industries where project risk or uncertainty amplifies commitment issues.

Prediction 4. *The effect of low correlation on subsidiary entry (given in Prediction 3) is stronger for financially unconstrained firms (proxied by high cash holdings, low leverage, or high credit rating).*

Prediction 5. *The effect of low correlation on subsidiary entry (given in Prediction 3) is stronger in industries with high project risk or uncertainty (proxied by cash-flow volatility or R&D intensity).*

Second, our model also highlights the role of the parent firm's existing asset base in shaping its organizational form decisions. Proposition 6 shows that the firm is more likely to undertake the new investment through a subsidiary when the size of the investment, relative to the assets of the parent firm, is small. Empirically, this mechanism is expected to be more pronounced when the parent firm holds a substantial stock of unencumbered tangible assets that can be pledged as collateral. This yields the following prediction:

Prediction 6. *The firm is more likely to expand via a subsidiary when the size of the new investment is small relative to the parent firm's unencumbered tangible assets.*

6.3 Organizational form and scope of expansion

Our model further yields implications for the investment strategies chosen by branch and subsidiary firms. Since our mechanism implies that a firm expands via a subsidiary only when it pursues the unselective strategy, it follows that subsidiary expansion should be associated with a more comprehensive investment strategy - one that includes both standard and complex projects (corresponding to the "easy" and "hard" projects in the model's unselective strategy) - compared to branch expansion.

This observation yields the following prediction:

Prediction 7. *Firms that expand via a subsidiary structure tend to maintain a broader scope of projects than firms that expand via a branch structure.*

Consistent with this prediction, Cerutti et al. (2007) finds that foreign banks' organizational choices depend on the desired degree of market penetration. Subsidiaries are more common when banks seek deep penetration into host markets - serving local retail and deposit clients and developing a broad range of on-the-ground activities - whereas branches are typically used for shallow penetration strategies focused on cross-border or wholesale operations that can be managed centrally from the parent institution.

More specifically, Proposition 4 (illustrated in Figure 3) shows that the trade-off between the efficiency loss from the selective strategy and the costs of establishing a subsidiary is particularly relevant when the implementation costs (M) are high. In such settings, a branch structure is more likely to be associated with a narrow focus on standardized, low-complexity projects, resulting in a starker contrast between branch and subsidiary expansions. This then yields the following prediction:

Prediction 8. *The relationship between a firm's organizational form and scope of expansion (given in Prediction 7) is more pronounced for expansion opportunities that require higher management costs during the implementation phase.*

Empirically, the scope of a firm's product portfolio can be proxied by indicators that capture the diversity or concentration of its activities, such as the number of distinct product lines or business segments (e.g., ORBIS NACE codes), the Herfindahl–Hirschman Index (HHI) of sales shares across product categories, or measures of technological breadth based on the dispersion of patent classes, including entropy indices computed from IPC or CPC codes. A higher entropy value reflects greater balance and diversity across technological fields, indicating broader product diversification potential. These indicators capture different aspects of product scope and can be combined with proxies for implementation costs (M), such as industry-level regulatory burden, technological complexity, or host-country institutional quality.

7 Conclusion

Firms entering new markets or developing new product lines must make a fundamental organizational choice: whether to integrate new activities within the existing firm or to establish legally separate subsidiaries. This decision is critical because it affects the firm's ability to manage incentives and allocate resources effectively. We show that the appropriate organizational structure can mitigate a key time-inconsistency problem that arises in such expansion efforts. Specifically, a firm might discard an investment because it generates a high level of managerial rent, even though, from an ex ante perspective, it would prefer to commit to invest because the expectation of such managerial rent compensates for the manager's initial efforts. In this circumstance, the firm can counter its underinvestment tendency by running its investment in a separate subsidiary firm, and raising debt within the subsidiary. In doing so, it profits from a limited liability option whose value defrays the manager's information rent.

An important difference between our approach and many prior treatments of organizational structures is that our analysis focuses on the dynamic effect of financing choices on the incentives. This mechanism contrasts with earlier work that emphasizes the role of subsidiaries in resolving a debt-overhang problem, enhancing managerial incentives through delegated authority, or facilitating an optimal trade-off between tax shields and bankruptcy costs for the firm.

Our framework generates testable empirical predictions that link organizational form to the degree of market competition, the firm's familiarity with the new market, the relative complexity and innovation of the product compared to its existing portfolio, and the correlation between new investments and existing business lines.

Appendices

A Proofs

A.1 Proof of Lemma 1

To show that the firm adopts one of the two investment strategies stated in this lemma, we must show that 1) the firm always searches and 2) the firm always continues an easy viable project. To prove this, we make use of the result in Lemma 2, which states that the firm profit under the selective strategy, Π^C_{sel} is given by (8), where $\Pi^C_{sel} \geq Y$ by Assumption 3.

If the firm does not search, it has only non-viable projects. Since these projects have negative NPV, the firm does not continue them and generates profit equal to $Y + (L-1) < Y < \Pi^C_{sel}$. This is thus suboptimal.

Suppose the firm follows a strategy of searching but does not continue an easy viable project, and offers the manager a compensation contract $(w^R_\sigma, w^0_\sigma, a_\sigma)$ that incentivizes search. It then follows that the firm can obtain a strictly higher profit by pursuing the easy viable project as well while offering the manager an alternative compensation contract $(w^{R'}_\sigma, w^{0'}_\sigma, a'_\sigma)$ that satisfies $w^{R'}_h = w^R_h$, $w^{0'}_h = w^0_h$, $a'_h = a_h$, $pw^{R'}_e + (1-p)w^{0'}_e = a_e$, and $a'_e = a_e$. It is thus suboptimal for the firm to not continue an easy viable project.

A.2 Proof of Lemma 2

This lemma follows immediately from the preceding arguments. Moreover, Assumption (3) implies that $\Pi_{sel} \geq Y$ and thus expansion under the selective investment strategy is always rational.

A.3 Proof of Lemma 3

An optimal contract that implements the unselective investment strategy maximizes Π_{unsel} given in (9) subject to the search constraint (11) and the monitoring constraint (12).

First, any optimal contract has $a_h = a_e = 0$. This is because a decrease in $a_\sigma > 0$ relaxes the constraint (11), does not affect the constraint (12), and strictly increases the firm's profit (9).

Second, consider the following two cases.

- Suppose $\zeta \geq \lambda\pi\frac{p-\delta}{\delta}M$. We show that in this case, any optimal contract binds the search constraint (11). This is because a slack (11) implies that either (12) is slack, or $w_h^0 \geq 0$, $w_e^R \geq 0$ and $w_e^0 \geq 0$ with at least one strict inequality. It is then possible to decrease w_h^R, w_h^0, w_e^R, or w_e^0 without violating either (11) or (12), while strictly increasing the firm's profit (9), a contradiction. As a result, in this case, the search constraint (11) binds, implying a managerial rent ρ_{unsel} of 0.

- Suppose $\zeta < \lambda\pi\frac{p-\delta}{\delta}M$. In this case, any contract that satisfies (12) implies a slack (11). Therefore it is optimal to set $w_h^0 = w_e^R = w_e^0$ to maximize the firm's profit (9). As a result, the binding (12) constraint implies a managerial rent $\rho_{unsel} = \lambda\pi\frac{p-\delta}{\delta}M - \zeta$, which is strictly positive, increasing in M, and decreasing in ζ.

The above characterization of the managerial rent under the optimal contract ρ_{unsel} then yields the firm profit given by (13).

A.4 Proof of Proposition 1

Under the optimal contracts, the firm's profit under the selective and the unselective strategy are given by Π_{sel}^C in Lemma 2 and Π_{unsel}^C in Lemma 3, respectively. We characterize the necessary and sufficient condition for $\Pi_{sel}^C \geq \Pi_{unsel}^C$ by examining the following cases:

- If $\zeta \geq \lambda\pi\frac{p-\delta}{\delta}M$, then $\Pi_{sel}^C < \Pi_{unsel}^C = \Pi^{FB}$.

- If $\zeta < \lambda\pi\frac{p-\delta}{\delta}M$, then $\Pi_{sel}^C \geq \Pi_{unsel}^C$ if and only if

$$\lambda\pi(pR - M - L) \leq \lambda\pi\frac{p-\delta}{\delta}M - \zeta, \tag{25}$$

  which is equivalent to

$$\zeta \leq \lambda\pi\left[\frac{p}{\delta}M - (pR - L)\right]. \tag{26}$$

Notice that for all M that satisfies Assumption 1, we have $\lambda\pi\left[\frac{p}{\delta}M - (pR - L)\right] < \lambda\pi\frac{p-\delta}{\delta}M$. Therefore, we have that $\Pi_{sel}^C \geq \Pi_{unsel}^C$ if and only if (26) is satisfied; or equivalently, if and only if

$$M \geq \mu^C(\zeta) \equiv \frac{\delta}{p}\left[\frac{\zeta}{\lambda\pi} + (pR - L)\right]. \tag{27}$$

A.5 Proof of Lemma 4

We prove this lemma in two steps. First, we show that the optimal contracts under commitment defined in Lemma 3 satisfy the additional continuation constraint (15) for $\sigma = h$ if and only if $M \leq \frac{\delta}{p}(pR - L)$. To see this, consider the following two cases:

- Suppose $\zeta \geq \lambda\pi\frac{p-\delta}{\delta}M$. The proof of Lemma 3 shows that an optimal contract under commitment binds (11) and satisfies (12). The constraint (15) for $\sigma = h$ is most relaxed by setting $w_h^0 = a_h = 0$ and $w_h^R = \frac{M}{\delta}$ to bind (12) (and setting $w_e^R, w_e^0 \geq 0$ to bind (11)). Therefore (15) is satisfied if and only if $M \leq \frac{\delta}{p}(pR - L) = \mu^C(0)$.

- Suppose $\zeta < \lambda\pi\frac{p-\delta}{\delta}M$. The proof of Lemma 3 shows that any optimal contract under commitment has $w_h^0 = a_h = 0$ and $w_h^R = \frac{M}{\delta}$. Therefore again (15) for $\sigma = h$ is satisfied if and only if $M \leq \frac{\delta}{p}(pR - L) = \mu^C(0)$.

The optimal contracts under commitment are thus also the optimal contracts under no commitment for all $M \leq \mu^C(0)$, yielding $\rho^B_{unsel} = \rho^C_{unsel}$ and the firm's equilibrium profit is equal to $\Pi^B_{unsel} = \Pi^C_{unsel}$, where ρ^C_{unsel} and Π^C_{unsel} are characterized in Lemma 3.

Next, we characterize the optimal contracts for $M > \mu^C(0)$ in the following steps.

(i) The above arguments imply that the constraint (15) for $\sigma = h$ binds for any optimal contract under no commitment.

(ii) The constraint (12) binds. This is because, if otherwise, then a reduction in w_h^R by some small ϵ and an increase in w_e^R by $\frac{\lambda}{1-\lambda}\epsilon$ continue to satisfy (12) while keeping (11) and the firm's profit Π_{unsel} unchanged, but relaxes (15) for $\sigma = h$, which is a contradiction.

(iii) $w_h^0 = 0$. This is because, if otherwise, then a reduction in both w_h^R and w_h^0 by some small ϵ keeps (12) satisfied and relaxes (15) for $\sigma = h$, while improving the firm's profit Π_{unsel}, which is a contradiction.

(iv) Steps (i)–(iii) then imply that $w_h^R = \frac{M}{\delta}$ and $a_h = \frac{p}{\delta}M - (pR - L)$.

(v) $a_e = 0$. This is because a decrease in $a_e > 0$ relaxes the constraint (11), does not affect the constraints (12) and (15) for $\sigma = h$, and strictly increases the firm's profit Π_{unsel}.

(vi) Finally, consider the following two cases.

- Suppose $\zeta \geq \lambda\pi(pR - M - L)$. We show that in this case, any optimal contract binds the search constraint (11). This is because a slack (11) implies that $w_e^0 \geq 0$ and $w_e^R \geq 0$, with at least one strict inequality. It is then possible to decrease either w_e^0 or w_e^R without violating any constraint, while strictly increasing the firm's profit, a contradiction. As a result, in this case, the search constraint (11) binds, implying a managerial rent $\rho_{unsel} = \lambda a_h = \lambda\left[\frac{p}{\delta}M - (pR - L)\right]$.
- Suppose $\zeta < \lambda\pi(pR - M - L)$. Then Steps (iv)-(v) imply a slack (11). Therefore it is optimal to set $w_e^0 = w_e^R = 0$ to maximize the firm's profit. As a result, managerial rent is given by $\rho_{unsel} = \lambda\left[\frac{p}{\delta}M - (pR - L)\right] + \lambda\pi(pR - M - L) - \zeta$.

Overall ρ_{unsel}^B is given by (17). We can alternatively express ρ_{unsel}^B as depending on the following two cases of ζ:

1. For $\zeta \leq \lambda\pi\frac{p-\delta}{p}(pR - L)$:

$$\rho_{unsel}^B = \begin{cases} 0, & \text{if } M \leq \frac{\zeta}{\lambda\pi}\frac{\delta}{p-\delta}, \\ \lambda\pi\frac{p-\delta}{\delta}M - \zeta, & \text{if } M \in [\frac{\zeta}{\lambda\pi}\frac{\delta}{p-\delta}, \frac{\delta}{p}(pR-L)], \\ \lambda\frac{p-\pi\delta}{\delta}M - \lambda(1-\pi)(pR-L) - \zeta, & \text{if } M \in [\frac{\delta}{p}(pR-L), pR - L - \frac{\zeta}{\lambda\pi}], \\ \lambda\left[\frac{p}{\delta}M - (pR-L)\right], & \text{if } M > pR - L - \frac{\zeta}{\lambda\pi}. \end{cases} \tag{28}$$

2. For $\zeta > \lambda\pi\frac{p-\delta}{p}(pR - L)$:

$$\rho_{unsel}^B = \begin{cases} 0, & \text{if } M \leq \frac{\delta}{p}(pR-L), \\ \lambda\left[\frac{p}{\delta}M - (pR-L)\right], & \text{if } M > \frac{\delta}{p}(pR-L). \end{cases} \tag{29}$$

A.6 Proof of Proposition 2

Before we derive the firm's optimal investment strategy under a branch structure, we first formally show that $\Pi_{sel}^B = \Pi_{sel}^C$. To do so, we show that the optimal contracts stated in Lemma 2 indeed satisfy the continuation constraint (15). Given that $a_h = a_e = 0$, a binding constraint (7) implies that

$$pw_e^R + (1-p)w_e^0 - a_e = \frac{\zeta}{(1-\lambda)\pi}, \tag{30}$$

which is strictly less than $pR - L$ by Assumption 3. The continuation constraint in the easy state is thus satisfied. Additionally, one can set $w_e^R = R$ and $w_e^0 = 0$, which then trivially satisfies the continuation constraint in the easy state. This then implies that there exist contracts that satisfy all constraints without commitment while generating the same profit as under commitment, that is, $\Pi_{sel}^B = \Pi_{sel}^C$.

We now characterize the necessary and sufficient condition for $\Pi_{sel}^B \geq \Pi_{unsel}^B$. From (8) and (16), we have that $\Pi_{sel}^B \geq \Pi_{unsel}^B$ if and only if $\rho_{unsel}^B \geq \lambda\pi(pR - M - L)$. Consider the following cases.

- Suppose $\zeta \leq \lambda\pi\frac{p-\delta}{p}(pR - L)$. In this case, ρ_{unsel}^B is given by (28). Notice first that for all $M \leq \frac{\delta}{p}(pR - L)$, we have $\rho_{unsel}^B \leq \lambda\pi\frac{p-\delta}{\delta}M < \lambda\pi(pR - M - L)$.

  Next, for $M = pR - L - \frac{\zeta}{\lambda\pi}$, $\rho_{unsel}^B = \lambda\left[\frac{p}{\delta}M - (pR - L)\right] \geq \lambda\pi(pR - M - L)$ if and only if

$$M \geq \frac{\delta(1+\pi)}{p + \delta\pi}(pR - L), \tag{31}$$

  which is satisfied for $M = pR - L - \frac{\zeta}{\lambda\pi}$ if and only if

$$\zeta \leq \zeta^B \equiv \lambda\pi\frac{p - \delta}{p + \delta\pi}(pR - L). \tag{32}$$

  Therefore we have that, if $\zeta \geq \zeta^B$ given by (32), then $\Pi_{sel}^B \geq \Pi_{unsel}^B$ if and only if (31) is satisfied; and if $\zeta \leq \zeta^B$, then $\Pi_{sel}^B \geq \Pi_{unsel}^B$ if and only if

$$\rho_{unsel}^B = \lambda\frac{p - \pi\delta}{\delta}M - \lambda(1-\pi)(pR - L) - \zeta \geq \lambda\pi(pR - M - L), \tag{33}$$

  or equivalently

$$M \geq \frac{\delta}{p}\left[\frac{\zeta}{\lambda} + (pR - L)\right]. \tag{34}$$

- Suppose $\zeta \leq \lambda\pi\frac{p-\delta}{p}(pR - L)$. In this case, ρ_{unsel}^S is given by (29). It is immediate that $\rho_{unsel}^B = 0 < \lambda\pi(pR - M - L)$ for all $M \leq \frac{\delta}{p}(pR - L)$. For $M > \frac{\delta}{p}(pR - L)$, we have that $\rho_{unsel}^B = \lambda\left[\frac{p}{\delta}M - (pR - L)\right] \geq \lambda\pi(pR - M - L)$ if and only if (31) is satisfied.

To summarize, $\Pi_{sel}^B \geq \Pi_{unsel}^B$ if and only if

$$M \geq \mu^B(\zeta) \equiv \begin{cases} \frac{\delta}{p}\left[\frac{\zeta}{\lambda} + (pR - L)\right], & \text{if } \zeta \leq \zeta^B, \\ \frac{\delta(1+\pi)}{p+\delta\pi}(pR - L), & \text{if } \zeta > \zeta^B, \end{cases} \tag{35}$$

where ζ^B is given by (32).

Notice that we have $\mu^B(\zeta) < \mu^C(\zeta)$, where $\mu^C(\zeta)$ is given by (27).

A.7 Proof of Proposition 3

Following analogous arguments to those in the case of a branch expansion (proof of Proposition 2), we can show that $\Pi^S_{sel} = \Pi^C_{sel} - C$.

Next, consider the case of the unselective strategy. Recall that we have established in the text preceding this proposition that, by Assumptions 1 and 2, the continuation constraint (19) for the hard viable project is satisfied for $w^R_h = \frac{p}{\delta}M$, $w^0_h = a_h = 0$. Therefore following the same arguments as in the proof of Lemma 3, we can show that $\rho^S_{unsel} = \rho^C_{unsel}$ and $\Pi^S_{unsel} = \Pi^C_{unsel} - C$, where ρ^C_{unsel} and Π^C_{unsel} are defined in (13).

The firm's optimal choice of investment strategy then follows from Proposition 1.

A.8 Proof of Lemma 5 and Proposition 4

We characterize the firm's choice of organizational structure via a series of lemmas.

Lemma 8. *For $M \leq \frac{\delta}{p}(pR - L)$, the firm expands via a branch and pursues the selective investment strategy.*

For $M \geq \mu^C(\zeta)$, the firm expands via a branch and pursues the unselective investment strategy.

Proof. For $M \leq \frac{\delta}{p}(pR - L) < \mu^B(\zeta) < \mu^C(\zeta)$, the firm chooses the unselective investment strategy under a branch structure by Proposition 2 and achieves the commitment outcome, i.e. $\Pi^B_{unsel} = \Pi^C_{unsel} > \Pi^C_{sel}$. This then implies that $\Pi^B_{unsel} > \max\{\Pi^S_{sel}, \Pi^S_{unsel}\}$ by Proposition 3. That is, branch expansion dominates.

For $M \geq \mu^C(\zeta) > \mu^B(\zeta)$, the firm chooses the selective investment strategy under a branch structure by Proposition 2 and archives the commitment outcome, i.e. $\Pi^B_{sel} = \Pi^C_{sel} > \Pi^C_{unsel}$. This then implies that $\Pi^B_{sel} > \max\{\Pi^S_{sel}, \Pi^S_{unsel}\}$ by Proposition 3. That is, branch expansion dominates. □

Lemma 9. *An unselective subsidiary is more profitable than a selective branch if and only if $M \leq \overline{\mu}^S(\zeta)$, where*

$$\overline{\mu}^S(\zeta) \equiv \begin{cases} \overline{\mu}_1^S(\zeta) \equiv \frac{\delta}{p}\left[\frac{\zeta - C}{\lambda\pi} + (pR - L)\right], & \text{if } \zeta \leq \overline{\zeta}^S, \\ \overline{\mu}_2^S \equiv (pR - L) - \frac{C}{\lambda\pi}, & \text{if } \zeta > \overline{\zeta}^S, \end{cases} \tag{36}$$

and

$$\overline{\zeta}^S \equiv \lambda\pi\frac{p-\delta}{\delta}\left[(pR - L) - \frac{C}{\lambda\pi}\right]. \tag{37}$$

Proof. We prove this result by comparing the firm's profits under a selective branch, which is equal to Π_{sel}^C given by (8), and an unselective subsidiary, which is equal to $\Pi_{unsel}^C - C$. Consider the two cases.

- For $\zeta \leq \lambda\pi\frac{p-\delta}{\delta}M$, an unselective subsidiary is more profitable than a selective branch if and only if $\rho_{unsel}^C + C = \lambda\pi\frac{p-\delta}{\delta}M - \zeta + C \leq \lambda\pi(pR - M - L)$, or equivalently, $M \leq \overline{\mu}_1^S(\zeta)$, where $\overline{\mu}_1^S(\zeta)$ is defined in (36). Notice that the boundary $M = \overline{\mu}_1^S(\zeta)$ satisfies $\zeta \leq \lambda\pi\frac{p-\delta}{\delta}M$ if and only if $\zeta \leq \zeta^S$, where ζ^S is given by (37).

- For $\zeta > \lambda\pi\frac{p-\delta}{\delta}M$, we have $\rho_{unsel}^C = 0$ and an unselective subsidiary is more profitable than a selective branch if and only if $C \leq \lambda\pi(pR - M - L)$, or equivalently, $M \leq \mu_2^S$, where $\overline{\mu}_2^S$ is defined in (36).

□

Lemma 10. *An unselective subsidiary is more profitable than an unselective branch if and only if $M \geq \underline{\mu}^S$, where*

$$\underline{\mu}^S \equiv \begin{cases} \underline{\mu}_1^S \equiv \frac{\delta}{p}\left[(pR - L) + \frac{C}{\lambda(1-\pi)}\right], & \text{if } \zeta \leq \underline{\zeta}_1^S, \\ \underline{\mu}_2^S(\zeta) \equiv \frac{\delta}{p(1-\pi)+\delta\pi}\left[(pR - L) - \frac{\zeta - C}{\lambda}\right], & \text{if } \zeta \in [\underline{\zeta}_1^S, \underline{\zeta}_2^S], \\ \underline{\mu}_3^S \equiv \frac{\delta}{p}\left[(pR - L) + \frac{C}{\lambda}\right], & \text{if } \zeta \geq \underline{\zeta}_2^S, \end{cases} \tag{38}$$

and

$$\underline{\zeta}_1^S \equiv \lambda\pi\frac{p-\delta}{p}\left[(pR - L) - \frac{\delta}{p-\delta}\frac{C}{\lambda(1-\pi)}\right], \tag{39}$$

$$\underline{\zeta}_2^S \equiv \lambda\pi\frac{p-\delta}{p}\left[(pR - L) + \frac{C}{\lambda}\right]. \tag{40}$$

Proof. An unselective subsidiary is more profitable than an unselective branch if and only if $\rho^C_{unsel} + C \leq \rho^B_{unsel}$. Using the first part of Lemma 8, we consider only $M \geq \frac{\delta}{p}(pR - L)$.

- Consider first the case of $\zeta \leq \lambda\pi\frac{p-\delta}{p}(pR - L)$. In this case, ρ^B_{unsel} is given by (28). For $M \in [\frac{\delta}{p}(pR - L), pR - L - \frac{\zeta}{\lambda\pi}]$, $\rho^C_{unsel} = \lambda\pi\frac{p-\delta}{\delta}M - \zeta$ and $\rho^B_{unsel} = \lambda\frac{p-\pi\delta}{\delta}M - \lambda(1 - \pi)(pR - L) - \zeta$. In this case, $\rho^C_{unsel} + C \leq \rho^B_{unsel}$ if and only if $M \geq \underline{\mu}^S_1$, where $\underline{\mu}^S_1$ is defined in (38). Notice that the boundary satisfies $\underline{\mu}^S_1 \leq pR - L - \frac{\zeta}{\lambda\pi}$ if and only if $\zeta \leq \underline{\zeta}^S_1$, where $\underline{\zeta}^S_1$ is defined by (39).

  For $M \geq pR - L - \frac{\zeta}{\lambda\pi}$, $\rho^C_{unsel} = \lambda\pi\frac{p-\delta}{\delta}M - \zeta$ and $\rho^B_{unsel} = \lambda\left[\frac{p}{\delta}M - (pR - L)\right]$. In this case, $\rho^C_{unsel} + C \leq \rho^B_{unsel}$ if and only if $M \geq \underline{\mu}^S_2$, where $\underline{\mu}^S_2$ is defined by (38).

- Next, consider the case of $\zeta \geq \lambda\pi\frac{p-\delta}{p}(pR - L)$. Notice that this is equivalent to $\frac{\delta}{p-\delta}\frac{\zeta}{\lambda\pi} \geq \frac{\delta}{p}(pR - L)$. Moreover, in this case, ρ^B_{unsel} is given by (29).

  For $M \geq \frac{\delta}{p-\delta}\frac{\zeta}{\lambda\pi}$, $\rho^C_{unsel} = \lambda\pi\frac{p-\delta}{\delta}M - \zeta$ and $\rho^B_{unsel} = \lambda\left[\frac{p}{\delta}M - (pR - L)\right]$. In this case, $\rho^C_{unsel} + C \leq \rho^B_{unsel}$ if and only if $M \geq \underline{\mu}^S_2$, where $\underline{\mu}^S_2$ is defined by (38). Notice that the boundary satisfies $\underline{\mu}^S_2 \geq \frac{\delta}{p-\delta}\frac{\zeta}{\lambda\pi}$ if and only if $\zeta \leq \underline{\zeta}^S_3$, where $\underline{\zeta}^S_3$ is defined by (40).

  For $M \in [\frac{\delta}{p}(pR - L), \frac{\delta}{p-\delta}\frac{\zeta}{\lambda\pi}]$, $\rho^C_{unsel} = 0$ and $\rho^B_{unsel} = \lambda\left[\frac{p}{\delta}M - (pR - L)\right]$. In this case, $\rho^C_{unsel} + C \leq \rho^B_{unsel}$ if and only if $M \geq \underline{\mu}^S_3$, where $\underline{\mu}^S_3$ is defined in (38). Notice that the boundary satisfies $\underline{\mu}^S_3 \leq \frac{\delta}{p-\delta}\frac{\zeta}{\lambda\pi}$ if and only if $\zeta \geq \underline{\zeta}^S_3$, where $\underline{\zeta}^S_3$ is defined by (40).

□

Lemma 11. *Recall that $\bar{C}$ is defined by* (20)*.*

- *If $C > \bar{C}$, $\overline{\mu}^S(\zeta) \leq \underline{\mu}^S(\zeta)$ for all ζ.*

- *If $C \leq \bar{C}$, then $\overline{\mu}^S(\zeta) \geq \mu^B(\zeta) \geq \underline{\mu}^S(\zeta)$ if and only if*

$$\zeta \geq \zeta^* \equiv \begin{cases} \frac{C}{1-\pi}, & \text{if } C \leq (1-\pi)\bar{C}, \\ \pi\bar{C} + C, & \text{if } C \in ((1-\pi)\bar{C}, \bar{C}]. \end{cases} \tag{41}$$

Proof. $\bar{C}$ is defined such that $\overline{\mu}^S_2 \geq \underline{\mu}^S_3$ if and only if $C \leq \bar{C}$, where $\overline{\mu}^S_2$ and $\underline{\mu}^S_3$ are given in (36) and (38), respectively.

Since $\max_\zeta \overline{\mu}^S(\zeta) = \overline{\mu}_2^S$ because $\overline{\mu}^S(\zeta)$ given in (36) is increasing in ζ, and $\min_\zeta \underline{\mu}^S(\zeta) = \underline{\mu}_3^S$ because $\underline{\mu}^S(\zeta)$ is decreasing in ζ, we have that if and only if $C \le \bar{C}$, there exists $\zeta^* \in (0, \underline{\zeta}_2^S]$ such that $\overline{\mu}^S(\zeta) \ge \underline{\mu}^S(\zeta)$ for all $\zeta \ge \zeta^*$.

We now characterize the threshold ζ^* for $C \le \bar{C}$.

- Suppose $\zeta^* \le \underline{\zeta}_1^S$. In this case, ζ^* is defined such that $\overline{\mu}_1^S(\zeta) = \underline{\mu}_1^S$, i.e. $\zeta^* = \frac{C}{1-\pi}$. This threshold indeed satisfies $\zeta^* \le \underline{\zeta}_1^S$ if and only if $C \le (1-\pi)\bar{C}$.

  Notice that, in this case, $\zeta^* \le \underline{\zeta}_1^S \le \zeta^B$, where ζ^B is given by (32). We can verify that $\overline{\mu}^S(\zeta^*) = \overline{\mu}_1^S(\zeta^*) = \mu_1^B(\zeta^*) = \mu^B(\zeta^*)$. This then implies that $\overline{\mu}^S(\zeta^*) = \mu^B(\zeta^*) = \underline{\mu}^S(\zeta^*)$.

  Moreover, we have $\overline{\mu}^S(\zeta) \ge \mu^B(\zeta) \ge \underline{\mu}^S(\zeta)$ if and only if $\zeta \ge \zeta^*$. This follows because the slope of $\overline{\mu}_1^S(\zeta)$ is positive and strictly greater than that of $\mu_1^B(\zeta)$, which is positive, while the slope of $\underline{\mu}^S(\zeta)$ is negative.

- Suppose $\zeta^* \in (\underline{\zeta}_1^S, \underline{\zeta}_2^S]$. In this case, ζ^* is defined such that $\overline{\mu}_1^S(\zeta) = \underline{\mu}_2^S(\zeta)$, i.e., $\zeta^* = \pi\bar{C} + C$. This threshold indeed satisfies $\zeta^* \ge \underline{\zeta}_1^S$ if and only if $C \ge (1-\pi)\bar{C}$.

  Notice that, in this case, $\zeta^* \ge \underline{\zeta}_1^S > \zeta^B$. We can verify that $\overline{\mu}^S(\zeta^*) = \overline{\mu}_1^S(\zeta^*) = \mu_2^B = \mu^B(\zeta^*)$. This then implies that $\overline{\mu}^S(\zeta^*) = \mu^B(\zeta^*) = \underline{\mu}^S(\zeta^*)$. Moreover, we have $\overline{\mu}^S(\zeta) \ge \mu^B(\zeta) \ge \underline{\mu}^S(\zeta)$ if and only if $\zeta \ge \zeta^*$ following similar arguments as in the previous case.

Lemma 5 then follows from the first part of Lemma 11, while Proposition 4 follows from Lemmas 8–10 and the second part of Lemma 11.

□

A.9 The firm's limited liability constraints for managerial compensation

In this section, we show that the firm has sufficient funds to pay the manager, given its optimal organizational form, optimal investment strategy, and optimal compensation contracts. It is therefore without loss of generality to assume unlimited liability in the baseline model.

By Proposition 4, there can be three cases:

(i) selective branch expansion with compensation contracts given by Lemma 2;

(ii) unselective subsidiary expansion with compensation contracts given by Lemma 3;

(iii) unselective branch expansion with compensation contracts given by Lemma 4.

Consider first the abandonment wages $a_\sigma \geq 0$. In the easy state, the optimal contracts in all cases (Lemmas 2–4) have $a_e = 0$. In the hard state, however, the optimal contracts have $a_h > 0$ only in if the firm expands via a branch structure with no commitment and follows the unselective investment strategy (see Lemma 4). In that case, we have $a_h = \frac{p}{\delta}M - (pR - L)$.

Since the firm's asset-in-place pays off $Y \geq 1$, the firm's debt is safe, and has $D_B = 1$. The firm has sufficient funds to pay the abandonment wage if and only if $Y + L - \left[\frac{p}{\delta}(pR-1) - (pR - L)\right] - 1 \geq 0$. This is satisfied for all $M \leq pR - 1$ (from Assumption 1) if and only if

$$Y \geq \frac{p-\delta}{\delta}(pR-1). \tag{42}$$

Notice that we have

$$\frac{p-\delta}{\delta}(pR-1) < \frac{1}{\delta}\left[L(1-\delta)p - (p-\delta)\right] = \frac{1}{\delta}\left(p\left[L(1-\delta)-1\right]+\delta\right) < 1, \tag{43}$$

where the first inequality follows from Assumption 2. Therefore (42) is satisfied since $Y \geq 1$.

Consider next the continuation wages $w_\sigma^R, w_\sigma^0 \geq 0$ for each of the three cases of optimal expansion form and investment strategy.

(i) When expanding via a selective branch, the optimal compensation contracts are given by Lemma 2. In this case, an optimal contract binds the manager's search incentive compatibility constraint (7). Since the project has a positive NPV under the selective investment strategy, there exist contracts with $w_e^R < R$ and $w_e^0 = 0$. This and the fact that $Y \geq 1$ imply that the firm always has sufficient funds to pay the manager's compensation.

(ii) When expanding via an unselective subsidiary, the optimal compensation contracts are given by Lemma 3.

We first show that the subsidiary has sufficient funds to pay the minimum wage $w_h^R = \frac{M}{\delta}$ needed to ensure the manager's monitoring incentives of the hard project by (12). To see this, recall that the arguments in Section 4.2 imply that it is optimal to issue subsidiary debt with $D_S = L$. The firm has sufficient funds to pay the wage $w_h^R = \frac{M}{\delta}$ if and only if $R - \frac{M}{\delta} - L \geq 0$, or equivalently, $M \leq \delta(R - L)$. We have that $\delta(R - L) > pR - L > pR - 1 > M$, where the first inequality follows from Assumption (2), and the last inequality follows from Assumption (1). Therefore $M \leq \delta(R - L)$ is satisfied.

Next, the proof of Lemma 3 shows that there can be two cases.

- If $\zeta \geq \lambda\pi\frac{p-\delta}{\delta}M$, any optimal contract binds the search constraint (11). The fact that the unselective investment strategy has a positive NPV (by Equation (1)) then implies that there exists a contract such that $w_h^0 = w_e^0 = 0$, and $w_h^R, w_e^R \leq R - D_S = R - L$. To see this, suppose by contradiction that $w_h^0 = w_e^0 = 0$ and $w_h^R = w_e^R = R - L$. (11) and (1) then imply that

  $$\pi\left[p(R - L) - \lambda M\right] = \zeta < (1 - \pi)(L - 1) + \pi(pR - 1 - \lambda M). \tag{44}$$

  This is a contradiction, since

  $$\pi\left[p(R - L) - \lambda M\right] > \pi(pR - 1 - \lambda M) > (1 - \pi)(L - 1) + \pi(pR - 1 - \lambda M). \tag{45}$$

  Therefore there exists an optimal contract with $w_h^0 = w_e^0 = 0$, $w_h^R \in (\frac{M}{\delta}, R - L)$ and $w_e^R \leq R - L$, and the firm has sufficient funds to pay the manager's compensation given $D_S = L$.

- If $\zeta < \lambda\pi\frac{p-\delta}{\delta}M$, the optimal contract has $w_h^R = \frac{M}{\delta}$ and $w_e^R = w_h^0 = w_e^0 = 0$. Again the firm has sufficient funds to pay the manager's compensation.

(iii) When expanding via an unselective branch, the optimal contracts are given by Lemma 4.

We first show that the firm has sufficient funds to pay the minimum wage $w_h^R = \frac{M}{\delta}$ needed to ensure the manager's monitoring incentives of the hard project by (12). To see this, notice that since the firm's asset-in-place pays off $Y \geq 1$, the firm's debt is safe, and has $D_B = 1$. The firm has sufficient funds to pay the wage $w_h^R = \frac{M}{\delta}$ if and only if $Y + R - \frac{M}{\delta} - 1 \geq 0$. This is satisfied for all $M \leq pR - 1$ (from Assumption 1) if and only if

$$Y \geq \frac{1}{\delta}\left[(p-\delta)R - (1-\delta)\right]. \tag{46}$$

Notice that we have

$$(p-\delta)R - (1-\delta) < (p-\delta)R - L(1-\delta) < 0, \tag{47}$$

where the last inequality follows from Assumption 2. Therefore (46) is always satisfied.

We can then follow analogous arguments as in the case of an unselective subsidiary to show that the firm has sufficient funds to pay the manager's optimal compensation.

A.10 Proof of Lemma 6

Let us denote by $\hat{D}_P(D_S)$ the amount of debt issued by the parent such that $d_P = 1 - d_S$. We first show that $\Delta_D(D_S, \hat{D}_P(D_S))$ is increasing in D_S for all $D_S \leq L$, and strictly so if and only if $q - qp^R > 0$. We then show that $\Delta_D(D_S, \hat{D}_P(D_S))$ is strictly decreasing in D_S for all $D_S \geq L$.

Consider first $D_S \leq L$. In this case, $\Delta_D(D_S, D_P)$ is given by (21). Notice that this implies that $\hat{D}_P \geq 1 - d_S \geq 1 - D_S > L - D_S$. There can be two cases depending on whether $\hat{D}_P(D_S) \leq R - D_S$.

- Suppose $\hat{D}_P(D_S) \in (L - D_S, R - D_S]$. Then, $\hat{D}_P(D_S)$ is given by

$$\left[q + \pi p(1-q^R)\right]\hat{D}_P(D_S) + (1-\pi)(1-q)(L - D_S) = 1 - \left[\pi p + (1-\pi)\right]D_S. \tag{48}$$

In this case, we have

$$\frac{d\Delta_D(D_S, \hat{D}_P(D_S))}{dD_S} = \frac{q(q - pq^R)}{q + \pi p(1-q^R)} \geq 0. \tag{49}$$

- Suppose $\hat{D}_P(D_S) \geq R - D_S$. Then $\frac{d\Delta_D(D_S, \hat{D}_P(D_S))}{dD_S} = q - pq^R \geq 0$ is given by (22).

Therefore $\Delta_D(D_S, \hat{D}_P(D_S))$ is increasing in D_S for all $D_S \leq L$, and strictly so if and only if $q - qp^R > 0$.

Consider next $D_S \in [L, R]$. In this case, $\Delta_D(D_S, D_P)$ is given by

$$\Delta_D(D_S, D_P) = (L - pD_S) - p(1 - q^R) \min\{R - D_S, D_P\}. \tag{50}$$

Again there can be two cases depending on whether $\hat{D}_P(D_S) \leq R - D_S$.

- Suppose $\hat{D}_P(D_S) \leq R - D_S$. Then, $\hat{D}_P(D_S)$ is given by

$$\left[q + \pi p(1 - q^R)\right] \hat{D}_P(D_S) = 1 - \left[\pi p D_S + (1 - \pi)L\right]. \tag{51}$$

  In this case, we have

$$\frac{d\Delta_D(D_S, \hat{D}_P(D_S))}{dD_S} = -\frac{pq}{q + \pi p(1 - q^R)} < 0. \tag{52}$$

- $\hat{D}_P(D_S) \geq R - D_S$. In this case, we have

$$\frac{d\Delta_D(D_S, \hat{D}_P(D_S))}{dD_S} = -pq^R \leq 0. \tag{53}$$

It then follows that $\Delta_D(D_S, \hat{D}_P(D_S))$ is maximized at $D_S = L$, and that $\Delta_D(L, \hat{D}_P(L)) \geq \Delta_D(0, \hat{D}_P(0))$, and strictly so if and only if $q - pq^R > 0$. Finally since the marginal debt servicing cost saving under a branch structure is equal to $\Delta_D(0, \hat{D}_P(0))$, this lemma then follows.

A.11 Proof of Proposition 5

From Lemma 6, we have that the marginal debt service cost saving under a branch structure is given by

$$\Delta_D^B = \Delta_D(0, \hat{D}_P(0)) = (1 - q)L - p(1 - q^R)D_B, \tag{54}$$

where

$$D_B = \frac{1 - (1 - \pi)(1 - q)L}{q + \pi p(1 - q^R)}; \tag{55}$$

and the marginal debt service cost saving under a subsidiary structure, maximized by setting $D_S = L$, is given by

$$\Delta_D^S = \Delta_D(L, \hat{D}_P(L)) = (1 - p)L - p(1 - q^R) \min\{R - L, D_P\}, \tag{56}$$

where $D_P = \hat{D}_P(L)$ is given as follows: If

$$\left[q + \pi p(1 - q^R)\right](R - L) \geq 1 - \left[\pi p + (1 - \pi)\right] L, \tag{57}$$

then $D_P \leq R - L$ and is given by

$$D_P = \frac{1 - \left[\pi p + (1 - \pi)\right] L}{q + \pi p(1 - q^R)}; \tag{58}$$

otherwise, $D_P \geq R - L$ and is given by

$$D_P = \frac{1 - \left[\pi p + (1 - \pi)\right] L - \pi p(1 - q^R)(R - L)}{q}. \tag{59}$$

Before we prove this proposition, we first characterize the firm's optimal contracts with risky asset-in-place in the following lemma.

Lemma 12. *Suppose the firm has risky asset-in-place and expands via either a branch or a subsidiary structure.*

- *When following the selective investment strategy, the firm's optimal contract and equilibrium profit is given by Lemma 2.*
- *When following the unselective investment strategy, the manager's compensation given the optimal contract is given by*

$$\rho_{unsel}^{risky}(\Delta_D) = \begin{cases} \rho_{unsel}^C = \max\{\lambda \pi \frac{p-\delta}{\delta} M - \zeta, 0\}, & \text{if } M \leq M_{unsel}^{risky}(\Delta_D), \\ \lambda \frac{p}{\delta} M - \left[(pR - L) + \Delta_D\right] \\ \quad + \max\{\lambda \pi (pR - M - L) + \Delta_D - \zeta, 0\}, & \text{if } M > M_{unsel}^{risky}(\Delta_D), \end{cases} \tag{60}$$

with

$$M_{unsel}^{risky}(\Delta_D) \equiv \frac{\delta}{p}\left[(pR - L) + \Delta_D\right], \tag{61}$$

where Δ_D is equal to Δ_D^B, given by (54), under a branch structure, and equal to Δ_D^S, given by (56), under a subsidiary structure.

Proof. For a given investment strategy, the firm's optimization problem is analogous to that in the baseline model, with the only difference that the firm's managerial compensation ρ_{sel}

given by (6) under the selective strategy, ρ_{unsel} given by (10) under the unselective strategy, as well as the marginal compensation monitoring given on the left-hand side of (12) are expressed in expectation with respect to $\tilde{Y}$. In addition, the firm's optimal contract must satisfy the continuation constraints, which is given by

$$(IC_{risky}^{continuation}): \quad \mathbb{E}^{\tilde{Y}}\left[pw_{\sigma}^{R,\tilde{Y}} + (1-p)w_{\sigma}^{0,\tilde{Y}} - a_{\sigma}^{\tilde{Y}}\right] \leq (pR - L) + \Delta_D, \tag{62}$$

where Δ_D is equal to Δ_D^B, given by (54), under a branch structure, and equal to Δ_D^S, given by (56), under a subsidiary structure.

First, suppose the firm follows the selective investment strategy. Following similar arguments as those in Section 4.1, the firm's optimal contract is identical to that under commitment. The resulting firm profit under a branch structure is given by Lemma 2.

Second, suppose the firm follows the unselective investment strategy. Following similar arguments as in the proof of Lemma 4, we have that when the firm follows the unselective strategy, its optimal contract coincides with that under commitment if and only if (62) in the hard state is satisfied for $\mathbb{E}^{\tilde{Y}}\left[w_{\sigma}^{R,\tilde{Y}}\right] = \frac{M}{\delta}$ and $w_h^{0,\tilde{Y}} = a_h^{\tilde{Y}} = 0$, that is, if $M \leq M_{unsel}^{risky}$, where M_{unsel}^{risky} is given by (61). Otherwise, the optimal contract has $\mathbb{E}^{\tilde{Y}}\left[pw_{\sigma}^{R,\tilde{Y}}\right] = \frac{M}{\delta}$, $w_h^{0,\tilde{Y}} = 0$, and

$$\mathbb{E}^{\tilde{Y}}\left[a_h^{\tilde{Y}}\right] = \frac{p}{\delta}M - \left[(pR - L) + \Delta_D\right]. \tag{63}$$

Overall, the managerial rent given the optimal contract is given by (60). □

We can now proceed to characterize the parameter space for which subsidiary expansion is optimal. As in the baseline model, when following the selective investment strategy, subsidiary expansion is dominated by branch expansion, since the latter saves on the set-up cost C. Subsidiary expansion is therefore optimal if and only if the unselective subsidiary is more profitable than (i) the selective branch:

$$\rho_{unsel}^{risky}(\Delta_D^S) + C \leq \lambda\pi(pR - M - L), \tag{64}$$

where $\rho_{unsel}^{risky}(\Delta_S)$ is given by (60), and Δ_D^B and Δ_D^S are given by (54) and (56), respectively, and (ii) the unselective branch:

$$\rho_{unsel}^{risky}(\Delta_D^S) + C \leq \rho_{unsel}^{risky}(\Delta_D^B), \tag{65}$$

First, we demonstrate that there exist parameter values such that subsidiary expansion is optimal. Let

$$\breve{M} = \frac{\delta}{p}\left[(pR - L) + \frac{p(1-q^R)D_B}{\lambda\pi}\right] > M^B_{unsel}, \tag{66}$$

$$\breve{\zeta} = \frac{p-\delta}{p}\left[\lambda\pi(pR - L) + p(1-q^R)D_B\right]. \tag{67}$$

Then we have that there exists C sufficiently small, such that subsidiary expansion is optimal for all $\zeta \geq \breve{\zeta}$ and $M = \breve{M}$. To see this, we first verify that the firm is indifferent between the selective and the unselective investment strategies for all $\zeta \geq \breve{\zeta}$ and $M = \breve{M}$. Next, Lemma 12 implies that, since $\breve{M} > M^{risky}_{unsel}$, the managerial rent given the optimal contract ρ^{risky}_{unsel} is strictly positive under a branch structure, and strictly higher than that under a subsidiary structure. Therefore, for all $\zeta \geq \breve{\zeta}$ and $M = \breve{M}$, subsidiary expansion is optimal if C is sufficiently small.

Next, we show that the parameter space for which subsidiary expansion is optimal is decreasing in the correlation between the firm's asset-in-place and the project payoffs, q^R. This is defined by the parameter space that satisfies (64) and (65).

- Consider first the condition (64). Since the left-hand side of (64) is increasing in M while the right-hand side is decreasing in M, it follows that either (64) is not satisfied for all M, or there exists $\overline{\mu}^S_{risky}$ such that (64) is satisfied if and only if $M \leq \overline{\mu}^S_{risky}$. Moreover, notice that $\rho^{risky}_{unsel}(\Delta_D)$ given by (60) is decreasing in Δ_D, and Δ^S_D given by (56) is increasing in q^R, where

$$\frac{\partial \Delta^S_D}{\partial q^R} = \begin{cases} \frac{pq(1-[\pi p+(1-\pi)]L)}{[q+\pi p(1-q^R)]^2}, & \text{if } q^R \leq 1 - \frac{1}{\pi p}\left(\frac{1-[\pi p+(1-\pi)]L}{R-L} - q\right), \\ p, & \text{otherwise.} \end{cases} \tag{68}$$

  Therefore the threshold $\overline{\mu}^S_{risky}$ is decreasing in q^R.

- Consider next the condition (65). We first show that either (65) is not satisfied for all M, or there exists a threshold $\underline{\mu}^S_{risky}$ such that (65) is satisfied if and only if $M \geq \underline{\mu}^S_{risky}$. Recall that Lemma 6 shows that $\Delta^S_D \geq \Delta^B_D$, with strictly inequality for all $q - pq^R > 0$.

  - For $M \leq M^{risky}_{unsel}(\Delta^B_D)$, $\rho^{risky}_{unsel}(\Delta^S_D) = \rho^{risky}_{unsel}(\Delta^B_D)$, and (65) is not satisfied.

– For $M \in (M_{unsel}^{risky}(\Delta_D^B), M_{unsel}^{risky}(\Delta_D^S)]$, $\frac{d\rho_{unsel}^{risky}(\Delta_D^S)}{dM} = 0 < \frac{d\rho_{unsel}^{risky}(\Delta_D^B)}{dM}$ if $\lambda\pi\frac{p-\delta}{\delta}M \leq \zeta$, whereas $\frac{d\rho_{unsel}^{risky}(\Delta_D^S)}{dM} > \frac{d\rho_{unsel}^{risky}(\Delta_D^B)}{dM} > 0$ if $\lambda\pi\frac{p-\delta}{\delta}M \geq \zeta$. This implies that, if (65) is satisfied for $M = M_{unsel}^{risky}(\Delta_D^S)$, then there exists $\underline{\mu}_{risky}^S \in (M_{unsel}^{risky}(\Delta_D^B), M_{unsel}^{risky}(\Delta_D^S)]$, such that (65) is satisfied if and only if $M \geq \underline{\mu}_{risky}^S$; otherwise, (65) is not satisfied for all $M \in (M_{unsel}^{risky}(\Delta_D^B), M_{unsel}^{risky}(\Delta_D^S)]$.

– For $M \geq M_{unsel}^{risky}(\Delta_D^S)$, $\Delta_D^S \geq \Delta_D^B$ implies that $0 < \frac{d\rho_{unsel}^{risky}(\Delta_D^S)}{dM} \leq \frac{d\rho_{unsel}^{risky}(\Delta_D^B)}{dM}$. This implies that if (65) is satisfied for $M = M_{unsel}^{risky}(\Delta_D^S)$, then (65) is satisfied for all $M \geq M_{unsel}^{risky}(\Delta_D^S)$; otherwise, then either (65) is not satisfied for all $M \geq M_{unsel}^{risky}(\Delta_D^S)$, or there exists $\underline{\mu}_{risky}^S \geq M_{unsel}^{risky}(\Delta_D^S)$, such that (65) is satisfied if and only if $M \geq \underline{\mu}_{risky}^S$.

The above analysis shows that either (65) is not satisfied for all M, or there exists a threshold $\underline{\mu}_{risky}^S$ such that (65) is satisfied if and only if $M \geq \underline{\mu}_{risky}^S$, where $\underline{\mu}_{risky}^S$ is defined such that (65) holds with equality.

We now show that the threshold $\underline{\mu}_{risky}^S$ is increasing in q^R. This follows because $0 \geq \frac{d\rho_{unsel}^{risky}(\Delta_D^S)}{dq^R} \geq \frac{d\rho_{unsel}^{risky}(\Delta_D^B)}{dq^R}$.

– For $M \leq M_{unsel}^{risky}(\Delta_D^B)$, $\frac{d\rho_{unsel}^{risky}(\Delta_D^S)}{dq^R} = \frac{d\rho_{unsel}^{risky}(\Delta_D^B)}{dq^R} = 0$.

– For $M \in (M_{unsel}^{risky}(\Delta_D^B), M_{unsel}^{risky}(\Delta_D^S)]$, $\frac{d\rho_{unsel}^{risky}(\Delta_D^S)}{dq^R} = 0 > \frac{d\rho_{unsel}^{risky}(\Delta_D^B)}{dq^R}$.

– For $M > M_{unsel}^{risky}(\Delta_D^S)$, $\rho_{unsel}^{risky}(\Delta_D)$ given by (60) is strictly decreasing in Δ_D, with $\frac{\partial\Delta_D^S}{\partial q^R}$ given by (68) and

$$\frac{\partial\Delta_D^B}{\partial q^R} = \frac{pq\left[1 - (1-\pi)(1-q)L\right]}{\left[q + \pi p(1-q^R)\right]^2} > \frac{\partial\Delta_D^S}{\partial q^R} \tag{69}$$

Therefore in this case we have $0 > \frac{d\rho_{unsel}^{risky}(\Delta_D^S)}{dq^R} > \frac{d\rho_{unsel}^{risky}(\Delta_D^B)}{dq^R}$.

To summarize, subsidiary expansion is optimal if and only if $M \in [\underline{\mu}_{risky}^S, \overline{\mu}_{risky}^S]$, where $\underline{\mu}_{risky}^S$ is increasing in q^R and $\overline{\mu}_{risky}^S$ is decreasing in q^R. That is, the parameter space for which subsidiary expansion is optimal is decreasing in q^R.

A.12 Proof of Lemma 7

Suppose the firm expands via a subsidiary structure and issues subsidiary debt D_S to raise d_S. Let us denote by $\hat{D}_P(D_S)$ the amount of debt issued by the parent such that $d_P = 1 - d_S$, and by $\Delta_D^Y(D_S, D_P)$ the debt servicing cost saving for a given debt structure (D_S, D_P).

We first show that $\Delta^Y(D_S, \hat{D}_P(D_S))$ is increasing in D_S for all $D_S \leq L$, and strictly so if and only if $\hat{D}_P(D_S) \in [Y, Y + L - D_S]$. We then show that $\Delta_D^Y(D_S, \hat{D}_P(D_S))$ is decreasing in D_S for all $D_S > L$.

Consider first $D_S \leq L$. In this case, $\Delta_D^Y(D_S, D_P)$ is given by

$$\Delta_D^Y(D_S, D_P) = (1-p)D_S + \min\{Y + L - D_S, D_P\} - [pD_P + (1-p)\min\{Y, D_P\}] \,. \quad (70)$$

There are three cases:

- Suppose $\hat{D}_P(D_S) \geq Y + L - D_S$, then

$$\Delta_D^Y(D_S, D_P) = pY + L - p(D_S + D_P), \quad (71)$$

  and $\hat{D}_P(D_S)$ is given by

$$\pi\left[pD_P + (1-p)Y\right] + (1-\pi)(Y + L - D_S) = 1 - \left[\pi p + (1-\pi)\right] D_S. \quad (72)$$

  In this case, we have $\frac{d\Delta_D^Y(D_S, \hat{D}_P(D_S))}{dD_S} = 0$.

- Suppose $\hat{D}_P(D_S) \in [Y, Y + L - D_S)$, then

$$\Delta_D^Y(D_S, D_P) = (1-p)(D_S + D_P) - (1-p)Y, \quad (73)$$

  and $\hat{D}_P(D_S)$ is given by

$$\pi\left[pD_P + (1-p)Y\right] + (1-\pi)D_P = 1 - \left[\pi p + (1-\pi)\right] D_S. \quad (74)$$

  In this case, we again have $\frac{d\Delta_D^Y(D_S, \hat{D}_P(D_S))}{dD_S} = 0$.

- Suppose $\hat{D}_P(D_S) < Y$, then

$$\Delta_D^Y(D_S, D_P) = (1-p)D_S, \quad (75)$$

  and which is strictly increasing in D_S.

Therefore $\Delta_D^Y(D_S, \hat{D}_P(D_S))$ is increasing in D_S for all $D_S \leq L$, and strictly so if and only if $\hat{D}_P(D_S) \leq Y$.

Consider next $D_S \in [L, R)$. In this case, $\Delta_D^Y(D_S, D_P)$ is given by

$$\Delta_D^Y(D_S, D_P) = L - pD_S + \min\{Y, D_P\} - [pD_P + (1-p)\min\{Y, D_P\}]\,. \tag{76}$$

There are two cases:

- Suppose $\hat{D}_P(D_S) \geq Y$, then

$$\Delta_D^Y(D_S, D_P) = L - p(D_S + D_P) + pY, \tag{77}$$

  and $\hat{D}_P(D_S)$ is given by

$$\pi\,[pD_P + (1-p)Y] + (1-\pi)Y = 1 - [\pi p D_S + (1-\pi)L]\,. \tag{78}$$

  In this case, we have $\frac{d\Delta_D^Y(D_S, \hat{D}_P(D_S))}{dD_S} = 0$.

- Suppose $\hat{D}_P(D_S) < Y$, then

$$\Delta_D^Y(D_S, D_P) = L - pD_S, \tag{79}$$

  which is strictly decreasing in D_S.

It then follows that $\Delta_D^Y(D_S, \hat{D}_P(D_S))$ is maximized at $D_S = L$. Moreover, we have

$$\hat{D}_P(L) = \begin{cases} \frac{1-[\pi(1-p)+(1-\pi)]Y-[\pi p+(1-\pi)]L}{\pi p} \geq Y, & \text{if } Y \leq Y^*, \\ 1 - \pi\,[\pi p + (1-\pi)]\,L < Y, & \text{if } Y > Y^*, \end{cases} \tag{80}$$

where

$$Y^* = 1 - [\pi p + (1-\pi)]\,L. \tag{81}$$

Therefore we have $\Delta_D^Y(L, \hat{D}_P(L)) \geq \Delta_D^Y(0, \hat{D}_P(0))$, and strictly so if and only if $Y > Y^*$. Finally, since the marginal debt servicing cost saving under a branch structure is equal to $\Delta_D^Y(0, \hat{D}_P(0))$, this lemma then follows.

A.13 Proof of Proposition 6

From Lemma 7, we have that the marginal debt service cost saving under a branch structure is given by

$$\Delta_D^{B,Y} = \Delta_D^Y(0, \hat{D}_P(0)) = \begin{cases} pY + L - pD_P^Y, & \text{if } Y \leq Y^*, \\ (1-p)(D_B^Y - Y), & \text{if } Y > Y^*, \end{cases} \tag{82}$$

where the debt issued under a branch structure is given by

$$D_B^Y = \begin{cases} \frac{1-\pi(1-p)Y-(1-\pi)(Y+L)}{\pi p} \geq Y + L, & \text{if } Y \leq Y^*, \\ \frac{1-\pi(1-p)Y}{\pi p+(1-\pi)} < Y + L, & \text{if } Y > Y^*, \end{cases} \tag{83}$$

where Y^* is defined by (81). Moreover, given the optimal subsidiary debt structure $D_S = L$, the marginal debt service cost saving under a subsidiary structure is given by

$$\Delta_D^{S,Y} = \begin{cases} (1-p)L + pY - pD_P^Y, & \text{if } Y \leq Y^*, \\ (1-p)L, & \text{if } Y > Y^*, \end{cases} \tag{84}$$

where the parent debt is given by

$$D_P^Y = \begin{cases} \frac{1-[\pi(1-p)+(1-\pi)](Y+L)}{\pi p} \geq Y, & \text{if } Y \leq Y^*, \\ 1 - [\pi p + (1-\pi)]\, L < Y, & \text{if } Y > Y^*. \end{cases} \tag{85}$$

The remainder of this proof follows similar steps as the proof of Proposition 5. First, we can show that the firm's optimal contracts with safe asset-in-place that pays off $Y < 1$ are as described in Lemma 12 by following analogous reasoning.

Next, we characterize the parameter space for which subsidiary expansion is optimal. This is defined by the parameter space that satisfies (64) and (65).

- For $Y \leq Y^*$, the debt servicing cost saving is identical under both organizational structure. Subsidiary expansion is thus never optimal, as it achieves the same outcome as branch expansion, but incurs the set-up cost C.

- For $Y \to 1$, the debt servicing cost saving under each organizational structure is identical to the baseline model, and the parameter space for which subsidiary expansion is optimal is described by Proposition 4.

- For $Y \in (Y^*, 1)$, similar arguments as those in the proof of Proposition 5 show that, there exist $\underline{\mu}_Y^S$ and $\overline{\mu}_Y^S$, such that subsidiary is optimal if and only if $M \in [\underline{\mu}_Y^S$ and $\overline{\mu}_Y^S]$. Moreover, $\underline{\mu}_Y^S$ is decreasing in Y and $\overline{\mu}_Y^S$ is increasing in Y. That is, the parameter space for which subsidiary expansion is optimal is increasing in Y.

A.14 Proof of Proposition 7

We start by characterizing the firm's optimal contract under delegation when following the first-best investment strategy of continuing all viable projects and abandoning all non-viable projects in the following lemma:

Lemma 13. *Suppose the firm delegates the time 1 continuation decision to the manager. Under the optimal contract that implements the first-best (unselective) investment strategy, managerial rent is given by*

$$\rho_{unsel}^{delegation} = B + \left(\lambda\pi\frac{p-\delta}{\delta}M - \pi B - \zeta\right)^+ . \tag{86}$$

The firm's profit is given by

$$\Pi_{unsel}^{delegation} = \Pi^{FB} - \rho^{delegation}. \tag{87}$$

Proof. The optimal contract minimizes managerial rent ρ_{unsel} given by (10) subject to constraint (23) to continue all viable projects, constraint (24) with the opposite inequality to abandon non-viable projects, constraint (12) to monitor the hard viable project, and the search constraint (11). We derive the optimal contracts in a series of steps.

(i) $w_\sigma^0 = 0$. This is because, if $w_\sigma^0 > 0$, then lowering w_σ^0 relaxes all constraints and reduces managerial rent ρ_{unsel}.

(ii) $a_\sigma = B$. This is because, if $a_\sigma > B$ so that (24) with the opposite inequality is slack, then lowering a_σ marginally does not violate this constraint, relaxes all other constraints, and reduces managerial rent ρ_{unsel}.

(iii) Finally, we characterize w_σ^R for the following two cases.

- Suppose $\zeta \geq \lambda\pi\frac{p-\delta}{\delta}M - \pi B$, we show that in this case, any optimal contract binds (11).

  If $B \leq \lambda\frac{p-\delta}{\delta}M$, we can ignore (23) in the hard state because it is implied by (12). Then a slack (11) implies that either (12) is slack, or (23) is slack in the easy state. It is then possible to decrease either w_h^R or w_e^R without violating any constraints, while strictly reducing the managerial rent ρ_{unsel}.

  If $B \geq \lambda\frac{p-\delta}{\delta}M$, we can ignore (12) because it is implied by (23) in the hard state. Then a slack (11) implies that (23) is slack in at least one of the two states. It is then possible to decrease either w_h^R or w_e^R without violating any constraints, while strictly reducing the managerial rent ρ_{unsel}.

  As a result, the search constraint (11) binds, and the managerial rent ρ_{unsel} is given by $\rho_{unsel} = \lambda a_h + (1-\lambda)a_e = B$.

- Suppose $\zeta < \lambda\pi\frac{p-\delta}{\delta}M - \pi B$. This can only be the case if $B \leq \frac{p-\delta}{\delta}M$, in which case we can ignore (23) in the hard state because it is implied by (12). Moreover, any contract that satisfies (12) implies a slack (11). Therefore the optimal has $w_h^R = \frac{M}{\delta}$ to bind (12) and $w_e^R = \frac{B}{p}$ to bind (23) in the easy state. As a result, in this case, managerial rent is given by $\rho_{unsel} = B + \left(\lambda\pi\frac{p-\delta}{\delta}M - \pi B - \zeta\right)$.

The managerial rent and firm profit under the optimal contract are therefore as stated in this lemma. □

We then consider the other investment strategies under delegation in the following lemma:

Lemma 14. *It is not optimal for the firm to delegate and pursue any other investment strategy.*

Proof. First, the selective investment strategy of continuing only the easy viable project and abandoning all other projects (the hard viable project and all non-viable projects) can be implemented under a branch structure without paying any managerial rent (by the arguments in Section 4.1). Delegation thus does not provide any benefit if the firm implements the selective investment strategy.

Second, following a strategy of continuing only the easy viable project and abandoning the hard viable project, while continuing a non-viable project in some states of the world is not optimal. This strategy is also dominated by branch expansion following the selective investment strategy, since the continuation of non-viable projects is inefficient.

Third, we show that following a strategy of continuing all viable and non-viable projects is not optimal. In this case, the compensation contract must satisfy Equations (23) and (24) to continue all projects, Equation(12) to monitor viable projects, and the following search constraint:

$$
\begin{aligned}
(IC^{search}_{\textit{non-viable}}): \quad & \lambda\pi \left[pw_h^R + (1-p)w_h^0 - (w_h^0 + B) - M\right] \\
& + (1-\lambda)\pi \left[pw_e^R + (1-p)w_e^0 - (w_e^0 + B)\right] - \zeta \geq 0.
\end{aligned} \tag{88}
$$

Given that the manager continues all projects, the managerial rent is given by

$$
\rho_{\textit{non-viable}} = \underbrace{\left[\lambda w_h^0 + (1-\lambda)w_e^0 + B\right]}_{\textit{rent from not searching}} + \underbrace{\begin{bmatrix} \lambda\pi \left[pw_h^R + (1-p)w_h^0 - (w_h^0 + B) - M\right] \\ + (1-\lambda)\pi \left[pw_e^R + (1-p)w_e^0 - (w_e^0 + B)\right] - \zeta \end{bmatrix}}_{\textit{marginal rent from searching}}. \tag{89}
$$

We now derive the optimal contracts in a series of steps.

(i) $w_\sigma^0 = 0$. This is because, if $w_\sigma^0 > 0$, then lowering w_σ^0 relaxes all constraints and reduces managerial rent $\rho_{\textit{non-viable}}$.

(ii) $a_\sigma = 0$. This is because, if $a_\sigma > 0$, then lowering w_σ^0 relaxes all constraints and reduces managerial rent $\rho_{\textit{non-viable}}$.

(iii) We can show that the managerial rent given the optimal contract that induces continuation of all viable and non-viable projects is equal to the managerial rent under the optimal contract that induces continuation of all viable projects but abandonment of all non-viable projects, i.e., $\rho^{\textit{delegation}}_{\textit{non-viable}} = \rho^{\textit{delegation}}_{\textit{unsel}}$. This follows the same arguments as in Step (iii) of the proof of Lemma 13, except that the search constraint is given by (88) instead of (11).

The firm's profit under the optimal contract is given by

$$
\Pi^{\textit{delegation}}_{\textit{non-viable}} = \Pi^{FB} + (1-\pi)(B-L) - \rho^{\textit{delegation}}_{\textit{non-viable}}, \tag{90}
$$

where the second term captures the loss due to the inefficient continuation of non-viable projects. It then follows that, under delegation, following the investment strategy of continuing all projects under delegation is strictly dominated by following the unselective strategy, as both require paying the same managerial rent, but the latter generates a higher firm profit due to better investment efficiency.

Finally, consider the strategy of continuing all viable projects and continuing non-viable projects in one of the two states. Following similar arguments as in the previous two cases, we can show that the managerial rent given the optimal contracts in this case is again equal to $\rho_{unsel}^{delegation}$. This strategy is thus again dominated by the unselective strategy. □

Lemmas 13 and 14 show that, under delegation, it is most profitable to follow the unselective investment strategy, i.e., to continue all viable projects and abandon all non-viable projects. The resulting firm profit is given by (87).

We now show that, at $B = L$, $\rho_{unsel}^{delegation} > \rho_{unsel}^{B}$, where ρ_{unsel}^{B} given by (17). Since ρ_{unsel}^{B} is increasing in M, and $M < pR - L$ (as implied by Assumption 1), we have $\rho_{unsel}^{B} < \frac{p-\delta}{\delta}(pR - L) < L$, where the last inequality follows by Assumption 2. Therefore, at $B = L$, we have $\rho_{unsel}^{delegation} \geq L > \rho_{unsel}^{B}$ for all M.

Therefore, by continuity, there exists $B^* < L$, such that delegation is dominated by the unselective branch for all $B \in (B^*, L)$. In particular, this implies that the parameter space for which the firm expands optimally via a subsidiary and chooses the unselective investment strategy is as described in Proposition 4.

Code Availability: No new code was generated in support of this research.

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