

(De)Centralized Debt Financing and Project Selection under imperfect Bank Competition

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Abstract

This paper examines how a firm should finance multiple investment projects when credit markets are imperfect and banks possess market power. Using the Monti–Klein framework, we model the firm’s strategic choice between raising debt for projects separately (decentralized funding) or jointly (centralized funding) and its implications for project selection and capital allocation. Our results reveal that imperfect competition in the banking sector crucially shapes the firm’s optimal financing mode. Depending on equity levels and market competitiveness, under centralized funding the firm may optimally bundle strong and weak projects — a form of corporate socialism — to reduce overall borrowing costs. Contrary to conventional views, winner picking and corporate socialism can coexist: bundling weak projects can enhance financing terms for strong ones and enable more aggressive resource reallocation towards strong projects. The findings offer a novel rationale for cross-subsidization as an optimal response to imperfect credit markets rather than a symptom of inefficiency.

Keywords. Corporate socialism; External financing; Imperfect credit market; Project selection; Winner picking.

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1 Introduction

Firms frequently face a multitude of potential investment opportunities that differ in scale, profitability, and other attributes. Since financial resources are limited, managers must identify the most preferable projects and determine how to allocate capital across the resulting project portfolio to maximize firm value. The process of project selection and capital allocation has therefore become a central concern in corporate finance and operations management (e.g., Korotkov and Wu, 2020; Mohagheghi et al., 2022; Si et al., 2022; Vieira et al., 2024). Headquarters can play an active role in reallocating scarce resources across the projects in the portfolio, thereby creating value through utilizing internal capital markets (Giroud and Mueller, 2015).

Because most firms depend on external financing, the efficiency of investment decisions is critically influenced by the conditions prevailing in credit markets. Traditional models of corporate finance typically assume that credit markets are perfectly competitive, implying that capital is allocated efficiently (e.g., Leland, 2007, for a review on this literature). In contrast, empirical evidence suggests that credit markets are rarely perfect and that there exists a relation between bank market structure and the cost of credits (Guriev and Kvasov, 2009). Several studies have consistently shown that concentrated banking markets generally lead to higher interest rates and lower supply of loans (e.g., Prager and Hannan, 1998; Cetorelli and Gambera, 2001; Beck et al., 2004; Guriev and Kvasov, 2009; Chaudron et al., 2023). Likewise, banks often engage in interest rate discrimination (e.g., Barone et al., 2011; Melnik and Shy, 2015; Ma, 2020; Bartlett et al., 2022).

While the implications of imperfect banking competition have been widely examined from the lenders' perspective, the borrower's perspective has received much less attention. Yet, for firms that depend on external debt financing, the structure of the credit market directly influences how they should design their financing strategy and allocate resources across projects (Sierra, 2019). In particular, when a firm must finance several projects si-

multaneously through an imperfectly competitive credit market, two natural questions arise. First, whether the firm should centralize or decentralize the external funding of the projects (e.g., Inderst and Müller, 2003; Akbel and Schnitzer, 2011; Cao et al., 2022). While under decentralized funding the firm raises funds for each project separately, under centralized funding the firm bundles the projects and raises funds for the entire bundle. Second, how should the firm allocate capital among projects (e.g., Lamont, 1997; Shin and Stulz, 1998; Aktas et al., 2019).

This paper addresses these questions by examining how a firm’s organizational financing structure — centralized or decentralized funding — interacts with optimal project selection and capital allocation. We consider a firm that requires funding from an imperfect credit market to conduct two out of three projects: a strong, a moderate, and a weak project. The analysis is conducted within the Monti–Klein framework (Monti, 1972; Klein, 1971), which models banks as Cournot competitors in the loan market.¹ In this setup, the firm’s cost of capital arises endogenously from the strategic interaction between banks competing for loan supply. The Monti-Klein framework predicts that as fewer banks compete in a market, they decrease the supply of loans which in turn yields higher interest rates (e.g., Freixas and Rochet, 2008, provide an excellent review).²

Treating the organizational form of the financing process, project selection, and capital allocation as strategic choice variables in the Monti-Klein framework, our paper shows that these choice variables crucially influence the firm’s cost of capital and, thus, the profitability of the firm. Depending on the credit market’s competitiveness and the firm’s equity level, either decentralized or centralized funding emerges as optimal. Under decentralized funding, banks can discriminate loan rates across projects, often to the detriment of the most prof-

¹Cetorelli and Peretto (2012), Qi et al. (2022), and Fillat et al. (2023) provide recent applications of the Monti-Klein framework.

²The Monti-Klein model is arguably the most popular industrial organization approach to banking. The popularity of the Monti-Klein model can be attributed to its potential for empirical applications. Several empirical studies provide evidence that bank behavior in credit markets can be approximated by Cournot competition (e.g., Corvoisier and Gropp, 2002; Uchida and Tsutsui, 2005; Degryse and Ongena, 2008; Benchimol and Bozou, 2024).

itable ones. In such cases, the firm engages in winner picking (Stein, 1997), allocating more equity and investment to high-return projects, to mitigate financing disadvantages.³ However, the firm cannot fully neutralize the banks’ ability to impose project-specific markups. Centralized funding changes this dynamic fundamentally. By bundling projects and raising a single loan for the portfolio, the firm determines the overall cost of capital at the portfolio level. This allows the firm to reallocate funds internally after borrowing, strengthening its capacity to channel more resources toward high-return projects. As a result, centralized funding facilitates even more aggressive winner picking. An important and perhaps counter-intuitive insight is that under centralized funding the firm might finance the weak project alongside the strong one. In contrast to the corporate socialism literature on the inefficiency of internal capital markets (e.g., Shin and Stulz, 1998; Rajan et al., 2000; Ozbas and Scharfstein, 2010; Li et al., 2023), this seemingly inefficient ”socialistic“ project selection is the response to imperfect credit markets. When the firm bundles a weak project with a strong one, this ”pretended corporate socialism“ may reduce overall financing cost imposed by banks, effectively improving terms for the strong project. Thus, the inclusion of a weak project may serve as a strategic instrument to reduce the firm’s overall cost of capital. Our model therefore demonstrates that winner picking and corporate socialism are not mutually exclusive.⁴ Rather, corporate socialism can enable more aggressive winner picking by improving access to external funds for the entire project bundle.

Banks prefer decentralized funding since this allows them to discriminate the cost of capital at the expense of the firms. If the market is sufficiently inefficient, the banks can use their market power to force the firm to decentralize the funding. In fact, we observe a non-monotonic relationship in that corporate socialism is applied for intermediate values of market competitiveness and equity, while decentralized funding is applied for high and low

³In our model, the firm’s internal equity allocation serves as a strategic substitute to counteract banks’ market power.

⁴Prevailing literature usually considers the resource allocation process for two projects, abstracting from issues of project selection. In such a setup, winner picking and corporate socialism are necessarily mutually exclusive strategies (e.g., Stein, 1997; Scharfstein and Stein, 2000; Gautier and Heider, 2009).

values of market competitiveness and equity. Finally, if the credit market is perfect, funding the two strongest projects is always optimal, and the financing structure becomes gratuitous.

Our research question is closely related to the seminal contribution of Inderst and Müller (2003), who examined the trade-offs between centralized and decentralized financing in a contracting framework à la Bolton and Scharfstein (1990). Their analysis shows conditions under which centralization dominates decentralization, but it abstracts from project selection and cross-subsidization. By contrast, our approach explicitly models project selection among multiple investment opportunities, thereby allowing for the coexistence of winner picking and corporate socialism. Moreover, our model emphasizes market structure as the key determinant of financing outcomes.

Our paper is also related to the internal capital market literature that emphasizes the role of headquarters in reallocating funds among divisions. While the "dark side" of internal capital markets is typically attributed to agency conflicts leading to inefficient cross-subsidization (corporate socialism as in Shin and Stulz, 1998; Rajan et al., 2000; Ozbas and Scharfstein, 2010; Hoang and Ruckes, 2015), the "bright side" literature highlights efficient internal reallocation (winner picking as in Stein, 1997; Brusco and Panunzi, 2005; Dai et al., 2024). Our model adds a new dimension by showing that even in the absence of internal agency problems, external financing conditions may induce behavior resembling corporate socialism.

Finally, our findings relate to the literature on self-sabotage, where firms deliberately limit their efficiency to engage in a less aggressive strategic interaction with an opponent (e.g., Arya and Mittendorf, 2011; Kopel et al., 2016; Brown and Sappington, 2021). Analogously, our model demonstrates that a firm may deliberately undertake a weaker project to influence banks' perceptions and reduce overall borrowing costs, constituting a mechanism of strategic inefficiency that enhances firm value under imperfect competition.

The remainder of the paper is organized as follows. Section 2 presents the model. Section 3 analyzes the firm's optimal project selection and investment decisions under decentralized

and centralized funding and derives the equilibrium financing strategy. Section 4 briefly examines the special case of a monopolistic bank. Section 5 concludes the paper. All proofs are relegated to the Appendix.

2 Model

We consider a firm (borrower) who can conduct at most two of three projects, P_1 , P_2 , and P_3 . The end-of-period cash outflow of project P_i with $i \in \{1, 2, 3\}$, is given by: $CF_i(I_i) = (a_i - I_i/2) I_i$, where I_i denotes the amount of investment and a_i denotes the size of the project. Without loss of generality, we assume the following ordering of the projects, $a_1 > a_2 > a_3$. Accordingly, we refer to P_1 as "strong project", P_2 as "moderate project" and P_3 as "weak project". The firm holds equity, E , which can be allocated among the two chosen projects, $E = E_i + E_j$ with $j \in \{1, 2, 3\}$ and $j \neq i$. E_i and E_j denote the amount of equity allocated to project P_i and P_j . If project P_i receives E_i units of equity, it borrows $L_i = I_i - E_i$ from the credit market. The banks at the credit market are willing to provide funds in exchange for a repayment with an interest rate of r_{iB} . The firm's cost of capital is given by: $t_i = 1 + r_{iB}$.

For our subsequent analysis it is convenient to analyze the investment decisions in terms of terminal values. Given the equity level, E_i , and the cost of capital, t_i , the terminal value of project P_i is given by:

$$TV_i = CF_i(I_i) - t_i L_i = \left(a_i - \frac{I_i}{2} - t_i \right) I_i + t_i E_i, \text{ with } I_i = L_i + E_i. \quad (1)$$

The firm's objective is to maximize the terminal value of conducting two projects, i.e., $\max \{TV_i + TV_j\}$.

Figure 1 depicts the sequence of events. At $t = 0$, the firm selects the projects, decides whether it funds the projects in a decentralized or centralized way, and allocates equity to

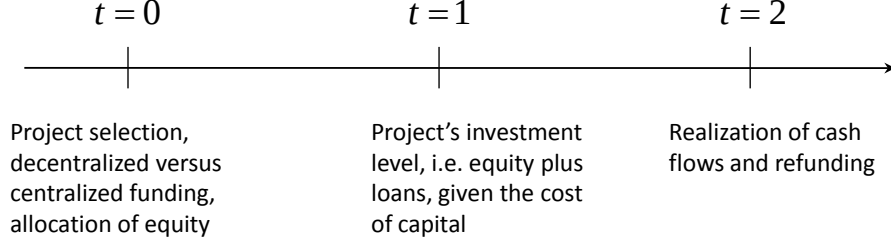


Figure 1: Timeline

the projects. Under decentralized funding, the firm raises funds for each project separately. Under centralized funding, the firm bundles the projects and raises funds for the entire bundle. At $t = 1$, the firm decides about the amount of investments for the individual projects, after the interest rates are determined in the banks' market for loans. At $t = 2$, the cash flows get realized and the firm refunds the loans. The equilibrium concept is backwards induction and we focus on subgame-perfect Nash equilibria.

To formalize the determination of the cost of capital, we apply the well-known Monti-Klein model with N banks (Klein 1971, Monti 1972). The Monti-Klein model provides a convenient, often used and also empirically validated framework, i.e., based on Cournot competition banks determine the optimal supply of loans taking into account that their choice affects the attainable interest rate. A key advantage of the Cournot approach is the well-known property that monopoly and perfect competition are the extremes of a well-understood range of outcomes with respect to the number of banks: monopoly applies for $N = 1$, perfect competition for $N \rightarrow \infty$, oligopoly in between. The Monti-Klein set-up thus provides a convenient framework for our objective to study how banking market structure affects a firm's financing strategy. For simplicity, we assume that the credit market is solely determined by the firm's demand. The profit function of the n -th bank financing project P_i is given by:

$$\pi_n = (t_i - 1 - r) \cdot d_{in}(\cdot), \quad (2)$$

where r denotes the banks' interest rate and $d_{in}(\cdot)$ denotes bank n 's supply. Each bank's

objective is to maximize profit via determining the appropriate supply.

Defining the net size of a project with $x_i = a_i - 1 - r$, for $i = 1, 2, 3$, we impose Assumption the following assumption throughout our analysis.

Assumption 1 $x_1 = a_1 - 1 - r > E$.

Assumption 1 rules out degenerate cases where the strongest project could be financed entirely by equity. Assumption 1 has two important implications. First, it guarantees that all equity is devoted to finance the projects; no equity remains idle. Second, although we do not consider explicitly the rate of return investors require for equity, Assumption 1 ensures that, in equilibrium, the return on equity is strictly higher than the return on debt.

3 Results

3.1 Decentralized Funding

We start our analysis with the case that the firm applies decentralized funding for the individual projects. Maximizing the terminal value for project P_i , i.e., $CF_i(I_i) - t_i L_i$ with $I_i = L_i + E_i$, yields an optimal demand for loans of $L_i^D(t_i, E_i) = \max\{a_i - t_i - E_i, 0\}$. Superscript D indicates decentralized funding. Intuitively, the higher the firm's cost of capital, t_i , the lower the demanded loan L_i . The associated maximum terminal value is given by:

$$TV_i^D(t_i, E_i) = \max \left\{ \left(\frac{(a_i - t_i)^2}{2} + t_i E_i \right); \left(a_i E_i - \frac{E_i^2}{2} \right) \right\}. \quad (3)$$

The term, $(a_i - t_i)^2 / 2$, represents the terminal value if the project is financed purely by debt. The term, $t_i E_i$, represents savings if the firm allocates equity of E_i to the project. The term, $(a_i E_i - E_i^2 / 2)$, denotes the terminal value if the project is financed purely by equity, $L_i = 0$.

Applying the Monti-Klein model, the appendix shows that demand for loan, $L_i^D(t_i, E_i)$, results in equilibrium cost of capital for the firm (recall: $x_i = a_i - 1 - r$):

$$t_i^D(E_i) = 1 + r + \frac{x_i - E_i}{1 + N}. \quad (4)$$

The cost of capital, $t_i^D(\cdot)$, equals one plus the interest rate, $1 + r$, plus a markup of $(x_i - E_i)/(1 + N)$. The markup is affected by three key factors: net size of the project, x_i , the amount of equity, E_i , and the degree of competition at the credit market, i.e., number of banks N . Since we abstract from organizational issues, all projects independent of their size are frisk-free. Consequently, higher net size of the project increases demand for loans and hence, increase cost of capital. The greater the allocated equity, the smaller the firm's demand for loans and, hence, its willingness to pay. Consequently, the greater the allocated equity, E_i , the smaller the cost of capital, t_i^D . The greater the degree of competition at the credit market, the higher the supply of loans which yields a lower interest rate in equilibrium. Consistent with common results in Cournot competition, the firm has to pay a lower markup when the market becomes more competitive, i.e., number of banks, N , increases. For the extreme case of perfect competition, $N \rightarrow \infty$, the firm's cost of capital equals one plus the interest rate, $t_i^D = 1 + r$.

Substituting the firm's cost of capital, $t_i^D(E_i)$, into the terminal value, $TV_i^D(t_i, E_i)$, yields a terminal value of $TV_i^D(E_i) = ((Nx_i + E_i)/(1 + N))^2/2 + E_i(1 + r + (x_i - E_i)/(1 + N))$.⁵ Conducting two arbitrary projects P_i and P_j , with $P_i > P_j$, yields a total terminal value of

$$TV_{ij}^D(\cdot) = TV_i^D(\cdot) + TV_j^D(\cdot) = \sum_{k \in \{i, j\}} \left(\frac{1}{2} \left(\frac{Nx_k + E_k}{1 + N} \right)^2 + E_k \left(1 + r + \frac{x_k - E_k}{1 + N} \right) \right).$$

Solving the first-order conditions with respect to E_i yields the optimal allocation of equity,

$$E_i = \min \left\{ \frac{E}{2} + \frac{x_i - x_j}{2}, E \right\} \quad \text{and} \quad E_j = (E - E_i).$$

⁵Calculating return on equity of a single project P_i , $RoE_i^D = TV_i^D/E_i = ((Nx_i + E_i)/(1 + N))^2/2E_i + t_i^D > t_i^D$, reveals that the return on equity exceeds the firm's cost of capital.

The stronger project P_i receives more equity with increasing difference between the two projects, $x_i - x_j$, amplifying the advantage of the strong project. For $E \leq \widehat{E}_{ij}^D = x_i - x_j$, all equity is allocated to the stronger project. Lemma 1 summarizes the equilibrium outcome.

Lemma 1 *If the firm conducts the two projects, P_i and P_j , via decentralized funding, the equilibrium outcome is given by (with $\widehat{E}_{ij}^D = x_i - x_j$ for $x_i > x_j$):*

$$\begin{aligned}
E_i^D &= \begin{cases} \frac{E}{2} + \frac{x_i - x_j}{2} & \text{if } E > \widehat{E}_{ij}^D \\ E & \text{if } E \leq \widehat{E}_{ij}^D \end{cases} & E_j^D &= \begin{cases} \frac{E}{2} - \frac{x_i - x_j}{2} & \text{if } E > \widehat{E}_{ij}^D \\ 0 & \text{if } E \leq \widehat{E}_{ij}^D \end{cases} \\
L_i^D &= \begin{cases} N \frac{x_i + x_j - E}{2(1+N)} & \text{if } E > \widehat{E}_{ij}^D \\ N \frac{x_i - E}{(1+N)} & \text{if } E \leq \widehat{E}_{ij}^D \end{cases} & L_j^D &= \begin{cases} N \frac{x_i + x_j - E}{2(1+N)} & \text{if } E > \widehat{E}_{ij}^D \\ N \frac{x_j}{(1+N)} & \text{if } E \leq \widehat{E}_{ij}^D \end{cases} \\
I_i^D &= \begin{cases} x_i - \frac{x_i + x_j - E}{2(1+N)} & \text{if } E > \widehat{E}_{ij}^D \\ x_i - \frac{x_i - E}{1+N} & \text{if } E \leq \widehat{E}_{ij}^D \end{cases} & I_j^D &= \begin{cases} x_j - \frac{x_i + x_j - E}{2(1+N)} & \text{if } E > \widehat{E}_{ij}^D \\ \frac{x_j}{1+N} N & \text{if } E \leq \widehat{E}_{ij}^D \end{cases} \\
t_i^D &= \begin{cases} 1 + r + \frac{x_i + x_j - E}{2(1+N)} & \text{if } E > \widehat{E}_{ij}^D \\ 1 + r + \frac{x_i - E}{1+N} & \text{if } E \leq \widehat{E}_{ij}^D \end{cases} & t_j^D &= \begin{cases} 1 + r + \frac{x_i + x_j - E}{2(1+N)} & \text{if } E > \widehat{E}_{ij}^D \\ 1 + r + \frac{x_j}{1+N} & \text{if } E \leq \widehat{E}_{ij}^D, \end{cases}
\end{aligned}$$

resulting in a maximum total terminal value of

$$TV_{ij}^D = \begin{cases} \frac{1}{2} \sum_{k=i}^j \left(x_k - \frac{x_i + x_j - E}{2(1+N)} \right)^2 + 2E \left(1 + r + \frac{x_i + x_j - E}{2(1+N)} \right) & \text{if } E > \widehat{E}_{ij}^D \\ \frac{1}{2} \left(\left(\frac{x_i N + E}{1+N} \right)^2 + \left(\frac{x_j N}{1+N} \right)^2 \right) + 2E \left(1 + r + \frac{x_i - E}{1+N} \right) & \text{if } E \leq \widehat{E}_{ij}^D. \end{cases}$$

It is instructive to study the firm's optimal financing strategy in more detail. If the firm has enough equity, $E \geq \widehat{E}_{ij}^D$, it allocates the equity across the two projects so that the costs of capital for both projects do not differ. The reason is that under decentralized funding the

banks can discriminate the cost of capital at the expense of the strong project. Equity serves as a strategic instrument to mitigate this problem. Calculating the equilibrium investments for project P_k , i.e., $I_k^{DEq} = x_k - (x_k - E/2) / (1 + N)$ for $k = i, j$, when the firm allocates the equity equally, i.e., $E_i = E_j$, we get: $I_i^D > I_i^{DEq}$ and $I_j^D < I_j^{DEq}$. That is, the firm allocates more equity to the stronger project P_i and invests disproportionately more into the stronger project (henceforth: *winner picking*).⁶ Although total investments are identical, $I_i^D + I_j^D = I_i^{DEq} + I_j^{DEq}$, winner picking increases the associated total terminal value.

We close this section by noting that, consistent with conventional wisdom, it is always optimal for the firm to select the two strongest projects, P_1 and P_2 , but never the weak one, P_3 (e.g., Lang and Stulz, 1994; Berger and Ofek, 1995; Servaes, 1996; Campa and Kedia, 2002).⁷ We obtain the following result that we state for sake of convenience in a non-technical way.

Proposition 1 *Under decentralized funding, it is optimal for the firm to always conduct the two strongest projects, P_1 and P_2 , irrespective of the level of equity. The firm always engages in winner picking.*

3.2 Centralized Funding

If the firm has not enough equity, $E < \hat{E}_{ij}^D$, the previous analysis showed that under decentralized funding the winner picking strategy is limited. Under centralized funding the firm bundles two projects and requires funding for the entire bundle. One might suspect that in this case the firm could improve its performance.

Before we study the project selection strategy in more depth, we start our analysis considering an arbitrary bundle of two projects, P_i and P_j with $P_i > P_j$. Given the cost of capital, t_{ij} , maximizing the total terminal value $\sum_{k=i}^j (a_k - I_k/2 - t_{ij}I_k) + t_{ij}E$ with

⁶For instance, Stein (1997) defines winner picking as the practice of actively shifting funds from less promising projects to more promising projects.

⁷The Appendix proves that the firm prefers conducting the strong project with debt and equity over conducting the medium project even if the medium project would be realizable purely by equity.

$I_i + I_j = L + E$, yields a loan of $L_{ij}^C(t_{ij}) = \sum_{k=i}^j \max\{a_k - t_{ij}, 0\} - E$. Superscript C indicates centralized funding. Assuming an interior solution, $a_j - t_{ij} > 0$, we obtain an associated maximum total terminal value of

$$TV_{ij}^C = \max \left\{ \frac{(a_i - t_{ij})^2}{2} + \frac{(a_j - t_{ij})^2}{2} + t_{ij}E; a_iE - \frac{E^2}{2} \right\}.$$

In contrast to decentralized funding, the cost of capital is identical for both projects and all equity is assigned to the bundle. The allocation of equity does not play a role. The term, $(a_iE - E^2/2)$, denotes the total terminal value if the projects are financed purely by equity, $L = 0$. In this case, the firm invests all equity into the stronger project i .

Now we derive the cost of capital assuming an interior solution, $a_j - t_{ij} > 0$. Applying the Monti-Klein model, the appendix shows that demand for loan $L_{ij}^C(t_{ij}, E)$ results in equilibrium cost of capital for the firm:

$$t_{ij}^C = 1 + r + \frac{x_i + x_j - E}{2(1 + N)}.$$

As before, the markup is decreasing in the number of banks, N . It is essential for our subsequent analysis that the selection of the individual projects crucially influences the markup, $(x_i + x_j - E)/(2(1 + N))$. In fact, the markup is now based on the average of the net size of the two projects less total equity, $(x_i + x_j - E)/2$. We will see that the structure of the markup affects the firm's project choice and investment strategy.

An interior solution, $a_j - t_{ij}^C > 0$, exists if $E > \hat{E}_{ij}^C(N) = x_i - x_j(1 + 2N)$ and the maximum total terminal value is given by:⁸

$$TV_{ij}^C = \frac{1}{2} \sum_{k=i}^j \left(x_k - \frac{x_i + x_j - E}{2(1 + N)} \right)^2 + 2E \left(1 + r + \frac{x_i + x_j - E}{2(1 + N)} \right).$$

If $E \leq \hat{E}_{ij}^C(N)$, the demand reduces to $L_{ij}^C(t_{ij}, E) = a_i - t_{ij} - E$, leading to the same cost of capital as derived under decentralized funding, i.e., $t_{ij}^C = t_i^D = 1 + r + (x_i - E)/(1 + N)$.

⁸Calculating the return on equity, $RoE_{ij}^C = TV_{ij}^C/E = \sum_{k=i}^j (x_k - [x_i + x_j - E]/[2(1 + N)])^2/(2E) + 2t_{ij}^C > t_{ij}^C$, reveals that the return on equity exceeds the firm's cost of capital.

In this case, it is optimal for the firm to allocate the entire equity to the stronger project i , since the stronger project has a higher marginal impact on terminal value and the allocation $E_i = E$ reduces the cost of capital for P_i . Notice that under some circumstances, the banks might be better off limiting the supply of loans to such an extent that it is optimal for the firm to fund only the stronger project i . However, such a strategy requires coordination to collude among banks. Since under Cournot competition collusion is not subgame perfect, banks cannot prevent the firm from practicing centralized funding. However, a monopolist bank, $N = 1$, can undertake such a strategy. We analyze this case in Section 4. The equilibrium outcome for an arbitrary bundle (P_i, P_j) is summarized in Lemma 2.

Lemma 2 *If the firm conducts the two projects, P_i and P_j , via centralized funding, the equilibrium outcome is given by (with $\widehat{E}_{ij}^C(N) = x_i - x_j(1 + 2N)$ for $x_i > x_j$):*

$$\begin{aligned}
E_i^C &= \begin{cases} \text{arbitrary} & \text{if } E > \widehat{E}_{ij}^C(N) \\ E & \text{if } E \leq \widehat{E}_{ij}^C(N) \end{cases} & E_j^C &= \begin{cases} \text{arbitrary} & \text{if } E > \widehat{E}_{ij}^C(N) \\ 0 & \text{if } E \leq \widehat{E}_{ij}^C(N) \end{cases} \\
L_{ij}^C &= \begin{cases} N \frac{x_i + x_j - E}{1 + N} & \text{if } E > \widehat{E}_{ij}^C(N) \\ N \frac{x_i - E}{1 + N} & \text{if } E \leq \widehat{E}_{ij}^C(N) \end{cases} & I_j^C &= \begin{cases} x_j - \frac{x_i + x_j - E}{2(1 + N)} & \text{if } E > \widehat{E}_{ij}^C(N) \\ 0 & \text{if } E \leq \widehat{E}_{ij}^C(N) \end{cases} \\
I_i^C &= \begin{cases} x_i - \frac{x_i + x_j - E}{2(1 + N)} & \text{if } E > \widehat{E}_{ij}^C(N) \\ x_i - \frac{x_i - E}{1 + N} & \text{if } E \leq \widehat{E}_{ij}^C(N) \end{cases} \\
t_{ij}^C &= \begin{cases} 1 + r + \frac{x_i + x_j - E}{2(1 + N)} & \text{if } E > \widehat{E}_{ij}^C(N) \\ 1 + r + \frac{x_i - E}{1 + N} & \text{if } E \leq \widehat{E}_{ij}^C(N), \end{cases}
\end{aligned}$$

resulting in a maximum total terminal value of

$$TV_{ij}^C = \begin{cases} \frac{1}{2} \sum_{k=i}^j \left(x_k - \frac{x_i + x_j - E}{2[1+N]} \right)^2 + 2E \left(1 + r + \frac{x_i + x_j - E}{2[1+N]} \right) & \text{if } E > \widehat{E}_{ij}^C(N) \\ \frac{1}{2} \left(\frac{x_i N + E}{1+N} \right)^2 + 2E \left(1 + r + \frac{x_i - E}{1+N} \right) & \text{if } E \leq \widehat{E}_{ij}^C(N). \end{cases}$$

Similar to decentralized funding, the firm engages in winner picking. As shown in Section 3.1, under decentralized funding the firm has to allocate the equity across the projects before inquiring for loans. In contrast, under centralized funding the firm allocates the resources (equity and loans) after receiving the loan for the whole bundle. Allocating the resources after receiving the loan increases the transferable sum. As a consequence, centralized funding improves the financing conditions for the stronger project P_i and strengthens winner picking compared to decentralized financing, in which the winner picking strategy cannot be implemented perfectly for low equity, $E < \widehat{E}_{ij}^D$. Under centralized funding, the winner picking strategy reaches its limit once the weaker project P_j does not receive funding, $E < \widehat{E}_{ij}^C(N)$. Technically, we get: $I_i^C > I_i^D$ for $\widehat{E}_{ij}^C(N) < E < \widehat{E}_{ij}^D$.

Lemma 2 enables to analyze the selection of the individual projects. One might suspect that it is optimal to choose the strong and moderate project, P_1 and P_2 , rather than combining the strong and the weak project, P_1 and P_3 . However, comparing the associated maximum total terminal values,

$$TV_{13}^C - TV_{12}^C = (x_2 - x_3) \frac{(x_2 + x_3)(1 + 2N(1 + N)) - 2(1 + 2N)(x_1 - E)}{4(1 + N)^2},$$

reveals that it can be optimal to bundle the strong and the weak project, P_1 and P_3 , if the equity level falls below the cutoff value $\widehat{E}_{13}^S(N)$, i.e.,

$$TV_{13}^C > TV_{12}^C \quad \text{if} \quad E < \widehat{E}_{13}^S(N) = x_1 - \frac{1 + 2N(1 + N)}{2(1 + 2N)}(x_2 + x_3).$$

Combining the strong and weak project can be interpreted as a kind of *corporate socialism*.⁹ The apparent observation is that the weak project benefits from corporate socialism in

⁹The superscript S indicates "corporate" socialism.

that it receives funding, which would never be the case under decentralized funding. In contrast to previous findings, the strong project also benefits since bundling improves the financing conditions of the strong project. From the firm's perspective, this kind of "pretended" corporate socialism is far from being inefficient. In fact, bundling the strong project with the weak project is a thoroughgoing engagement in winner picking. The firm receives less external funding, i.e., $L_{13}^C < L_{12}^C$ and total investments are lower, i.e., $I_1^C(P_1, P_3) < I_1^C(P_1, P_2)$. However, given that P_3 requires less resources than P_2 , the firm can allocate more resources to P_1 . In the area where corporate socialism dominates, the additional profit from the strong project outweighs the profit reduction coming from the weak project.

The cutoff value $\hat{E}_{13}^S(N)$ is increasing in x_1 , but decreasing in x_2 and x_3 . Thus, the greater the difference between the strong project, P_1 , and the other ones, the more likely the firm engages in corporate socialism. Increasing equity reduces the firm's incentive to engage in the weak project P_3 , and, thus, to practice corporate socialism. The rationale is twofold. First, equity increases the share the firm receives from the investments in the projects and reduces the share that the banks receive. Thus, it becomes more important to conduct the most efficient projects. Second, equity reduces demand for loans which increases the competition among banks for the residual demand at the credit market. As competition increases, the markup decreases, which in turn, reduces the firm's incentive to engage in inefficient investments. However, corporate socialism only pays off with the possibility to cross-subsidize the strong project with the weak project. Choosing the moderate and the weak project, P_2 and P_3 , is never optimal, i.e., $TV_{12}^C > TV_{23}^C$.

Summing up, we are now in the position to determine the firm's optimal strategy under centralized funding. For sufficiently high levels of equity, $E > \hat{E}_{13}^S(N)$, the demand for loans is relatively low. Thus, it is optimal to conduct the most profitable projects, P_1 and P_2 , instead of reducing the markup by bundling the strong and the weak project, P_1 and P_3 (corporate socialism). For lower amounts of equity, $E < \hat{E}_{13}^S(N)$, credit terms become more

important and it is optimal to engage in corporate socialism which improves the financing conditions. Engaging in corporate socialism remains optimal as long as the conditions at the market allow bundling the two projects, P_1 and P_3 , i.e., $E > \widehat{E}_{13}^C(N)$.¹⁰ For $E < \widehat{E}_{13}^C(N)$, it is again optimal to fund the two strongest projects, P_1 and P_2 .

Corporate socialism can only be an equilibrium candidate if the difference between the moderate and the weak project is sufficiently small, i.e., $\widehat{E}_{13}^S(N) > \widehat{E}_{13}^C(N)$, or $x_2 < x_3[(1 + 6N(1 + N))/(1 + 2N(1 + N))]$ equivalently. To concentrate on an interesting trade-off and to avoid unnecessary case distinctions, we impose throughout the subsequent analysis the following assumption.

Assumption 2 $x_2 < x_3 \cdot \frac{1 + 6N(1 + N)}{1 + 2N(1 + N)}$ for $N > 1$.

Before we proceed, we summarize the firm's optimal project selection strategy.

Lemma 3 *Under centralized funding, it is optimal for the firm to conduct*

(i) *the strong and the moderate project, P_1 and P_2 , if $E > \widehat{E}_{13}^S(N)$,*

(ii) *the strong and the weak project, P_1 and P_3 , if $\widehat{E}_{13}^S(N) > E \geq \widehat{E}_{13}^C(N)$,*

(iii) *the strong and the moderate project, P_1 and P_2 , if $E \leq \widehat{E}_{13}^C(N)$,*

with $\widehat{E}_{13}^S(N) = x_1 - \frac{1 + 2N(1 + N)}{2(1 + 2N)}(x_2 + x_3) > \widehat{E}_{13}^C(N) = x_1 - x_3(1 + 2N)$.

In contrast to decentralized funding, the firm's project selection strategy is more complex in that it is not optimal to always select the two strongest projects, P_1 and P_2 . The corporate finance literature has emphasized the importance of equity, E , and competitiveness of the credit market, N , as key variables. Lemma 3 demonstrates that the optimality of choosing a particular project bundle does not depend in a monotonic fashion on these two key variables.

Proposition 2 summarizes our key finding in a non-technical way.

¹⁰Similarly if $E < \widehat{E}_{12}^C(N)$, it is optimal to conduct only the strong project P_1 and not the moderate project P_2 . In this case, decentralized funding is superior. We will study this issue more in depth in the following section.

Proposition 2 *Under centralized funding, it is optimal for the firm to bundle the two strongest projects, P_1 and P_2 , for high and low levels of equity and to bundle the strong and the weak project (corporate socialism), P_1 and P_3 , for intermediate levels of equity. The firm always engages in winner picking. Winner picking and corporate socialism are not necessarily mutually exclusive, rather corporate socialism induces winner picking more aggressively.*

3.3 Centralized versus Decentralized Funding

In this section, we study under which circumstances the firm should centralize or decentralize the funding of the individual projects. We first compare centralized versus decentralized funding for the two strongest projects, P_1 and P_2 . Since under decentralized funding the banks can discriminate the cost of capital at the expense of the firm, centralized funding is (weakly) superior for the firm as long as the conditions at the market allow bundling the two projects P_1 and P_2 , i.e., $TV_{12}^C > TV_{12}^D$ for $E > E_{12}^C(N)$ (see Lemma 2). If the firm can bundle the two projects, decentralized funding can at best replicate the outcome of centralized funding by allocating the equity across the two projects so that it induces the same cost of capital for both projects. As outlined in Lemma 1, the firm can pursue this strategy as long as it has enough equity, i.e., $TV_{12}^C = TV_{12}^D$ for $E > \hat{E}^D$. For $E < E_{12}^C(N)$, bundling is not possible and decentralized funding is superior, i.e., $TV_{12}^C < TV_{12}^D$ for $E < E_{12}^C(N)$. Additionally, given Lemma 3, the firm can improve centralized funding by engaging in corporate socialism, i.e., $TV_{13}^C > TV_{12}^C$ for $\hat{E}_{13}^S(N) > E \geq \hat{E}_{13}^C(N)$. The following Proposition 3 summarizes the firm's optimal strategy that we discuss subsequently.

Proposition 3 *The firm's optimal financing strategy is given by: the firm*

- (i) *is indifferent between decentralized or centralized funding of the strong and the moderate project, P_1 and P_2 , if $E > \hat{E}_{12}^D$,*

(ii) prefers to centralize the funding of the strong and the moderate project, P_1 and P_2 , if

$$\hat{E}_{12}^D \geq E > \hat{E}_{13}^S(N),$$

(iii) prefers to centralize the funding of the strong and weak project, P_1 and P_3 , if $\hat{E}_{13}^S(N) >$

$$E \geq \hat{E}_{13}^C(N) \text{ (corporate socialism),}$$

(iv) prefers to centralize the funding of the strong and the moderate project, P_1 and P_2 , if

$$\hat{E}_{13}^C(N) \geq E > \hat{E}_{12}^C(N),$$

(v) prefers to decentralize the funding of the strong and the moderate project, P_1 and P_2 ,

$$\text{if } E \leq \hat{E}_{12}^C(N),$$

with the relations $\hat{E}_{12}^D = x_1 - x_2 > \hat{E}_{13}^S(N) = x_1 - \frac{1 + 2N(1 + N)}{2(1 + 2N)}(x_2 + x_3) > \hat{E}_{13}^C(N) = x_1 - x_3(1 + 2N) > \hat{E}_{12}^C(N) = x_1 - x_2(1 + 2N)$.

Two key variables are important in determining the firm's financing strategy: equity, E , and competitiveness of the credit market, N . Figure 2 illustrates the firm's optimal strategy as a function of E and N .

For low values of equity, i.e., $E < \hat{E}_{12}^C(N)$, decentralized funding of the two strongest projects, P_1 and P_2 , is optimal, since the conditions at the credit market do not allow bundling of particular projects. For $\hat{E}_{12}^C(N) < E < \hat{E}_{13}^C(N)$, the conditions at the market allow bundling the two strongest projects, P_1 and P_2 , but not the strong and weak project, P_1 and P_3 . Since the equity level is too low to enable the firm to replicate centralized funding of P_1 and P_2 with decentralized funding, centralized funding is superior. For $\hat{E}_{13}^C(N) < E < \hat{E}_{13}^S(N)$, the market conditions allow bundling P_1 and P_3 . Engaging in such corporate socialism is optimal because it reduces the cost of capital for the strong project. However, since this has the negative effect that the weak project P_3 is conducted, corporate socialism is only optimal if the market is not too competitive. For $\hat{E}_{13}^S(N) < E$, corporate socialism becomes suboptimal, while bundling the two strongest projects becomes optimal. For high

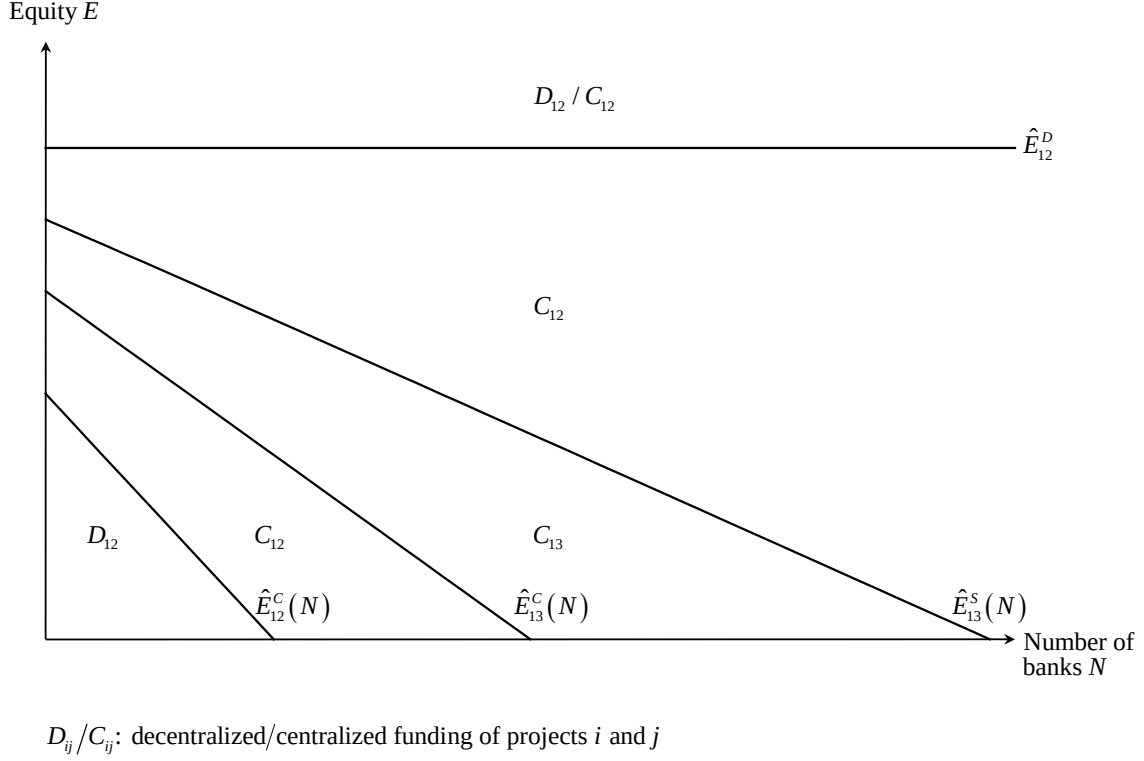


Figure 2: The firm's financing strategy

equity, $E > \hat{E}^D$, decentralized funding can replicate centralized funding and both forms of funding are optimal.

Calculating the difference of the total terminal values, $TV_{12}^C - TV_{12}^D$, shows that in the limit $N \rightarrow \infty$ the difference converges to zero,

$$\lim_{N \rightarrow \infty} (TV_{12}^C - TV_{12}^D) = \lim_{N \rightarrow \infty} \frac{(1 + 2N)(x_1 + x_2 - E)^2}{4(1 + N)^2} = 0.$$

Consistent with conventional wisdom, the form of funding does not matter in a perfect credit market, irrespective of the level of equity E . In particular, it is always optimal to fund the two strongest projects, P_1 and P_2 .

Corollary 1 *In the presence of a perfect credit market, $N \rightarrow \infty$, the form of funding does not matter. It is always optimal for the firm to fund the two strongest projects, P_1 and P_2 .*

4 Extension: Monopolistic Bank

In this section, we study the case of a monopolistic bank. Our previous findings can change for the case that the firm inquires for centralized funding. As mentioned in Section 3.1, the banks may be better off determining the cost of capital such that the investment of the weaker project becomes non-profitable for the firm. However, as outlined, the banks could not coordinate with each other and establish, in equilibrium, this solution. In contrast, as a monopolist, the bank does not need to coordinate and may have a greater ability to strategically influence the project selection process.

This section provides a brief sketch how to adapt our previous findings. We start by analyzing the case that the firm wants to fund the projects P_i and P_j centrally. The bank has the following two strategies: (i) it can finance both projects providing supply of loans $L_{ij}^C = (x_i + x_j - E)/2$ which results in equilibrium cost of capital for both projects (as before for $N = 1$), $t_{ij}^C = 1 + r + (x_i + x_j - E)/4$, leading to a profit for the bank of $\pi_{ij}^C = (x_i + x_j - E)^2/8$; (ii) it can prevent funding of the weaker project by providing supply of loans just for the amount of $L_{ij}^M(x_i - E)/2$.¹¹ By determining $L = L_{ij}^M$, the monopolistic bank ensures that the firm won't invest in the weaker project, resulting in cost of capital as for the decentralized funding case, $t_{ij}^M = t_i^D = 1 + r + (x_i - E)/2$, and a profit for the bank of $\pi_i^M = (x_i - E)^2/4$. Comparing the two profits, reveals that the bank prefers funding the two projects if equity exceeds the cutoff value $\hat{E}_{ij}^M$, i.e.,

$$E > \hat{E}_{ij}^M = x_i - (1 + \sqrt{2})x_j. \quad (5)$$

For $E \leq \hat{E}_{ij}^M$, the bank provides sufficient loans to fund the stronger project, leading to cost of capital as for the stronger project under decentralized funding, $t_{ij}^C = t_i^D$.¹²

¹¹The superscript M denotes the limit loan strategy of the monopolistic bank.

¹²We show in the appendix that the condition $E \leq \hat{E}_{ij}^M$ guarantees that under decentralized funding the cost

As a consequence, for $E \leq \hat{E}_{13}^M$, the firm bundles the projects P_1 and P_2 , rather than conducting P_1 . Similarly, for $E \leq \hat{E}_{12}^M$, the firm generally refrains from centralized funding and funds the projects in a decentralized manner. Technically, $\hat{E}_{ij}^M > \hat{E}_{ij}^C(1)$. Similar to the case of N banks, the firm always conducts the strong and the moderate project, P_1 and P_2 , and corporate socialism is not an issue if $\hat{E}_{13}^M(N) < \hat{E}_{13}^S(N)$, or $x_2 > x_3(1 + 6\sqrt{2}/5)$ equivalently. To avoid unnecessary case distinctions, we impose as in our previous section the following assumption.¹³

Assumption 3 $x_2 < x_3 \cdot \frac{1 + 6\sqrt{2}}{5}$.

Summing up, the area in which the firm exercises corporate socialism diminishes from $\hat{E}_{13}^C(1) \leq E \leq \hat{E}_{13}^S(1)$ to $\hat{E}_{13}^M \leq E \leq \hat{E}_{13}^S(1)$, while the area in which the firm prefers decentralized funding expands from $E \leq \hat{E}_{12}^C(1)$ to $E \leq \hat{E}_{12}^M(1)$. In other words, if the bank is a monopolist, its excessive market power limits the firm's possibility to conduct centralized funding. The following Proposition summarizes our finding.

Proposition 4 *For a monopolized credit market, the firm's optimal financing strategy is given by: the firm*

(i) *is indifferent between decentralized or centralized funding of the two strongest projects,*

$$P_1 \text{ and } P_2, \text{ if } E > \hat{E}_{12}^D,$$

(ii) *prefers to centralize the funding of the two strongest projects, P_1 and P_2 , if $\hat{E}^D(1) \geq$*

$$E > \hat{E}_{13}^S(1),$$

(iii) *prefers to centralize the funding of the strong and moderate project, P_1 and P_3 , if*

$$\hat{E}_{13}^S(1) \geq E > \hat{E}_{13}^M \text{ (corporate socialism),}$$

of capital, t_i^D , leads to zero demand for the weaker project, P_j .

¹³Notice, Assumption 3 is stricter than Assumption 2, i.e., $x_2 < x_3 \cdot (12/5)$ for $N = 1$. As outlined, the reason is the monopolistic bank's market power in determining the cost of capital.

(iv) prefers to centralize the funding of the two strongest projects, P_1 and P_2 , if $\hat{E}_{13}^M \geq E > \hat{E}_{12}^M$,

(v) prefers to decentralize the funding of the two strongest projects, P_1 and P_2 , if $E \leq \hat{E}_{12}^M$,

with the relations $\hat{E}_{12}^D = x_1 - x_2 > \hat{E}_{13}^S(1) = x_1 - \frac{5}{6}(x_2 + x_3) > \hat{E}_{13}^M = x_1 - (1 + \sqrt{2})x_3 > \hat{E}_{12}^M = x_1 - (1 + \sqrt{2})x_2$.

Importantly, combining our two key results, Propositions 3 and 4, reveals that although corporate socialism is more likely as the credit market becomes less competitive (for $N > 1$), the excessive market power of a monopolist, $N = 1$, reverts this result resulting in a non-monotonic relationship.

5 Concluding Remarks

Empirical and theoretical research has long debated why firms engage in cross-subsidization of weak projects at the expense of strong ones (e.g., Shin and Stulz, 1998; Rajan et al., 2000; Ozbas and Scharfstein, 2010). The prevailing explanation attributes such corporate socialism to internal agency conflicts and inefficiencies within internal capital markets (e.g., Stein, 1997; Scharfstein and Stein, 2000). This paper offers an alternative rationale rooted in imperfect credit markets rather than organizational frictions.

We show that corporate socialism can emerge as a strategic financing response to limited banking competition. When lenders possess market power, bundling strong and weak projects under centralized financing can lower the firm's overall cost of capital. Thus, corporate socialism is not necessarily inefficient. It can serve to enhance winner picking, enabling firms to channel relatively more funds toward profitable projects. In fact, corporate socialism allows winner picking more aggressively. Contrary to prevailing literature, we show that winner picking and corporate socialism are not mutually exclusive: the inclusion of a weaker

project can strategically facilitate stronger winner picking by improving credit terms for the firm's core investments.

Summing up, our model provides several novel predictions concerning a firm's optimal project selection of the financing process using the competitiveness of the credit market as key variable. Broadly interpreting our model, we should find funding of strong projects for higher values of market competitiveness and corporate socialism for low values of market competitiveness.

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Appendix

Proof of Lemma 1. The firm's demanded loan, $L_i^D(t_i, E_i) = a_i - t_i - E_i$, yields the inverse demand function

$$t_i(L_i^D, E_i) = a_i - E_i - L_i^D, \quad (\text{A1})$$

where L_i^D is the sum of loans granted by all N banks, $L_i^D = \sum_{n=1}^N L_{in}^D$. The first-order condition of each bank n 's profit, $\pi_n(\cdot) = (t_i(L_i^D, E_i) - 1 - r) L_{in}^D$, with respect to L_{in}^D yields bank n 's reaction function, $L_{in}^D = (a_i - 1 - r - E_i - \sum_{k \in N \setminus n} L_{ik}^D)/2$. Applying the symmetry condition for all banks yields each bank's equilibrium supply of $L_{in}^D(E_i) = (a_i - 1 - r - E_i)/(1 + N)$. Plugging overall supply, $L_i^D = N \cdot L_{in}^D(E_i)$, into (A1) yields the cost of capital (recall: $x_i = a_i - 1 - r$)

$$t_i^D(E_i) = 1 + r + \frac{x_i - E_i}{1 + N}.$$

Next, we show that the firm prefers conducting the strong project with debt and equity to conducting the moderate project even if the moderate project would be realizable purely by equity, i.e., $E > a_2$. From (3) and (4) we see that the firm prefers to finance the strong project P_1 by debt and equity over financing the same project purely by equity as long as

$$\frac{1}{2} \left(\frac{Nx_1 + E}{1 + N} \right)^2 + E \left(1 + r + \frac{x_1 - E}{1 + N} \right) > (x_1 + 1 + r) E - \frac{E^2}{2},$$

or $x_1 > E$ equivalently. Assumption 1 ensures that this inequality is always fulfilled.

Since the firm strictly prefers P_1 over P_2 when both projects are financed purely by equity

$$(x_1 + 1 + r) E - \frac{E^2}{2} > \frac{a_2^2}{2} \quad \text{for } E = a_2,$$

implying that the firm prefers conducting the strong project with debt and equity to conducting the moderate project even if the moderate project would be realizable purely by equity.

Proof of Lemma 2. The firm's demanded loan, $L_{ij}^C(\cdot) = \sum_{k=1}^i \{a_k - t_{ij}\} - E$, yields the inverse demand function

$$t_{ij}(L_{ij}^C) = \frac{a_i + a_j - E - L_{ij}^C}{2}, \quad (\text{A2})$$

where L_{ij}^C is the sum of loans granted by all N banks, $L_{ij}^C = \sum_{n=1}^N L_{ijn}^C$. Calculating the first-order condition of each bank n 's profit, $\pi_n = (t_{ij}(L_{ij}^C) - 1 - r)L_{ijn}^C$, with respect to L_{ijn}^C yields bank n 's reaction function $L_{ijn}^C = (a_i + a_j - E - \sum_{k \in N \setminus n} L_{ijk}^C)/2 - 1 - r$. Applying the symmetry condition for all banks yields each bank's equilibrium supply $L_{ijn}^C = (a_i + a_j - E - 2(1 + r))/(1 + N)$. Plugging overall supply, $L_{ij}^C = N \cdot L_{ijn}^C$, into (A2) results in equilibrium cost of capital (recall: $x_i = a_i - 1 - r$)

$$t_{ij}^C = 1 + r + \frac{x_i + x_j - E}{2(1 + N)}.$$

Proof of Proposition 4. As shown in the text, a monopolist bank prefers funding only the strong project P_i instead of funding the bundle P_i and P_j for $E < \hat{E}_{ij}^M = x_i - (1 + \sqrt{2})x_j$.

We now prove that excluding the weaker project P_j is feasible by setting $t_{ij}^C = t_i^D$. With decentralized funding, overall demand is given by $(x_i - t_{ij}^C + 1 + r) + (x_j - t_{ij}^C + 1 + r) - E$, where $x_k - t_{ij}^C + 1 + r$ is the demand for the respective project. Excluding P_j requires the determination of cost of capital such that it achieves zero demand for the weaker project, $x_j - t_{ij}^L + 1 + r = 0$, and results in the bank's profit of $\pi_{ij}^L = (x_i - x_j - E)x_j$. The superscript L denotes the "limit strategy".

If the limit cost of capital t_{ij}^L is below the cost of capital for the strong project in the decentralized funding case, $t_{ij}^L < t_i^D$, then the bank could increase its profit by raising the cost of capital up to t_i^D and reaching the profit of the decentralized funding case, $\pi_i^D = (x_i - E)^2/4 > \pi_{ij}^L$. The reason is that raising cost of capital from t_{ij}^L to t_i^D does not change the demand for the weaker project (demand cannot be lower than zero) but allows the

bank to charge its optimal cost of capital for the strong project. Foreclosing investments in the weaker project and determining cost of capital with t_i^D is only possible if $t_{ij}^L < t_i^D$ or $E \leq \widehat{E}_{ij}^L = x_i - 2x_j$.

Finally, contrasting $\widehat{E}_{ij}^L$ with $\widehat{E}_{ij}^M$ in (5) reveals that $\widehat{E}_{ij}^M < \widehat{E}_{ij}^L$.