Optimal Choice of Funding for Early Startups: Crowdsourcing *versus* Bank Loans

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Abstract: This paper investigates the optimal funding choice for early-stage entrepreneurs, focusing on the decision between bank loans and crowdfunding. Using a two-period theoretical model, we examine scenarios where potential consumers self-select to fund the startup based on perceived product quality, without equity ownership. We then extend the model to include equity participation for crowdfunding, enabling crowd funders to receive shares in ventures with high capital requirements. In equilibrium, we find that crowdfunding is optimal when startup costs are low, while bank loans become preferable beyond a specific cost threshold. For significantly higher costs, equity-based crowdfunding offers an alternative incentive mechanism to engage crowd funders, addressing the need for additional capital. This model provides insights into the financing landscape for new ventures, emphasizing the impact of capital structure on profitability and investor incentives.

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Keywords: Crowdfunding, Startup Financing, Bank Loans, Entrepreneurial Finance.

1. INTRODUCTION

The increasing complexity and diversification of financing options for early-stage ventures have reshaped the entrepreneurial landscape. Traditionally, startup financing relied heavily on bank loans, venture capital, and angel investments. Each of these financing methods comes with its distinct costs and limitations, such as collateral requirements, equity dilution, and often rigid terms that can hinder entrepreneurial flexibility (Cumming and Johan, 2013). However, the past decade has witnessed the rise of alternative financing channels, with crowdfunding emerging as a revolutionary tool for small businesses and startups (Belleflamme, Lambert, and Schwienbacher, 2014). Crowdfunding offers entrepreneurs an opportunity to access funds without the traditional gatekeepers of finance, allowing for a direct connection between the business and its future customers or investors (Mollick, 2014). This paper examines the decision-making process entrepreneurs face when choosing between traditional bank loans and crowdfunding, developing a theoretical model that illustrates the optimal conditions for each financing option. Crowdfunding's rapid rise can be attributed not only to the financial capital it offers but also to its secondary benefits, such as validating market demand and increasing visibility (Mollick, 2014). Entrepreneurs can leverage crowdfunding platforms to test market interest in their products or services before full-scale production, effectively using the campaign as a form of market research. Additionally, the social aspect of crowdfunding enables ventures to build early relationships with customers and create a com munity around the product. This is particularly importantfor startups that rely heavily on network effects, where the value of the product or service increases with the number of users (Belleflamme *et al.*, 2014; Katz and Shapiro, 1985). The interaction between early adopters and the entrepreneur fosters product improvement and adaptation to consumer needs, further enhancing the venture's chance of success. However, the conditions under which crowdfunding is preferable to more traditional forms of financing, such as bank loans, remain underexplored. This paper seeks to fill this gap by developing a two-period model that integrates price discrimination and network externalities to determine the optimal financing strategy for startups under different scenarios.

While traditional bank loans remain a popular option for many entrepreneurs, they come with several limitations. For one, bank loans typically require collateral, which can be a significant barrier for new businesses without substantial assets (Cosh, Cumming, and Hughes, 2009). Furthermore, bank loans impose fixed repayment schedules, which can place financial strain on startups during periods of low or fluctuating revenue (Berger and Udell, 1998). Unlike equity financing, bank loans do not offer flexibility in terms of ownership dilution, but they do not provide the same opportunities for market validation that crowdfunding offers. In this context, the decision between crowdfunding and bank loans becomes one of balancing financial needs with strategic business goals. This paper's model explores the trade-offs between these financing options, particularly in the presence of network externalities and pricing strategies that entrepreneurs can use to segment their customer base and maximize profits. In crowdfunding, entrepreneurs engage in a dual pricing strategy that leverages early backers' willingness to pay a premium for early access or special rewards, while

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later customers benefit from a lower price point as production scales (Bhargava and Choudhary, 2001). This price discrimination strategy allows startups to extract maximum consumer surplus and effectively finance their operations with less reliance on debt. Additionally, crowdfunding enables entrepreneurs to test and adjust their pricing models based on early customer feedback, something that is not possible with bank loans. This flexibility in financing and market testing provides a unique advantage that traditional financing mechanisms do not. Moreover, crowdfunding platforms often foster network externalities, where each additional backer not only contributes financially but also adds to the product's perceived value by increasing its visibility and market reach (Katz and Shapiro, 1985). This effect can be especially powerful in industries where social proof and community engagement are critical to product adoption. For example, a successful crowdfunding campaign can signal to potential customers and investors that there is a strong market demand for the product, which can lead to increased sales and investment opportunities. This dynamic creates a self-reinforcing cycle of growth that can be difficult to achieve through bank loans alone. However, the effectiveness of crowdfunding is contingent upon the startup's ability to generate sufficient interest and engagement, particularly in the early stages of the campaign. This paper aims to build on the existing literature by developing a formal theoretical model that compares the optimal financing choices for entrepreneurs, focusing on the trade-offs between crowdfunding and bank loans, and then further extending the model to include equity participation. The model considers factors such as startup costs, network externalities, and the ability of entrepreneurs to engage in price discrimination. By incorporating these elements, the model provides a more nuanced understanding of when crowdfunding is the superior choice for startups and when traditional bank loans or equity participation might be more appropriate. In doing so, the paper contributes to the broader discussion on entrepreneurial finance, offering insights for both practitioners and policymakers on how to better support early-stage ventures in their quest for sustainable growth.

2. LITERATURE REVIEW

The rise of crowdfunding as an alternative source of finance has garnered significant attention in academic literature over the past decade. Traditionally, entrepreneurs seeking external financing have relied on bank loans, venture capital, or angel investors, each with unique challenges such as high collateral requirements, equity dilution, and limited access for earlystage ventures (Cosh *et al.*, 2009; Berger and Udell, 1998). The advent of digital platforms like Kickstarter and Indiegogo has facilitated a shift, enabling entrepreneurs to raise capital directly from the public by leveraging small contributions from a large number of backers (Belleflamme et al., 2014). This democratization of finance provides startups with access to a broader pool of potential investors, often without the stringent requirements of banks or venture capitalists.

Early research on crowdfunding has focused on factors influencing campaign success. Agrawal, Catalini, and Goldfarb (2011) highlighted the role of information asymmetry, noting that geographical distance between entrepreneurs and backers can create uncertainty that reduces the likelihood of success. However, this effect is mitigated by strong social networks and effective communication, which reduce information asymmetry and enhance campaign outcomes (Agrawal *et al.*, 2011). Vismara (2016) extended this analysis by emphasizing the importance of lead investors in equity crowdfunding, finding that early contributions from reputable investors serve as quality signals, encouraging broader investment from the crowd. This behavior aligns with the herd behavior model in financial markets (Banerjee, 1992), where individuals follow early participants, amplifying campaign success.

Signaling quality has become a central theme in the crowdfunding literature. Ahlers, Cumming, Günther, and Schweizer (2015) demonstrated that ventures signaling high quality through indicators such as founder experience, strong networks, and detailed business plans are more likely to meet their funding goals. Similarly, Mollick (2012) found that entrepreneurs who provide thorough project descriptions, updates, and progress reports are significantly more successful in their campaigns. These findings underscore crowdfunding's role as both a financial tool and a communication platform, where transparency and trust are key.

Recent research has increasingly examined equity participation in crowdfunding, recognizing its potential to attract investors for capital-intensive projects. Studies by Ahlers *et al.* (2015) and Agrawal, Catalini, and Goldfarb (2014) highlight that equity-based crowdfunding allows investors to share in venture profits, aligning incentives for long-term growth and addressing information asymmetry. This form of financing is particularly relevant for high-growth sectors, where profit-sharing can appeal to a broader range of investors beyond traditional lenders or non-equity crowdfunding participants. Equity participation offers ventures the flexibility to structure returns that adjust to profitability levels, making it an adaptable tool for entrepreneurs seeking substantial capital (Heminway, 2013).

Social networks also play a crucial role in crowdfunding. Vulkan, Åstebro, and Sierra (2016) demonstrated that geographic proximity between entrepreneurs and backers correlates positively with campaign success, reflecting the "home bias" phenomenon in traditional finance, where investors prefer local firms due to reduced information asymmetries (Coval and Moskowitz, 1999). Engaging local communities allows entrepreneurs to leverage pre-existing relationships, generating early momentum that attracts additional backers beyond their immediate network. This emphasizes the importance of social capital in crowdfunding, where support from early adopters can be instrumental in achieving broader campaign success.

Crowdfunding's ability to leverage network effects is another significant aspect explored in the literature. Network externalities, where the value of a product or service increases with the number of users, are particularly relevant in crowdfunding contexts (Katz and Shapiro, 1985). Belleflamme *et al.* (2014) argue that crowdfunding enables entrepreneurs to create a community around their product, where each additional backer not only provides financial support but also enhances product visibility and credibility. This effect is especially beneficial in sectors where social proof influences adoption, such as technology and consumer goods. Here, each new backer increases the perceived value of the product, making it more attractive to future investors.

While crowdfunding offers significant advantages in terms of accessibility and community engagement, it also has limitations. Lukkarinen, Teich, Wallenius, and Wallenius (2016) found that the success of crowdfunding campaigns is highly dependent on sustained engagement with backers, which can be resource-intensive for small teams. Moreover, large-scale or capital-intensive projects may struggle to raise sufficient funds through traditional crowdfunding alone, necessitating a mixed approach (Heminway, 2013). This aligns with the idea that different stages in a startup's lifecycle require distinct financing methods, with crowdfunding being more suitable for early-stage ventures with lower capital needs (Berger and Udell, 1998).

The choice between crowdfunding and traditional bank loans depends on factors such as capital requirements, the entrepreneur's willingness to engage with the crowd, and collateral availability. While bank loans provide larger capital sums, they also come with rigid repayment schedules and collateral requirements, which can be prohibitive for early-stage ventures (Cosh *et al.*, 2009). Crowdfunding, by contrast, offers greater flexibility in fund usage but requires significant effort in campaign management and community building (Mollick, 2014). Additionally, the ability to engage in price discrimination-by offering different reward tiers or products at various stages of the campaign-adds a layer of complexity that is absent in traditional bank loans (Bhargava and Choudhary, 2001). This price discrimination strategy allows entrepreneurs to maximize consumer surplus by segmenting early backers, who pay premiums for early access or exclusive rewards, and later customers, who benefit from scaled-down prices.

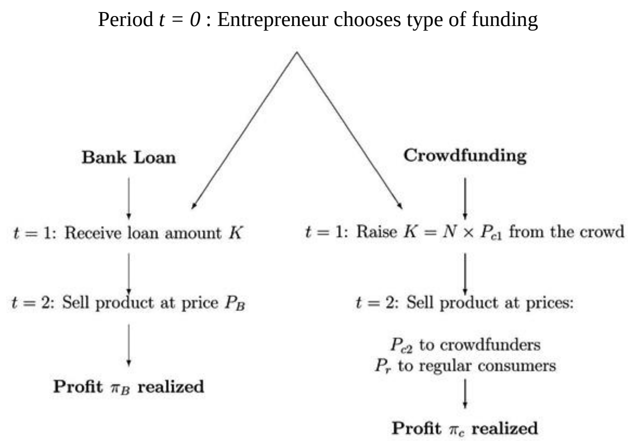
This paper builds on existing literature by developing a formal model that explores conditions under which entrepreneurs should choose crowdfunding over bank loans. By incorporating network externalities, price discrimination, and equity participation into the decision-making framework, the model provides a nuanced perspective on how startups can optimize their financing strategies. Furthermore, the model contributes to entrepreneurial finance literature by offering insights into how diverse financing mechanisms support innovation and growth in the startup ecosystem.

3. MODEL

It is important to first outline the preliminary assumptions upon which the model is based. The model assumes that the capital raised, denoted as *k*, exactly covers the fixed costs of production, with the entrepreneur unable to raise more than needed. This assumption enables the entrepreneur to practice price discrimination between the crowdfunding phase and the product launch phase, aiming to maximize profitable surplus while maintaining the consumers' incentive compatibility constraints.

Additionally, the model posits that all participants share a constant, exogenous discount rate β within the range [0,1]. The bank interest rate, *i*, is also assumed to be exogenously determined. Furthermore, the perceived quality of the entrepreneur's product, *q*, is considered exogenous, positive, and known to all participants. While there may be valid criticism regarding the assumption of exogenizing product quality, this is maintained for two reasons. Firstly, exogenizing quality simplifies the analysis and interpretation; secondly, product information is usually quickly disseminated in the large, communal, interactive environment of crowdfunding platforms.

The following diagram illustrates the two-period model, wherein an entrepreneur selects their preferred funding method.



The entrepreneur selects a funding method in period 0, receives the required capital *k* in period 1, sets prices in period 2, and then realizes profits.

Drawing from the framework of Mussa and Rosen (1978), consumer type is defined by individual taste for product quality, represented by a random variable *x*. Thus, consumers' valuations of the product quality vary in proportion to *x*. For simplicity, it is assumed that *x* follows a uniform distribution within the range [0, 1].

In line with the network effect scenarios explored by Katz and Shapiro (1985) and similar to the approach of Bhargava and Choudhary (2001), each consumer aims to maximize the following utility function:

$$U = xq - p$$

where *u* is monotonically increasing in *x* and *q*.

To further distinguish between crowd and regular consumers, we assume that crowd consumers will perceive the product quality *q* to be strictly greater than their regular consumer counterparts:

$$q = \begin{cases} q_r & \text{for a regular consumer} \\ q_c & \text{for a crowd consumer} \end{cases}$$

3.1. The Case with a Bank Loan

We impose that a consumer will require a positive utility:

$$xq_r - p_B \geq 0$$
$$\Rightarrow x \geq \frac{p_B}{q_r} = \underline{x_B}$$

Thus, as long as $x \geq \underline{x_B}$, demand will occur. As such, the demand function characterized by a unit mass of consumers is equal to:

$$1 - \underline{x_B} = 1 - \frac{p_B}{q_r}$$

Hence, we get the following profit function:

$$\pi_B = \beta\left[\left(1 - \frac{p_B}{q_r}\right) \cdot p_B - K(1+i)\right]$$

Maximizing with respect to ρ_B,

$$\pi_B = \beta\left[\left(1 - \frac{p_B}{q_r}\right) \cdot p_B - K(1+i)\right] \text{ s.t. } p_B > 0$$

which yields the following First-order condition (FOC):

$$\beta\frac{(q_r - 2p_B)}{q_r} = 0$$
$$\Rightarrow p_B^* = \frac{q_r}{2}$$
$$\Rightarrow \underline{x_B^*} = \frac{1}{2}$$

Thus, for consumers of type $x \in \left[\frac{1}{2}, 1\right]$, demand will occur under the bank loan scenario, and the entrepreneur will receive the following profit:

$$\pi_B = \begin{cases} \beta\left[\frac{q_r}{4} - K(1+i)\right] & \text{if } K < \frac{q_r}{4(1+i)} \\ 0 & \text{Otherwise} \end{cases}$$

3.2. THE CASE WITH CROWDFUNDING

Due to the price discrimination mechanism, incentive compatibility and participation constraints must be enforced in equilibrium. Consumers must form some sort of expectation in period 1 about the number of other consumers who are going to participate (N). Following Katz and Shapiro (1985), we consider a fulfilled equilibrium in a rational expectation setting where $P_{1c}\, N = K$.

Assuming $E(N) = N^e > 0$ in equilibrium, we have:

$$P_{1c} = \frac{K}{N^e}$$

Thus, crowd and regular consumers will have the following expected utilities in equilibrium:

$$U_c = \beta(xq_c - p_{2c}) - \frac{K}{N^e}$$
$$U_r = \beta(xq_r - p_r)$$

and the following Incentive Compatibility (IC) condition must be satisfied:

$$U_c \geq U_r$$
$$\Rightarrow \beta(xq_c - p_{2c}) - \frac{N^e}{K} \geq \beta(xq_r - p_r)$$
$$\Rightarrow x \geq \frac{K - \beta\Delta p N^e}{\beta\Delta q N^e} = \bar{x}$$

where $\Delta_p = p_r - p_{2c} > 0$ to avoid arbitrage and $\Delta_q = q_c - q_r > 0$.

As such, only consumers with type $x \in [\bar{x}, 1]$ will participate in the crowd funding process. and in equilibrium, we have $N = N^e$ where $N^e = 1 - x$. We find N^e using its general uniform distribution and find its roots by solving the quadratic:

$$N^e = 1 - \frac{K - \beta\Delta p N^e}{\beta\Delta q N^e}$$
$$\Rightarrow N^{e^2}(\beta\Delta q) - N^e[\beta(\Delta p + \Delta q)] + K = 0$$

The two roots are:

$$N^e = \frac{\beta(\Delta p + \Delta q) \pm \sqrt{\beta^2(\Delta p + \Delta q)^2 - 4\beta\Delta q K}}{2\beta\Delta q}$$

Analytically, we choose the higher value (+) and ensure positivity under the root to get:

$$\beta^2(\Delta p + \Delta q)^2 - 4\beta\Delta q K > 0$$
$$\Rightarrow \Delta p > 2\sqrt{\frac{\Delta q K}{\beta}} - \Delta q \text{ condition for a real root}$$
$$\Rightarrow \text{ but we must have } 2\sqrt{\frac{\Delta q K}{\beta}} - \Delta q > 0 \text{ as condition for no arbitrage}$$
$$\Rightarrow \text{ Hence: } K < \frac{\beta\Delta q}{4} = \bar{K}$$

Now that we have pinned down N^e for the IC and PC of the crowd consumers, we need to consider the participation constraints of the regular consumers.

Just like we did for the bank:

$$xq_r - p_r \geq 0$$
$$\Rightarrow x \geq \frac{p_r}{q_r} = \underline{x}$$

Therefore, consumers with type $x \in [\underline{x}, \bar{x}]$ will not participate in the crowd funding process but will buy the product in period 2 at price p_r

As such, for types $x \in \{[\underline{x}, \bar{x}] \cup [\underline{x}, 1]\}$ we have the following profit function

$$\pi_c = \beta\left[p_{2c}N^e + p_r(\bar{x} - \underline{x})\right] + p_{1e}N^e - K$$

where the last two terms are equal and hence cancel out. Note that this profit function is maximized by plugging back the values that were found for $N^e, \underline{x}$, and $\bar{x}$ onto the profit function π_c then maximize with respect to prices to find the following solutions:

$$p_r^* = \frac{q_r}{2}$$
$$\underline{x}^* = \frac{1}{2}$$

Noting that $p_r^* = p_B^*$ and $\underline{x}^* = \underline{x}_B^*$

$$\Delta p^* = 2\sqrt{\frac{\Delta q K}{\beta}} - \Delta q$$

$$p_{2c}^* = \frac{q_r}{2} - 2\sqrt{\frac{\Delta q K}{\beta}} + \Delta q$$

$$\Rightarrow \pi_c = \beta\left[\frac{q_r}{4} + \sqrt{\frac{\Delta q K}{\beta}}\right] - 2K$$

Next, we find the conditions that ensure $\underline{x} \le \bar{x}$. This is done by plugging in the optimal values found for each expression in this inequality to get:

$$\frac{p_r}{q_r} < \frac{K - \beta\Delta p\left[\frac{\beta(\Delta p + \Delta q) + \sqrt{\beta^2(\Delta p + \Delta q)^2 - 4\beta\Delta q K}}{2\beta\Delta q}\right]}{\beta\Delta q\left[\frac{\beta(\Delta p + \Delta q) + \sqrt{\beta^2(\Delta p + \Delta q)^2 - 4\beta\Delta q K}}{2\beta\Delta q}\right]}$$

$$\Rightarrow K > \frac{\beta\Delta p^*}{2} + \frac{\beta\Delta q}{4} = \underline{K}$$

Substituting for Δp^*, we get

$$K > \beta\left[\frac{2\sqrt{\frac{\Delta q K}{\beta}} - \Delta q}{2}\right] + \frac{\beta\Delta q}{4}$$

$$K^2 + \frac{1}{2}K\beta\Delta q > 0$$

$$\Rightarrow \underline{K} = 0$$

Hence, for consumers of type $x \in \left[\frac{1}{2}, 1\right]$ demand will occur under the crowd funding scenario, and the entrepreneur will receive the following profit:

$$\pi_c = \begin{cases} \text{Not considered due to arbitrage} & \text{if } K > \bar{K} \\ \beta\left[\frac{q_r}{4} + \sqrt{\frac{\Delta q K}{\beta}}\right] - 2K & \text{if } 0 < K < \bar{K} \end{cases}$$

Note here that a sufficient condition for a positive profit is to have

$$\beta\left[\frac{q_r}{4} + \sqrt{\frac{\Delta q K}{\beta}}\right] > 2K$$

As such, by substitution at the upper bound of k, we find that the sufficient condition for the crowd funding profit to be positive reduces to $\Delta q < 2q_r$, otherwise self-selection would fail.

4. EMPIRICAL IMPLICATIONS

To ensure crowdfunding is optimal, the following must apply:

$$\pi_c - \pi_B > 0$$

$$\Rightarrow \beta\left[\frac{q_r}{4} + \sqrt{\frac{\Delta q K}{\beta}}\right] - 2K - \beta\left[\frac{q_r}{4} - K(1+i)\right] > 0$$

Hence, the equilibrium decision rule for optimal profit can be characterized as follows:

- Choose crowd method if

$$0 < K \le \frac{\beta\Delta q}{[\beta(1+i)+2]^2} = \underline{\underline{K}}$$

- And Bank loan if

$$\underline{\underline{K}} = \frac{\beta\Delta q}{[\beta(1+i)+2]^2} < K \le \frac{q_r}{4(1+i)} = \overline{\bar{K}}$$

Neither funding option is optimal if

$$K > \overline{\bar{K}}$$

Further empirical validation could be achieved by analyzing campaign data across multiple crowdfunding platforms, focusing on how different pricing structures influence both campaign success and post-campaign market performance. Moreover, the role of network externalities, as emphasized in this paper, can be empirically tested by examining the correlation between the number of early backers and the long-term viability of the venture. Research by Mollick (2014) supports the notion that the size and engagement of a crowdfunding community play a significant role in determining a campaign's ultimate success. A robust analysis of campaign data could explore how different levels of consumer engagement, driven by network effects, contribute to higher post-launch sales and scalability. Additionally, platforms that allow for user-generated content or feedback loops, such as Patreon, offer a valuable empirical setting to test the iterative product development process modeled in this paper. The presence of network effects in these settings could be directly tied to the ability of entrepreneurs to engage in price discrimination and create segmented markets of early and late adopters. Finally, empirical research could also investigate how different forms of hybrid financing, such as equity crowdfunding, affect startup performance, particularly for ventures with higher capital needs. Heminway (2013) and Hornuf and Schwienbacher (2017) suggest that equity crowdfunding campaigns not only provide capital but also foster a deeper level of investor commitment, which can positively influence venture growth. By analyzing campaigns that successfully integrate reward-based and equity crowdfunding models, future research could explore the conditions under which hybrid financing models outperform traditional bank loans or reward-based crowdfunding alone. This would provide empirical support for the theoretical argument that equity crowdfunding represents a middle ground between the flexibility of crowdfunding and the financial backing of more traditional capital sources.

5. EQUITY PARTICIPATION IN CROWDFUNDING

Model with Equity Participation

We expand the initial two-period model to include equity participation, and introduce a framework in which crowd funders receive shares of the startup in exchange for their contribution. Equity participation provides crowd investors with potential returns based on the venture's success, addressing situations where higher startup costs may necessitate investor incentives beyond product or network benefits.

In this model, let α denote the equity stake offered to the crowd, and Π represent the venture's profits. We assume that the decision to include equity-based crowdfunding is influenced by the cost threshold identified in the original model, where conventional crowdfunding becomes suboptimal for higher capital requirements.

Crowd Investors' Utility Function

Crowd investors now expect a return on investment, proportional to the venture's future profits. Their utility function can be expressed as follows:

$$U_c = \beta(xq_c - p_{2c}) + \alpha\Pi$$

where αΠ represents the expected equity-based return on the venture's profits Π, p_{2c} is the product price for the crowd, and β is the discount rate applied uniformly across stakeholders. Here, equity participation aligns crowd funders' interests with the venture's profitability, distinguishing their incentives from those of non-equity-based funders. Equity crowdfunding has been shown to attract investors interested in long-term profitability rather than immediate consumer rewards, aligning investor incentives with venture growth and profit sharing (Cumming, Leboeuf, and Schwienbacher, 2020). Critically, risk-taking dynamics are important in crowdfunding, where equity stakes can incentivize both entrepreneurs and investors to commit to profitable outcomes Schwienbacher (2018).

Venture's Profit Maximization

The entrepreneur maximizes profit, factoring in the required equity share to the crowd. The profit function for the entrepreneur under equity participation becomes:

$$\pi_v = (1 - \alpha)\Pi$$

Where (1-α)Π is the retained profit after distributing equity returns to the crowd. The objective is to maximize this profit by choosing an optimal price level p_{2c} and setting a competitive α to maintain investor participation.

Incentive Compatibility and Participation Constraints

To ensure crowd funders participate under the equity model, an incentive compatibility (IC) constraint must hold. Crowd funders participate if their utility from equity participation meets or exceeds the utility from standard crowdfunding. The IC constraint, ensuring crowd utility is at least as high as that from other investment opportunities, is given by:

$$\beta(xq_c - p_{2c}) + \alpha\Pi \geq \beta(xq_r - p_r)$$

Where q_c and q_r are the perceived product qualities for crowd and regular consumers, respectively, and p_r is the price for regular consumers.

The venture's participation constraint (PC) requires that the retained profit be sufficiently positive after accounting for the equity share:

$$(1 - \alpha)\Pi > K$$

where k represents the initial capital required for the venture. This constraint ensures that the entrepreneur receives a viable return after compensating equity investors, incentivizing them to continue with the venture.

First-Order Condition and Optimal Equity Share

Optimal contract design in crowdfunding plays a critical role in addressing moral hazard, particularly in equity-based models (Strausz, 2017). To find the optimal level of equity participation α and product price p_{2c}, we maximize the venture's profit function:

$$\max_{\alpha, p_{2c}} \pi_v = (1 - \alpha)\Pi = (1 - \alpha) f(K, q_c, p_{2c}, p_r)$$

Where f () reflects the functional relationship of profits with capital K, product quality q_c, and prices p_{2c} and p_r. Assuming a competitive environment, we use the first-order conditions (FOC) for profit maximization with respect to α and p_{2c}.

For α:

$$\frac{\partial \pi_v}{\partial \alpha} = -\Pi + \frac{\partial \Pi}{\partial \alpha}(1 - \alpha) = 0$$

Solving for α, we find:

$$\alpha^* = 1 - \frac{\partial \Pi / \partial \alpha}{\Pi}$$

For p_{2c}:

$$\frac{\partial \pi_v}{\partial p_{2c}} = \frac{\partial \Pi}{\partial p_{2c}}(1 - \alpha) = 0$$

These conditions provide the values of α^* and p_{2c}^* that maximize the venture's profit, balancing the equity share to crowd funders with retained profits.

In general, equilibrium occurs when:

1. The IC condition holds, so crowd investors are incentivized to participate based on equity returns.
2. The PC for the venture ensures that after distributing profits to investors, the venture retains sufficient earnings.
3. Both the entrepreneur and investors are in a stable agreement, where adjusting α or p_{2c} would not yield additional utility for either party.

The resulting equilibrium (α^*, p_{2c}^*) maximizes the venture's retained earnings while securing necessary investment through equity participation. This extension, while generic in its form, can shed light for ventures facing high initial capital requirements, where crowd investors need stronger incentives for participation. Hence, the empirical implications for equity participation model implies that for ventures with substantial capital needs, equity-based crowdfunding may be more effective than traditional methods. Further research could consider the role of exit options, such as buybacks or secondary markets for equity stakes, in enhancing investor utility Ahlers *et al.* (2015).

CONCLUSION

This paper has developed a theoretical model that provides new insights into the decision making process entrepreneurs face when choosing between crowdfunding and traditional bank loans. By incorporating elements such as price discrimination and network externalities, the model offers a more nuanced understanding of how these financing mechanisms differ in their ability to support early-stage ventures. The results indicate that crowdfunding is particularly well-suited for ventures with low startup costs and high consumer engagement, where the ability to harness network effects and engage in segmented pricing strategies maximizes both financial and non-financial benefits. These findings are consistent with prior empirical research, such as the analysis by Mollick (2014) on crowdfunding dynamics and Belleflamme et al. (2014) on network externalities in crowdfunding campaigns.

One of the key contributions of this paper is its emphasis on the non-financial benefits of crowdfunding, particularly its role in enhancing product visibility, validating market demand, and building a community around the venture. Unlike traditional bank loans, which primarily provide financial capital, crowdfunding offers a platform for entrepreneurs to test and refine their products while simultaneously generating consumer buy-in. This dual function of crowdfunding suggests that it is not merely an alternative financing tool but a strategic asset that entrepreneurs can leverage to build long-term relationships with their customers. In this sense, the model underscores the importance of considering not just the financial trade-offs but also the strategic benefits of crowdfunding when making financing decisions.

The equity participation model extension in this paper adds a valuable dimension to the analysis, specifically addressing scenarios where ventures require higher levels of initial capital. By incorporating equity participation, the model enables ventures to share future profits with crowd funders, aligning investor incentives with long-term profitability and making equity-based crowdfunding a feasible option for capital-intensive projects. This extension reflects arguments by Heminway (2013) and Hornuf and Schwienbacher (2017) on how equity crowdfunding blends the validation and flexibility of reward-based crowdfunding with the security and growth potential of equity financing. The equilibrium derived in this extended model highlights the balance ventures can achieve between retaining sufficient profit and engaging crowd investors, ultimately optimizing capital structure for growth-focused ventures.

Looking forward, future research could build on this extended model by exploring hybrid financing structures, such as combining equity crowdfunding with traditional loans, which may offer even greater flexibility in industries with high initial capital requirements. Further empirical validation using real-world crowdfunding data would provide valuable insights into the model's applicability and effectiveness, aiding entrepreneurs and policymakers in navigating the evolving landscape of entrepreneurial finance.

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