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After successful fundraising: how overfunding and category spanning affect the release and audience-perceived quality of crowdfunded products

Clarissa E. Weber · Norbert Steigenberger · Hendrik Wilhelm

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Abstract Overfunding of crowdfunded product-development projects would seem to be a welcome outcome for entrepreneurs, yet initial theory and evidence suggest that overfunding can have both positive and negative consequences. To overcome these contradictory predictions, we develop theory linking research on slack resources, audience expectations, and product category spanning to hypothesize boundary conditions for whether and when overfunding has a positive or negative effect on the product-development outcomes of product release and audience-perceived product quality. Post-crowdfunding data on video-game development projects show that entrepreneurs with high-category-spanning products benefit substantially less from overfunding than entrepreneurs with low-category-spanning products. Our study provides novel insights into the relation between overfunding and product release as well as audience-perceived product quality. It also contributes to our emerging understanding of the role of categories in the context of crowdfunding. We discuss implications for theory and practice.

Plain English Summary For entrepreneurs receiving more funding than sought in a crowdfunding campaign would seem to be a welcome outcome. However, prior studies have shown that such overfunding can have both positive and negative effects on subsequent product-development outcomes. To shed light on when the effects of overfunding are predominantly positive and when are they predominantly negative, we derive theory on how a product's category spanning—that is, the positioning of a product in multiple product categories—may impact the effect of overfunding; specifically, on the probability that a product is released and on audience perceptions of the product's quality. We test these predictions with data from video-game product-development projects crowdfunded on Kickstarter. Our results show that for products with low category spanning, overfunding can be beneficial in terms of both product release and audience perceptions of quality, while high overfunding for

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products with high category spanning can have detrimental effects for audience perceptions of quality.

Keywords Crowdfunding · Overfunding · Category spanning · Product release · Product quality

JEL Classification L26 · O31 · G23

1 Introduction

Attracting funding is a crucial step in developing products in entrepreneurial ventures (Clough et al., 2019), and a popular option for attracting those funds is crowdfunding—particularly reward-based crowdfunding (McKenny et al., 2017; Short et al., 2017). Entrepreneurship research has extensively explored the conditions that benefit fundraising success via crowdfunding as well as the internal dynamics of crowdfunding campaigns (Kaminski & Hopp, 2020; Mollick, 2014; Steigenberger & Wilhelm, 2018; Taeuscher et al., 2021). In addition, an emerging stream of research has started to investigate what happens after a crowdfunding campaign (Mollick & Kuppuswamy, 2014; Vanacker et al., 2019). This research has provided rich insights into how and when entrepreneurs can attract additional funding after a crowdfunding campaign (e.g., Buttice et al., 2017; Colombo & Shafi, 2021; Drover et al., 2017; Roma et al., 2017; Rossi et al., 2022; Signori & Vismara, 2018) and how crowdfunding may impact ventures' overall profitability or failure (e.g., Coakley et al., 2022; Hornuf et al., 2018; Mollick & Kuppuswamy, 2014; Walthoff-Borm et al., 2018).

While this research has begun to help us understand what happens post-crowdfunding, we still know little about product-related outcomes after ventures raise funds via crowdfunding—specifically, how the funding that entrepreneurs obtain influences the probability of crowdfunded products being released and, once released, how audiences evaluate product quality (Murray & Fisher, 2022; Pollack et al., 2021; Stanko & Henard, 2017). As anecdotal evidence shows, product-development projects that succeed at attracting funding do not always achieve the same success following a crowdfunding campaign—while some products get a favorable reception from audiences, others are never released and some of those that are released disappoint audiences (Belavina et al., 2020; Parhankangas & Renko, 2017). The question of when successfully crowdfunded product-development projects become successful post-crowdfunding is currently not well understood.

One prominent aspect of successful fundraising via crowdfunding that likely has a direct impact on the outcomes of subsequent product development is overfunding. Overfunding refers to any funding above entrepreneurs' fixed funding goal (Chemla & Tinn, 2020; Koch et al., 2021), and is a consequence of the specific design of many crowdfunding platforms: once the fixed funding goal has been reached, contributors can pledge additional funds until the campaign ends (usually 30 days after it starts) (Kuppuswamy & Bayus, 2017). Campaigns that quickly reach their funding goal are therefore likely to continue to attract contributions and exceed that goal—at times to an excessive degree (Chemla & Tinn, 2020).

For product-development outcomes, it is unclear whether overfunding has a positive or negative effect. On the one hand, funding that exceeds the funding goal should provide entrepreneurs with slack resources and thus more opportunities and leeway to carry out subsequent development activities, providing them with a buffer to help overcome the challenges that often arise during development processes (Parida & Örtqvist, 2015; Roma et al., 2017). Other studies, though, have pointed out that excess funding may also have adverse effects, such as increased management requirements (Bradley et al., 2011a; Vanacker et al., 2013). Overfunded product-development projects may also suffer from unmanageable complexity and uncontrolled organizational scaling because during fundraising entrepreneurs can make unbounded claims, which may increase their fundraising success—and thus lead to substantial overfunding—but may also inflate audience expectations (Mollick, 2014; Murray & Fisher, 2022). Crowdfunding is particularly rife with examples of overfunded projects that significantly disappointed audiences (Belavina et al., 2020). Indeed, many of the highest-funded Kickstarter projects released products to lackluster audience responses. Two prominent examples are the smartwatch "Pebble," which raised 20.3 million USD on a 500,000 USD funding goal, and the "Ouya" video-gaming console, which raised 8.6 million USD on a 900,000 USD funding goal. Both products flopped.

Taken together, research provides mixed predictions about the impact that overfunding has on the subsequent development outcomes of crowdfunded products. In this study, we integrate research on slack resources, audience expectations, and product category spanning to develop theory on the relationship between overfunding and two central outcomes of product development—the probability that a product is released and audience perceptions of product quality—as well as identify the boundary conditions for when exactly overfunding benefits a crowdfunded product-development project. We explain how overfunding can have both positive and negative effects on product release and audience-perceived product quality. Drawing on recent research on category positioning (Soublière & Gehman, 2020; Taeuscher et al., 2021; Younkin & Kashkooli, 2020), we further argue that the effect of overfunding is contingent on a product's category spanning. The choice of which market category to target is critically important to an entrepreneurial venture (Negro et al., 2015; Zhao et al., 2018). As category research has highlighted, positioning products in multiple categories—that is, category spanning—may be problematic, both for audiences who need to make sense of products and for entrepreneurial ventures that face the operational challenges of integrating the different—and at times even contradictory—demands from the different categories (Leung & Sharkey, 2014; Younkin & Kashkooli, 2020). We propose that the degree of category spanning shapes whether and to what degree a crowdfunded product-development project can benefit from overfunding.

We test our hypotheses using archival data on 236 successfully funded video-game development projects from the crowdfunding platform Kickstarter combined with market data from Steam, the key platform for releasing video games. The results support our theory regarding product release: overfunding is positively related to product release, yet this effect is negatively moderated by category spanning. Regarding audience-perceived product quality, we find a curvilinear negative relationship for high-category-spanning products, while low-category-spanning products generally benefit from overfunding. Overall, our findings indicate that overfunding can be beneficial for crowdfunded product outcomes with low category spanning, both in terms of probability of release and audience perceptions of quality, while products with high category spanning may suffer when overfunding levels are high.

Our study is one of the first to connect overfunding to the outcomes of crowdfunded product development and thus contributes to the emerging stream of research that illuminates the post-crowdfunding stage of entrepreneurial ventures (e.g., Murray & Fisher, 2022; Pollack et al., 2021; Rossi et al., 2022; Vanacker et al., 2019). It offers novel theoretical predictions for, and empirical evidence on, the surprising observation that more fundraising success does not consistently lead to more success in terms of product release and product quality. In doing so, our results provide an important building block for understanding crowdfunding as a means for entrepreneurs to fund and realize product development. In addition, our study contributes to the emerging understanding of categories in the context of crowdfunding (Leung & Sharkey, 2014; Moss et al., 2018; Parhankangas & Renko, 2017), providing theory and evidence on how category spanning shapes the effect of fundraising success on product-development outcomes.

2 Theory and hypotheses development

2.1 Crowdfunding for product development

Crowdfunding is a popular option for entrepreneurs to mobilize financial resources to fund the costly and risky process of entrepreneurial venturing because it allows them to seek funding from many individual contributors (Block et al., 2021; Short et al., 2017). Crowdfunding can take several forms; the most prominent are equity, lending, and reward-based crowdfunding (Drover et al., 2017). In equity crowdfunding, contributors receive an ownership stake in return for their investment in an entrepreneurial venture (Vismara, 2018), while in the lending form, contributors are repaid with interest (Kgoroeadira et al., 2019). In reward-based crowdfunding, contributors provide entrepreneurs with funding to develop a specific product in exchange for rewards, often including the product to be developed (Belleflamme et al., 2014). Since we are interested in the outcomes of crowdfunding for product development, the focus of our study is on this latter form of crowdfunding.

On most reward-based crowdfunding platforms (such as Kickstarter or Indiegogo), entrepreneurs set a fixed funding goal and deadline before launching the campaign (Mollick, 2014). If by the end of the fundraising campaign they have not met their funding goal, they receive no funding (all-or-nothing design) (Calic et al., 2021). If the funding goal is reached before the previously announced funding deadline, contributors can continue to pledge money until the end of the campaign. Crowdfunding campaigns that meet or exceed their funding goal can keep all funds (minus taxes and a platform fee), and move on to developing the product using the funds they have raised. If product development results in a finished product, the product is released to the market. If product development fails and no product is released, any remaining funds—if there are any—need to be paid back to contributors (McKenny et al., 2017).

Intuitively, entrepreneurs whose campaigns exceed their goal should have a better starting point for product development than those that only just meet their goal (Roma et al., 2017; Vanacker et al., 2013). At the same time, excess funding can also have negative effects; in particular, initial studies and practical evidence caution against the downsides of overfunding on crowdfunding platforms (Mollick, 2014; Murray & Fisher, 2022). In the sections that follow, we theorize how the positive and negative effects of overfunding manifest differently for two distinct product-related outcomes: the probability that a product is released and the audience-perceived quality of the released product. We further outline how the effects of overfunding on these outcomes depend on a product's category positioning.

2.2 Overfunding, product release, and audience-perceived product quality

We argue that overfunding will positively affect the probability that a product is released. Entrepreneurial product-development processes often come with unanticipated costs and unexpected complications (Belavina et al., 2020; Mollick, 2014), which require adaptations, changes, and extra work, all of which are demanding for entrepreneurial ventures that are typically resource-constrained. However, because funding success on many crowdfunding platforms is determined by an all-or-nothing design, entrepreneurs often set conservative funding goals; in other words, they set their goals as low as possible to maximize the chance that the campaign reaches its goal and thus receives funding (McKenny et al., 2017). Because product-development processes often cost more than initially projected, funding that only meets—but does not exceed—the funding goal is often insufficient to deal with eventualities and fund the entire product development (Roma et al., 2017; Wessel et al., 2021). The more excess funding entrepreneurs receive, the more they will have on hand to pay for unanticipated costs and complications that may arise during product development—for example, to hire additional staff or outsource certain tasks. While overfunding may also increase management costs (Bradley et al., 2011b; Vanacker et al., 2013), these costs will increase linearly as overfunding increases and are not likely to exceed the additional benefits—for example, the costs of managing a larger number of employees are unlikely to exceed the benefits of more employees working on product development—thus resulting in a linear positive net effect. Also in support of a positive effect, previous studies have shown that organizations with excess financial resources can search more committedly for solutions (Chen & Miller, 2007), are better able to exploit their knowledge base (Wang, Choi, Wan, Dong 2016), and use their resources more effectively (Parida & Örtqvist, 2015). Accordingly, the more overfunding a project receives, the better entrepreneurs should be able to deal with unexpected costs and complications, and the higher the probability that a crowdfunded development process leads to a completed product and eventual release.

Accordingly, we hypothesize:

H1: Overfunding has a positive effect on the probability that crowdfunded products are released.

The relation between overfunding and audience-perceived quality of a released product is less straightforward. In terms of the entrepreneur's ability to improve product quality, research suggests that entrepreneurs can better exploit their capabilities if they have financial slack (D'Este et al., 2012; Parida & Örtqvist, 2015). If the funding goal is a minimum viable threshold for product development, overfunding should make it possible for the entrepreneur to make a better product; for example, by investing more resources into individual product features that audiences perceive as valuable—such as product design—which is likely to

positively influence audience-perceived product quality. While this effect might—similar to our argument in Hypothesis 1—be linearly dampened by management costs (Bradley et al., 2011b; Vanacker et al., 2013), overfunding will—up to a certain threshold—have a positive effect on the audience-perceived quality of a released product.

On the other hand, after a certain threshold, overfunding will begin to affect audience expectations nonlinearly. Small levels of overfunding are unlikely to generate substantial audience attention, given that most crowdfunding projects that meet their funding goal typically slightly exceed their goal. Thus, a small surplus is unlikely to attract much attention and overly inflate expectations. After a certain threshold, however, audience expectations of the final product are likely to increase disproportionally (Mollick, 2014; Murray & Fisher, 2022). High levels of overfunding signal that many contributors have a high level of trust in the entrepreneurial venture (Jessen & Jørgensen, 2012; Mena et al., 2020) and indicate to audiences—including contributors and (potential) customers who initially abstained from contributing but might be interested in buying later (Belavina et al., 2020)—that an exceptionally high-quality product is likely to emerge from this product-development process. This effect is fostered by the highly visible nature of overfunded projects, which are frequently discussed in social media, online communities, the public press, and other outlets. The more (over-) funded they are, the more likely they generate discussion, long before an actual product is released (Logue & Grimes, 2022; Scheaf et al., 2018). With increasingly high levels of attention, the heterogeneity of audiences and expectations is also likely to increase (Stevenson et al., 2019). Higher and more diverse expectations may then lead to a dangerous blend of expectations that are increasingly difficult to satisfy (Garud et al., 2014).

In addition, slack resources are socially constructed properties of a venture's resource position (Dolmans et al., 2014). Entrepreneurs' scope for development activities might not proportionately scale to audiences' increased expectations—which have been fueled by their perceptions of excessive overfunding (Murray & Fisher, 2022). In other words, these inflated expectations may easily exceed entrepreneurs' ability to improve the quality of the product.

Furthermore, audience perceptions of quality may also be hampered by additional product features that entrepreneurs offer once they exceed their funding goal (Steigenberger, 2017). Such promised add-ons—the extent and scope of which typically increase substantially with increasing overfunding—might be more- or less-aligned with the core product, thereby threatening the coherence of a product and thus its perceived quality. High overfunding can result in "scope creep" or "feature creep," which occurs when a product has too many features or features that are too heterogeneous (Shmueli & Ronen, 2017), thereby negatively affecting audience-perceived quality.

In sum, we argue that the relationship between overfunding and audience perceptions of product quality is shaped by three counteracting effects that result in a curvilinear form: first, a positive effect that increases the quality entrepreneurs can deliver in the production process; second, at high levels of overfunding, a negative effect arising from disproportionally increased and heterogeneous expectations; and third, another negative effect from scope and feature creep that threatens a product's coherence. While the positive effect is largely linear, we expect the negative effects to increase disproportionally with overfunding, such that audience-perceived product quality first increases with overfunding, up to an inflection point where the negative effects increasingly outweigh the positive effects of more overfunding. We accordingly hypothesize:

> H2: Overfunding has a curvilinear effect on audience-perceived product quality, such that crowdfunded products with an intermediate level of overfunding have the highest degree of audience-perceived product quality.

2.3 The moderating role of product category spanning

Category positioning critically affects product development and product assessments (Negro et al., 2015). Specifically, category spanning—defined as a product or venture being positioned in multiple categories (such as genres)—may affect product development and audience evaluations (Hsu et al., 2009). Positioning a product into one category allows firms to effectively

target clearly defined category demands and to focus on excelling in that category. In contrast, the more categories a product is positioned in, the more information asymmetries, agency problems, and other inefficiencies arise, which are likely to result in poorer product-development outcomes (Dobrev et al., 2001; Negro & Leung, 2013). Spanning more categories also impacts stakeholder evaluations because placing a product in more categories increases ambiguity and hampers identification, which can lead to poorer evaluations and market outcomes (Arjaliès & Durand, 2019; Hsu et al., 2009; Zuckerman et al., 2003). For example, prior research has shown that multigenre films receive worse audience ratings than films that clearly fit into one specific genre (Hsu, 2006); eBay sellers not specializing in one product category are less successful (Hsu et al., 2009); wines from category-spanning wineries receive lower ratings from critics (Negro & Leung, 2013); and category-spanning crowdfunding projects are less successful at fundraising (Leung & Sharkey, 2014; Moss et al., 2018; Parhankangas & Renko, 2017). Building on these arguments and evidence, we posit that category spanning moderates the effect of overfunding on product release and on audiences' perceptions of quality.

In Hypothesis 1, we argue that overfunding positively influences the probability that a product is released because more overfunding makes it possible to use additional financial resources in the development process and pay for unexpected costs and complications, making it more likely that the product will be completed and released. Category spanning, we hypothesize, negatively moderates this relationship: the more categories a product spans, the weaker the positive effect of overfunding. Products that are clearly positioned within one category can be well-tailored to the specific demands of that category (Hsu et al., 2009), meaning that additional resources are likely put to good use. The more a product extends into multiple categories, however, the more complex the product-development process is and the more likely that additional costs and complications will arise (Negro & Leung, 2013), meaning that additional resources are less likely to be put to effective use. Entrepreneurs with category-spanning projects that are overfunded can more easily get lost in opportunities as they attempt to accommodate the diverse and potentially inconsistent demands of different category audiences (Hsu et al., 2009), thus making it harder to successfully complete a project. Therefore, we propose that while overfunding increases the probability of product release, the positive effect of overfunding diminishes as the number of categories a product spans increases. We thus hypothesize:

> H3: Category spanning negatively moderates the positive relationship between overfunding and the probability that crowdfunded products are released.

We further argue that category spanning moderates the curvilinear relationship between overfunding and audiences' perceptions of the quality of crowdfunded products stated in Hypothesis 2. First, category spanning modifies audience responses to overfunding, such that high-level overfunding has a less-negative impact on audience-perceived product quality for products with low category spanning. Specifically, in Hypothesis 2 we argued that overfunding—after passing a threshold—will hamper audience-perceived quality because high levels of overfunding result in strongly inflated audience expectations. However, low-category-spanning products foster clearly defined audience expectations about product characteristics, making it less likely that these expectations will become excessively inflated and audiences—in turn—are less likely disappointed (Arjaliès & Durand, 2019; Leung & Sharkey, 2014).

In contrast, when category spanning is high, low levels of overfunding will have a positive effect on audience-perceived product quality, while high levels of overfunding will have a negative effect. Low levels of overfunding will benefit high-category-spanning products because the additional resources enable entrepreneurs to create better products (Parida & Örtqvist, 2015; Vanacker et al., 2013). At the same time, audiences are unlikely to pay attention to this level of overfunding, and expectations are unlikely to inflate excessively. Under these conditions, audiences may revert to superordinate classifications—broad and relatively generic ones—when evaluating a high-category-spanning product (Younkin & Kashkooli, 2020), and their expectations will be less heterogeneous. Thus, low levels of

overfunding result in both valuable resources and a comparably less-demanding audience, whose expectations are less likely to be disappointed. Thus, for low levels of overfunding, high category spanning will benefit audience evaluations of product quality.

However, high levels of overfunding will harm high-category-spanning products, because the additional resources are combined with an increasingly larger, more-heterogeneous audience. As outlined in the argument leading to Hypothesis 2, high levels of overfunding disproportionally increase audience expectations (Mollick, 2014; Murray & Fisher, 2022). The more categories a product spans, the more heterogeneous these increased expectations will become (Hsu, 2006), which will eventually overtake the dampening effect of superordinate classifications, making it particularly hard for entrepreneurs to create a product that is both consistent and meets audience expectations. Thus, audiences will likely evaluate a high-category-spanning product with high levels of overfunding negatively.

In addition, the dangers of scope and feature creep are more likely to occur when high-category-spanning products are highly overfunded, since entrepreneurs in this situation will be more likely to try and satisfy the different demands of different categories (Bradley et al., 2011a; Voss et al., 2008), which further endangers product coherence and thus negatively affects quality evaluations. These mechanisms decrease the degree to which entrepreneurs with high-category-spanning products can benefit from overfunding, and this effect increases as overfunding increases.

Taken together, our arguments lead to the following hypothesis:

> H4: Category spanning negatively moderates the curvilinear relationship between overfunding and audience-perceived product quality. When category spanning is low, overfunding has a positive effect on audience-perceived product quality. When category spanning is high, low levels of overfunding have a positive effect on audience-perceived product quality, while high levels of overfunding have a negative effect.

3 Method

3.1 Empirical context and data collection

To test our hypotheses, we used data on video-game development projects funded through the crowdfunding platform Kickstarter, one of the largest crowdfunding platforms for consumer-related product-development projects and one that has been widely used to test theory on product-development-related crowdfunding (e.g., Chan & Parhankangas, 2017; Colombo et al., 2015). We focused on video-game development projects to reduce heterogeneity in our sample, which improves the validity of our measures. Video-game development is particularly suited to test our theory since clear and observable measures exist for our variables of interest—in particular, overfunding, category spanning, product release, and audience-perceived product quality. Furthermore, many ventures producing video games have used Kickstarter, ensuring a sufficiently large sample for statistical analysis.

We collected data on all video-game development projects that received funding on Kickstarter between October 2013 and January 2016. We chose this time window because our study focuses on the consequences—in terms of product release and audience-perceived quality—of successful fundraising, and product-development cycles in the video-game industry usually take 1 to 4 years to complete after funding has been obtained (Stefyn, 2022). Thus, our data—last updated in October 2022—account for more than 6 years during which a video game could have been released after receiving funding. This ample time window gives us confidence that our data cover all subsequent product releases of funded projects. As detailed in our measurement section below, this time window also provides us with sufficient data on the audience-perceived product quality of released video games. To collect data on audience perceptions of product quality and features of the developed product, we used data from the video-game distribution service Steam. This platform, with more than 132 million monthly active users (Murray, 2022) and more than 60,000 listed games (Steamspy.com, 2021), is the one most used by developers to release games.

Both professional and hobby developers pitch video games on Kickstarter. Hobby developers, however, usually lack the routines and resources to keep up with professional productions, and audiences might have different expectations of hobby projects. Therefore, to avoid biasing our results, we followed prior research (e.g., Calic & Mosakowski, 2016; Mollick, 2014; Steigenberger & Wilhelm, 2018) and excluded hobby projects from our sample. As in previous research, we applied a 25,000 USD funding-goal cutoff; that is, we excluded all projects with a funding goal lower than 25,000 USD, which resulted in

a sample of 236 successfully funded video-game development projects in our observation period.

Of the 236 successfully funded video-game projects in this period, a total of 192 (81%) resulted in a product release: 179 games were released on Steam, and 13 (e.g., *Forgotten Trail: A Video Game That Makes You Smarter*) on other outlets, such as the developer's website.[1] We dropped 10 games due to missing values. To rule out outlier-induced bias, we used Stata's *bacon* package (Weber, 2010) to initially screen the data. *Bacon* identified nine influential outliers (e.g., *Kingdom Come: Deliverance*) that received highly uncommon levels of overfunding. To avoid biased estimates, we removed these observations.[2] Thus, our final dataset for testing Hypotheses 1 and 3 (predicting product release) covers 217 projects.

To test Hypotheses 2 and 4, we had to restrict our sample to those 179 games that were released on Steam. Of these 179 games, we had to drop 27 due to missing values. To ensure a reliable measurement of audience-perceived product quality, we also removed four games that had very few quality ratings (i.e., < 10 raters).[3] Ratings based on such a low number of raters are inherently sensitive to orchestrated ratings that do not reflect the true quality of the product, (e.g., employees buy and rate the game), thus providing unreliable measurements of audience-perceived product quality. Furthermore, *Bacon* identified eight influential outliers (e.g., *Kingdom Come: Deliverance*), which we removed. The final sample for the model predicting audience-perceived product quality thus comprises 140 projects.

[1] To maximize our test power, the dataset we used to test Hypotheses 1 and 3 (predicting product release) includes video games published both on Steam and on other outlets. However, because our operationalization of audience-perceived product quality (for our tests of Hypotheses 2 and 4) requires games to be published on Steam, we ran an additional analysis testing Hypotheses 1 and 3 using only games published on Steam. Excluding games published on other outlets from our tests of Hypotheses 1 and 3 provides results similar to those reported below, thus demonstrating the robustness of our results.

[2] Including the outlier observations into our analysis provides results similar to those reported below. This again demonstrates the robustness of our results.

[3] Additional analyses including the four video games with fewer than 10 raters show results similar to those reported below, which also demonstrates the robustness of our results.

3.2 Measures

Product release We created a dummy variable that took the value of 1 if a successfully funded video game was released (and 0 if not). Products that were in an unfinished stage (alpha- and beta-versions, early access) were coded as "not released."

Audience-perceived product quality To measure audience-perceived product quality, we followed previous research on audience evaluations (Wang, Wezel, Forgues 2016) and used aggregated product ratings. Specifically, we used the percentage of positive ratings a video game received on Steam. Games on Steam are rated by responding to the question "Would you recommend this game to other players?" with a thumbs-up or thumbs-down. The Steam platform aggregates these responses to an overall approval score ranging from 0 to 100%. We used this percentage score (transformed to a scale ranging from 0 to 1) to measure audience-perceived product quality. To ensure comparability across games, we used only ratings provided by users within the first year after the game's release. This variable ranges between 0.12 and 0.99.

Overfunding To measure overfunding, we calculated the difference between a project's funding goal on Kickstarter and the funding it had raised at the end of the funding period. To ensure comparability across projects, we converted all non-USD projects to USD using historical conversion rates. Because we included in our sample only projects that had reached their funding goal, this measure cannot fall below zero. For the dataset covering product release, we obtained values between 0 USD and 618,158.00 USD. For the dataset covering audience-perceived product quality, overfunding ranges between 156.00 USD and 618,158.00 USD.

Category spanning We identified four broad video-game product categories: simulation, strategy, action, and role-playing, which are clearly differentiated by the game mechanics they use, by their typical narrative structures, and by their visual aesthetics (Apperley, 2006). To classify games into one or more of those categories, we used the keywords provided by Steam audiences, or, for products that were not

released, the information provided on the respective Kickstarter pages. To comprehensively represent all Steam keywords in our categories, we added a fifth category, "adventure," which captured point-and-click adventures that are clearly different from the other four categories in terms of game mechanics, narrative approach, and visual aesthetics. In line with previous research on category spanning (e.g., Leung & Sharkey, 2014), we created a series of dummy variables indicating whether each released game belonged to one or more of the respective categories. We then summed these dummies to obtain a measure for the degree of category spanning. In our data, this variable ranges from 1 (the game belongs to one category) to 4 (the game belongs to four categories).

Control variables In the model predicting product release (Model 1), we controlled for developer *team size* because larger teams may have better access to talent and networks, enabling them to attract more funds and make more-productive use of excess funds to complete a product. We obtained information on team size from the Kickstarter pitches. When no information was provided, we e-mailed the respective entrepreneurs. We also controlled for the *funding goal*, as higher funding goals may impact the likelihood of overfunding, while also increasing the probability of product release (Mollick, 2014; Wessel et al., 2021). We further controlled for whether the game was a *visual novel*. Visual novels are adventure games in terms of narrative structure and visual aesthetics but offer a more passive game experience than common adventure games. Controlling for this characteristic of adventure games is important, as visual novels—because of their very loyal fan bases—may attract higher levels of overfunding, while at the same time—because their game mechanics are very simple—may have a higher product-release probability.[4] Finally, following standard practice (e.g., Colombo et al., 2015) we controlled for whether a *project* was *US-based* (0 = non-US based; 1 = US-based). Because Kickstarter is a US-based company, US-based projects seeking funding on Kickstarter may have a home advantage from US contributors and raters. US-based projects may also have different opportunities to release a game.

To ensure a consistent model design, we included these same control variables in the model predicting audience-perceived product quality (Model 2). In this model, we further controlled for the Steam *price* of a game (in USD) because higher prices may result in higher audience expectations, which could influence audience perceptions of game quality in relation to its overfunding. Furthermore, we controlled for *time to market*, which is the number of days between the game's successful funding on Kickstarter and its release, as games with substantial overfunding may take longer to develop (Mollick, 2014), and audience expectations of product quality may be higher for games that take longer to develop. Finally, we accounted for the *peak number of players* because "hype" games are likely to receive higher levels of overfunding but may also receive more scrutiny from players (Logue & Grimes, 2022), which could affect the relation between overfunding and audience-perceived product quality.

3.3 Analytical approach

Our analytical approach takes into account that our two dependent variables—product release (Hypotheses 1 and 3) and audience-perceived product quality (Hypotheses 2 and 4)—have different measurement levels. We tested Hypotheses 1 and 3 with Stata's 16.1 *probit* estimator (Model 1), as the dependent variable ("product release") is binary. Hypotheses 2 and 4 include a fractional dependent variable (audience-perceived product quality). We therefore used Stata's 16.1 *fracreg* estimators to test Hypotheses 2 and 4 (Model 2). We specified omnibus models including the interaction terms to test our hypotheses[5] because excluding

[4] To rule out that including the visual-novel-control variable biases our results, we ran additional analyses excluding this variable from both Model 1 and Model 2. These additional analyses provide results very similar to the results reported below, demonstrating the robustness of our results.

[5] To ensure that our decision to use omnibus models did not affect our results for the unconditional Hypotheses 1 and 2—neither hypothesis depends on the contingency effect of the moderator—we ran additional models without the interaction terms. These additional analyses provide the same conclusions as reported in our Results section. Specifically—in support of Hypothesis 1—results show a positive and significant effect of overfunding on product release ($\beta = 0.40$, $p = 0.066$). Supporting our decision to reject Hypothesis 2, results show no significant effect of overfunding squared on audience-perceived product quality ($\beta = -0.01$, $p = 0.662$).

significant higher-order terms can bias estimations of lower-order terms (Aiken & West, 1991; Jaccard & Turrisi, 2003). We *z*-standardized all the predictor variables we used for the hypotheses testing to facilitate interpretation. We estimated all models using robust standard errors.

To ensure the robustness of our results, we ran two additional sets of analyses. First, in line with methodological recommendations (Angrist & Pischke, 2009), we tested Hypotheses 2 and 4 using Stata's 16.1 *regress* function. The results of this additional analysis are very similar to the results reported below in terms of both the direction and the significance levels of the effects. Second, because only video games that are released can be rated on their quality, our first dependent variable ("product release") determines whether our second dependent variable ("audience-perceived product quality") is observed, which may have resulted in a selection bias (Heckman, 1979). To address such possible bias, we followed common practice (e.g., Abdurakhmonov et al., 2021; Malhotra et al., 2018) and computed a selection control (Heckman, 1979) using our Model 1. Using the results of this *probit* estimation, we calculated and then included into Model 2 the inverse Mills ratio to adjust for possible selection concerns. Overall, these models support the results of our hypotheses tests as reported below. Because the inverse Mills ratio is non-significant ($p=0.734$), we are confident that our results do not suffer from selection bias.[6]

4 Results

Table 1 reports the descriptive statistics of our dataset covering both released and unreleased products (Hypotheses 1 and 3). All bivariate correlations are in the expected directions. We do not observe any strong correlations. Multicollinearity most likely does not present an issue, as the mean Variance Inflation Factor (VIF) is 1.10 and the maximum VIF value is 1.23. This is substantially below the commonly accepted threshold of 10 (Neter et al., 1996).

Table 2 reports the descriptive statistics of our dataset on audience-perceived product quality (i.e., only released products) and related variables (Hypotheses 2 and 4). Again, all bivariate correlations are in the expected directions and we do not observe any strong correlations, nor do VIFs suggest that multicollinearity is an issue (mean: 1.22, max: 1.47).

Table 3 (Model 1) and Table 4 (Model 2) present the results of our hypotheses testing.

Hypothesis 1 proposes that overfunding increases the probability that crowdfunded products are released. In line with this hypothesis, Model 1 (Table 3) shows a positive and significant effect of overfunding on product release ($\beta=0.79$, $p=0.013$). Thus, Hypothesis 1 is supported. Additional analysis (based on unstandardized data) using Stata's *margins* command suggests that a 100,000 USD increase in overfunding increases the probability of product release by 26.09%.

Hypothesis 2 states that overfunding has a curvilinear effect on audience-perceived product quality, such that crowdfunded products with an intermediate level of overfunding have the highest degree of audience-perceived product quality. As demonstrated by Model 2 (Table 4), our results show a negative effect of overfunding squared on audience-perceived product quality that is only marginally significant ($\beta=-0.06$, $p=0.094$), and our additional analyses reported in Footnotes 5 and 6 consistently provide non-significant results. We therefore reject Hypothesis 2.

Hypothesis 3 states that category spanning negatively moderates the positive relationship between overfunding and the probability that crowdfunded products are released. Model 1 (Table 3) shows that our results support this statement, as demonstrated by the negative and significant interaction effect of overfunding and category spanning ($\beta=-0.73$, $p=0.002$). Thus, Hypothesis 3 is supported. We probed this result using simple-slopes tests (Aiken & West, 1991) at low (i.e., minimum) and high (i.e., mean+1 SD) levels of category spanning. In probing low levels of category spanning at the minimum, we followed methodological guidance to pick meaningful values of the moderator (Dawson, 2013). The minimum level of category spanning covers all video games

[6] To ensure the robustness of the Heckman correction, we also estimated Model 1 and Model 2 using a Generalized Two-Step Heckman Selection Model (Carlson, 2022). The results show identical directions and similar *p*-values for all coefficients used for hypotheses testing as reported in our main analyses, including the non-significant *p*-value for overfunding squared predicting audience-perceived product quality ($p=0.221$), which results in our rejection of Hypothesis 2. Going beyond our main analyses—but consistent with our additional manual test rejecting a selection bias—the results show a non-significant lambda term ($p=0.935$), which suggests that the error terms across the two equations are not correlated. Thus, our separate estimation of two models provides an adequate and parsimonious approach, which is unlikely to suffer from selection bias.

Table 1 Descriptive statistics and correlations (Model 1)

		Mean	Median	SD	1	2	3	4	5	6
1	Product release	0.82	1.00	0.38						
2	Visual novel[1]	0.04	0.00	0.20	0.04					
3	US-based project[2]	0.54	1.00	0.50	−0.14	−0.13				
4	Team size	7.51	6.00	5.70	0.07	−0.02	−0.13			
5	Funding goal	85,678.60	50,000.00	106,367.40	−0.03	−0.01	0.12	0.14		
6	Category spanning	1.27	1.00	0.53	0.06	−0.11	−0.07	0.03	−0.03	
7	Overfunding	43,443.83	14,265.00	76,996.50	0.12	0.18	0.02	0.05	0.37	−0.05

$n = 217$, correlations at |0.14| or larger are significant at $p = 0.05$

[1]Dummy variable (0 = no visual novel, 1 = visual novel)

[2]Dummy variable (0 = non-US-based project, 1 = US-based project)

that operate in a single category, thus providing a meaningful contrast to high-category-spanning games. This analysis reveals that overfunding for low-category-spanning products has a significant positive effect ($b = 0.28$, $p = 0.003$) on product release. In contrast, overfunding for high-category-spanning products has no significant effect ($b = 0.01$, $p = 0.805$) on product release. Figure 1 below illustrates this interaction effect.

Finally, Hypothesis 4 proposes that category spanning negatively moderates the curvilinear relation between overfunding and audience-perceived product quality, such that when category spanning is low, overfunding has a positive effect on audience-perceived product quality; in contrast, when category spanning is high, low levels of overfunding have a positive effect on audience-perceived product quality, while high levels of overfunding have a negative effect. Model 2 (Table 4) provides initial support for this hypothesis, showing a negative and significant effect of overfunding squared and category spanning on audience-perceived product quality ($\beta = -0.14$, $p = 0.049$). Table 5 presents the marginal effects for different levels of overfunding on audience-perceived product quality conditional on low (minimum) and high (mean + 1 SD) levels of category spanning, and Figure 2 plots these relationships, providing a more accurate understanding of this interaction effect.

These results suggest that when category spanning is low, additional funding to projects that are already substantially overfunded further increases audience-perceived product quality; yet additional funding to projects with a low level of overfunding does not increase audience-perceived product quality. Chi^2-difference tests demonstrate that when category spanning is low (minimum), the marginal effects of limited (= 0) overfunding (0.79) and substantial (= 5) overfunding (0.88) differ significantly ($Chi^2[1] = 13.64$, $p = 0.000$). In contrast, when category spanning is high (mean + 1 SD), additional funding to projects with a low level of overfunding increases audience-perceived product quality up to an inflection point at overfunding = 1. When it exceeds the inflection point, additional overfunding increasingly diminishes audience-perceived product quality. In line with this observation, when category spanning is high (mean + 1 SD), a Chi^2-difference test between the marginal effect of overfunding = 0 (0.81) and overfunding = 5 (0.01) is significant ($Chi^2[1] = 151.63$, $p = 0.000$). Overall, these results support Hypothesis 4.

5 Discussion

In this paper, we study when and how overfunding of crowdfunded product-development projects affects the probability of product release and audience perceptions of product quality. Based on data on crowdfunded video-game development projects on Kickstarter, we find support for a direct positive effect of overfunding on the probability of product release. By accounting for category spanning, we also find that this effect is statistically significantly different from zero for products with low category spanning but not for high-category-spanning products. Regarding the relationship between overfunding and audience perceptions of product quality, we find that low-category-spanning products benefit from higher levels

Table 2 Descriptive statistics and correlations (Model 2)

		Mean	Median	SD	1	2	3	4	5	6	7	8	9
1	Audience-perceived product quality	0.78	0.82	0.15									
2	Visual novel[1]	0.04	0.00	0.20	0.21								
3	US-based project[2]	0.51	1.00	0.50	−0.04	−0.14							
4	Team size	7.86	6.00	6.16	−0.12	−0.04	−0.14						
5	Funding goal	97,303.08	50,000.00	14,3953.50	−0.08	−0.03	0.14	0.08					
6	Price	17.20	16.79	8.30	0.15	0.06	−0.07	0.22	0.37				
7	Time to market	849.70	727.50	551.50	−0.04	−0.18	0.13	−0.11	0.08	0.14			
8	Peak players	1,187.94	220.00	2,660.57	0.12	−0.09	−0.04	0.06	0.24	0.19	0.00		
9	Category spanning	1.29	1.00	0.57	−0.10	−0.11	−0.07	0.08	−0.09	0.06	−0.01	−0.03	
10	Overfunding	57,071.62	21,376.00	91,342.89	0.16	0.19	0.09	0.03	0.41	0.35	−0.05	0.32	−0.10

$n = 140$, correlations at |0.18| or larger are significant at $p = 0.05$

[1]Dummy variable (0 = no visual novel, 1 = visual novel)

[2]Dummy variable (0 = non-US-based project, 1 = US-based project)

of overfunding, while high-category-spanning products—after an initial peak—increasingly suffer from overfunding.

Our study expands emerging theorizing on when and how fundraising success on crowdfunding platforms shapes subsequent entrepreneurial venturing. Extant research on crowdfunding has extensively studied the conditions that impact fundraising success (e.g., Anglin et al., 2018; Block et al., 2018; Cappa et al., 2021; Steigenberger & Wilhelm, 2018; Taeuscher et al., 2021). However, as Vanacker et al., (2019: 228) point out, the "real challenges" for entrepreneurs start only after a successful crowdfunding campaign, when they need to "build viable businesses that create innovative products or services, generate employment, and provide the promised rewards or financial returns." Whether a crowdfunding project is eventually successful is thus not only determined by a favorable fundraising-campaign outcome, but also by the subsequent steps (Öner Kula, 2020; Schwienbacher, 2018).

An emerging stream of research has thus started to investigate the post-crowdfunding stage of entrepreneurial ventures (Mollick & Kuppuswamy, 2014; Vanacker et al., 2019). This research has so far primarily studied the impact of crowdfunding campaigns on follow-on funding as well as the long-term viability and success of crowdfunded ventures (e.g., Rossi et al., 2022; Signori & Vismara, 2018; Walthoff-Borm et al., 2018). At the same time, scholars have called for a closer investigation of how fundraising outcomes impact product-development outcomes after a successful crowdfunding campaign (Pollack et al., 2021; Stanko & Henard, 2017; Vanacker et al., 2019). Initial research has shown that greater success in fundraising does not necessarily coincide with greater success in subsequent product-development processes (Murray & Fisher, 2022; Schwienbacher, 2018). Our research further qualifies these findings by providing a better understanding of the different (positive vs. negative) effects that overfunding has on the probability of product release and audience-perceived product quality, respectively, and adding category spanning as an important boundary condition that explains when exactly entrepreneurs benefit from overfunding and when they do not. Our study theorizes and empirically shows that

Table 3 Effects of overfunding and category spanning on product release (Model 1, Hypotheses 1 and 3)

	Coefficient	SE (Robust)	*p*	95% Confidence Interval	
				LL	UL
Constant	1.36	0.305	0.000	0.768	1.962
Visual novel[1]	−0.11	0.658	0.870	−1.396	1.182
US-based project[2]	−0.41	0.222	0.062	−0.850	0.021
Team size	0.03	0.023	0.245	−0.018	0.070
Funding goal	0.00	0.000	0.055	0.000	0.000
Category spanning	−0.05	0.124	0.689	−0.292	0.193
Overfunding	**0.79**	**0.317**	**0.013**	**0.170**	**1.414**
Overfunding × category spanning	**−0.73**	**0.236**	**0.002**	**−1.190**	**−0.264**
Pseudo R^2	.11				
Observations	217				

The table reports *probit* estimates with robust standard errors. Two-tailed tests.

LL: lower limit; *UL*: upper limit. Results printed in bold are hypotheses tests.

[1]Dummy variable (0 = no visual novel, 1 = visual novel)

[2]Dummy variable (0 = non-US-based project, 1 = US-based project)

the effects of overfunding are contingent on category spanning, such that primarily low-category-spanning products benefit from overfunding. While overfunding can give entrepreneurs more opportunities and leeway in the challenging and error-prone development process, it can also—particularly for

Table 4 Effects of overfunding and category spanning on audience-perceived product quality (Model 2, Hypotheses 2 and 4)

	Coefficient	SE (Robust)	*p*	95% Confidence interval	
				LL	UL
Constant	0.73	0.122	0.000	0.489	0.969
Visual novel[1]	0.63	0.194	0.001	0.246	1.005
US-based project[2]	−0.02	0.084	0.848	−0.180	0.148
Team size	−0.01	0.006	0.047	−0.025	0.000
Funding goal	0.00	0.000	0.010	0.000	0.000
Price	0.01	0.006	0.015	0.003	0.027
Time to market	0.00	0.000	0.634	0.000	0.000
Peak players	0.00	0.000	0.044	0.000	0.000
Category spanning	0.04	0.058	0.454	−0.070	0.158
Overfunding	0.13	0.073	0.083	−0.017	0.270
Overfunding squared	**−0.06**	**0.035**	**0.094**	**−0.127**	**0.010**
Overfunding × category spanning	0.21	0.111	0.062	−0.010	0.424
Overfunding squared × category spanning	**−0.14**	**0.069**	**0.049**	**−0.271**	**−0.001**
Pseudo R^2	.02				
Observations	140				

The table reports *fractional regression* estimates with robust standard errors. Two-tailed tests.

LL: lower limit; *UL*: upper limit. Results printed in bold are hypotheses tests.

[1]Dummy variable (0 = no visual novel, 1 = visual novel)

[2]Dummy variable (0 = non-US-based project, 1 = US-based project)

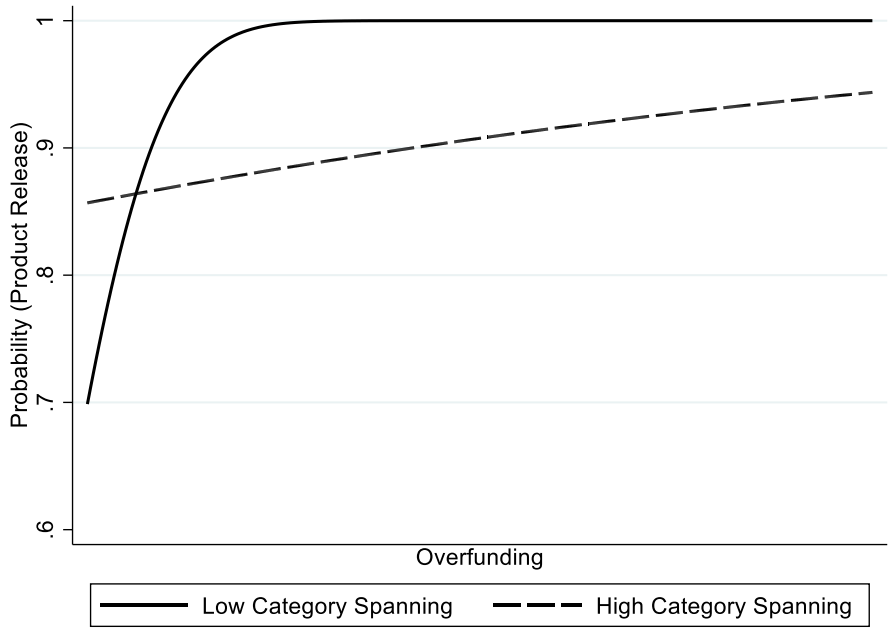

Fig. 1 Interplay of overfunding and category spanning on product release

high-category-spanning products—raise expectations to degrees that are difficult for entrepreneurs to meet, can promote scope and feature creep, and can thus lower the audience-perceived quality of a product.

Our study provides further evidence that category-positioning is a crucial factor for crowdfunded products. Recent research has begun to systematically study the effect that categories have on crowdfunding projects, underlining the importance of clear category positioning for stakeholder expectations and fundraising success (Leung & Sharkey, 2014; Moss et al., 2018; Parhankangas & Renko, 2017; Taeuscher et al., 2021). Our study extends this line of work by providing theory and evidence on the moderating effect that category spanning has for the post-fundraising stage—highlighting that high category spanning may create a context that fosters adverse effects after successful fundraising and explaining why low-category-spanning crowdfunded projects benefit more from overfunding.

Some limitations of our study are important to note. First, our sample was drawn from one specific industry (video games) and one specific crowdfunding platform (Kickstarter). To probe the generalizability of our theory, we invite future research to replicate our study with other samples. Second, our study reveals that category spanning is an interesting moderator of the relationship between overfunding and product-development outcomes, but it is likely not the only relevant moderator. We thus encourage future research to put more emphasis on how fundraising outcomes and product-development outcomes relate, and to consider different moderating or mediating mechanisms to help further illuminate the link

Table 5 Marginal effects of overfunding for low and high levels of category spanning on audience-perceived product quality

Overfunding		0	1	2	3	4	5	Max
Category spanning: low (Min)	*ME*	0.79	0.80	0.81	0.83	0.86	0.88	0.91
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Category spanning: high (Mean + 1 SD)	*ME*	0.81	0.84	0.78	0.55	0.18	0.01	0.00
	p	0.000	0.000	0.000	0.014	0.547	0.846	0.944

Max. overfunding (z) = 6.14, *ME*: marginal effect

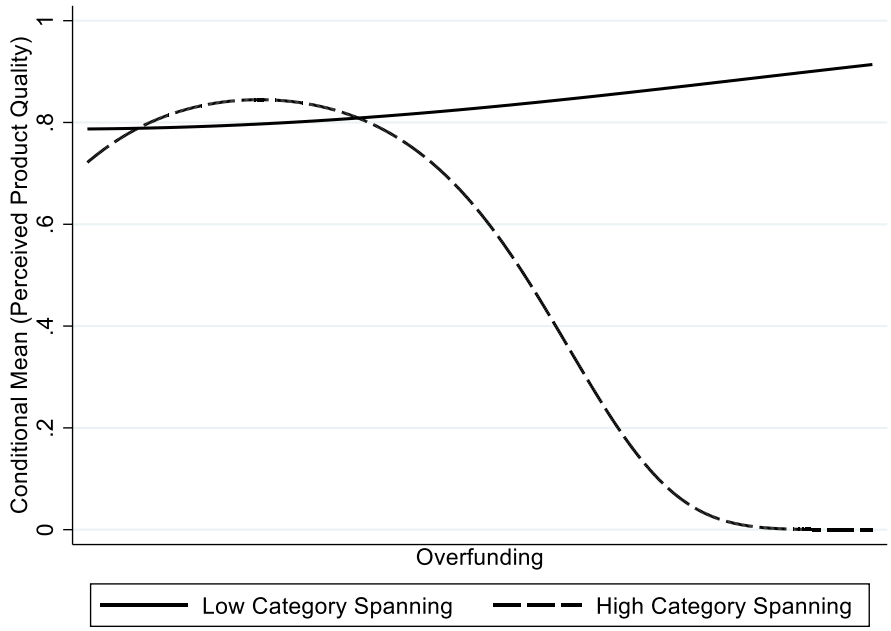

Fig. 2 Interplay of overfunding and category spanning on audience-perceived product quality

between the fundraising result and the subsequent fate of a crowdfunded product, which we view as an important next step in crowdfunding research. For example, it would be interesting to study how individual characteristics of entrepreneurs, such as their experience in product development (Delmar & Shane, 2006), impact the relationship between overfunding and product-development outcomes since such characteristics might help them deal with the negative implications of overfunding. For similar reasons, entrepreneurs' social capital (Buttice et al., 2017) and the support they receive from other resource providers, such as venture-capital or angel investors (Thies et al., 2019; Vanacker et al., 2013), could moderate or mediate the relationship between fundraising success on crowdfunding platforms and subsequent product-development success. Because prior research has shown that language in crowdfunding campaigns is an important factor for shaping audience expectations (Parhankangas & Renko, 2017), it would also be interesting to examine how campaign linguistics shape subsequent audience perceptions of released products. Finally, in our study, we were interested in the release of products and their audience-perceived quality as important outcomes of product development. Future research might want to complement our approach by focusing on other outcomes, such as sales figures, user and rater numbers, or professional critics' ratings.

Our study also has important implications for entrepreneurs. Primarily, our findings indicate that entrepreneurs may benefit from overfunding and that most attempts to increase funding during a crowdfunding campaign are thus warranted. The exception is for entrepreneurs intending to develop a high-category-spanning product. These entrepreneurs are well-advised to carefully manage audience expectations during campaigns and afterwards, as high levels of overfunding might hurt those entrepreneurs more than help them.

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Declarations

Competing interests The authors declare no competing interests.

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