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When Do You Enter? Entrepreneurial Firms' Entry Timing and Product Performance in the Digital Platform Market

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Abstract: The digital platform market has evolved into a critical location for firms to engage in innovation and entrepreneurship. However, there is no clear answer to the question of when entrepreneurial firms should enter the digital platform market in order to gain a sustainable competitive advantage. A balanced panel and an individual fixed effect model were built using monthly product data from game developers on the Steam platform. Furthermore, in accordance with first-mover advantage theory, this study empirically investigated the impact of entry timing on product performance of entrepreneurial firms in the digital platform market, as well as the moderating effect of product updates. The results show that the impact of entrepreneurial firms' entry timing on product performance in the digital platform market has a U-shaped relationship, which is moderated by product updates. These findings not only have implications for entrepreneurs looking to compete in the digital platform market, but also contribute to the sustainable development of the digital platform ecosystem.

Keywords: digital platform market; entrepreneurial firms; market entry timing; product performance; product updates

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1. Introduction

The platform market is an intermediary that facilitates the exchange of goods or services between two or more groups of subjects [1]. Shopping malls, farmers markets, publishing houses, etc., are all typical examples of platform markets. With the application and popularization of digital technology, the limitations of the traditional physical space have been surpassed, and the platform market based on digital technology has emerged in various fields [2–4]. Digital platform markets, such as e-commerce platforms, game platforms, search engines, and social platforms, have evolved as important locations for firms to conduct innovation and entrepreneurship [5,6]. The digital platform market can help entrepreneurial firms overcome their "liability of newness." Entrepreneurial firms' entry into the digital platform market implies that they have obtained "platform endorsement," which is conducive not only to contact with potential customers, but also to obtaining stakeholder recognition [7]. Furthermore, the digital platform market can help entrepreneurial firms overcome their "liability of smallness." The platform owners can provide certain boundary resources, such as application programming interfaces (APIs) and software development kits (SDKs), which greatly reduce entrepreneurial costs and increase the possibility of value creation [8].

Even though the digital platform market provides firms with numerous entrepreneurial opportunities and lowers their entrepreneurial costs, entrepreneurs are still faced with the quandary of when to enter. When entrepreneurs enter early, the digital platform market is going through the initial stage. In this stage, the overall number of platform users is relatively limited, and the platform architecture has not yet been perfected. Entrepreneurs who enter the market at this time will face high market risks, and the products they launch may not be able to attract a sufficient number of users [9–11]. When entrepreneurs enter in

the mid-term, the digital platform market is often in the growth stage. In this stage, the platform is currently experiencing extensive and rapid growth [12]. Entrepreneurs entering the market at this time face a dynamic and unstable technology and market environment, increasing the venture failure risk [13]. When entrepreneurs enter late, the digital platform market is often in the mature stage. In this stage, the platform becomes stable and redundant, and the crowding effect of complementors gradually emerges [2,14]. Entrepreneurs entering the market at this time face fierce market competition, and their products may face challenges in term of catching users' attention [9,10,15]. As a result, the question of when entrepreneurial firms can enter the digital platform market to achieve higher product performance and further sustainable growth urgently needs to be answered.

Moreover, in comparison to the traditional context, the digital platform market provides a more convenient location for product updates, particularly for digital products such as apps and games [16]. The platform not only provides development guides or standard kits to entrepreneurs, but also encourages them to update in order to provide higher-value products [17]. Because of technical flexibility, digital products can be iterated and updated continuously after they are released [18]. In fact, product update is one of the most important behavioral strategies for entrepreneurial firms after entering the digital platform market. However, the interaction of product updates and the entry timing effect has not yet been studied. Based on the above research gaps, this study answers the following questions to broaden the theoretical boundary: (1) How does the timing of entry of entrepreneurial firms into the digital platform market impact product performance? (2) How do product updates moderate the relationship between entry timing and product performance?

To answer the above questions, we use the game market as the research context for three main reasons: first, the game market is a standard digital platform market [10]. Platform owners (such as Valve) provide a place for game developers to interact with game players in this market. Typically, players naturally gravitate toward the platform with the most games, and developers prefer the platform with the most users [19]. The game market includes not only platform-layer markets such as Steam, Origin, and EPIC Games, but also professional-layer markets with various segments such as action games, role-playing games, and strategy games. Second, the game market's emergence as a digital platform market has a specific time node [20]. To break through the physical CD sales model, some companies gradually began to build their own online channels to release games and launch updates in the early twenty-first century. The fact that companies are allowing third-party game developers to publish games through these online channels indicates that the digital platform market (two-sided market) is beginning to emerge and grow. Third, because the game market is highly competitive and dynamic, entrepreneurial firms must constantly update in order to maintain a competitive advantage [20]. Although some gamers are loyal to certain types of games, in most cases, gamers' tastes change rapidly, and they seek novelty and creativity in their gaming experience [21]. Many game sales, for example, peak on the release date and then decline exponentially in the weeks that follow as players seek out more graphically detailed and innovative games [19,22,23]. Furthermore, changing consumer expectations require faster game updates.

Specifically, this study used monthly product data from Steam, the largest PC game market in the world, to create a balanced panel dataset for empirical analysis. According to the findings, there is a U-shaped relationship between the entry timing of entrepreneurial firms and product performance in the digital platform market. In other words, compared to entrepreneurial firms that enter the digital platform market in the mid-term, earlier or later entry can achieve higher product performance. It is important to note that the first-mover advantage outlasts the late-mover advantage. Simultaneously, product updates reduce the U-shaped relationship between entry timing and product performance, likely increasing entrepreneurial firms' first-mover and late-mover advantages.

2. Literature Review

2.1. Market Entry Timing Effect

Researchers who have studied the market entry timing effect suggests that a difference in market entry timing is a key factor in explaining differences in product performance [24–26]. According to the first-mover advantage theory, market pioneers frequently use naturally generated or actively established "isolation mechanisms," such as patent protection, scale and scope economies, learning effects, and user switching costs, to enhance first-mover profits and maintain market share durability [24,25,27]. Nikolaeva (2007) [28] confirmed that companies still have a first-mover advantage in the online retail market—however, because the Internet lowers consumer switching costs and online retailers have a shorter entry interval, this first-mover advantage is relatively short-lived. Furthermore, other studies have suggested that there may be first-mover disadvantages, which primarily include the free-rider effect, technology or market uncertainty, and asset fixity, implying that there is a "late-mover advantage" [26,29,30]. According to Cennamo and Santalo (2019) [31], as the platform matures, the free-rider effect becomes more apparent, and enterprises that enter the market later benefit from the positive influence of the first movers. In addition to the emphasis on early and late entrants, a small number of studies have investigated the impact of mid-term market entry on product performance. According to Schlichte et al., (2019) [32], mid-term market entrants are more likely to succeed than early and late entrants because they frequently enter at the peak of the technological wave, when technology acceptance is high and risks are low. However, Yao et al., (2020) [33] discovered in the online IT service market that companies entering the market in the mid-term have difficulty in obtaining both first-mover and late-mover advantages, and their performance is lower than that of early and late entrants. It is clear that existing research on the issue of when enterprises enter the market to achieve higher product performance has not reached a consistent conclusion, and there are conflicting viewpoints. As a result, we must pay closer attention to the uniqueness of the digital platform market.

2.2. Digital Platform Market

The digital platform market, unlike other markets, is made up of a professional layer and a platform layer, having typical duality. The professional layer refers to the collection of enterprises with market similarity, where "market" is a general term for both the product market and the consumer market [34]. The development of the professional-layer market is primarily influenced by segment competitors. The platform layer refers to the collection of enterprises with platform similarity, where the platform is an organizational form made up of a modular core, standardized interfaces, complementary expansion, and a set of social management mechanisms [35]. Platform owners have the most influence on the development of the platform-layer market. In particular, the digital platform market is made up of several professional-layer markets and a platform-layer market. Platform owners use their own classification system to distinguish different segments of professional-layer markets [36,37], and all professional-layer markets combine to form the platform-layer market. For example, entrepreneurs selling books on Amazon are influenced not only by the growth of complementors in Amazon's book segment (professional layer), but also by the growth of complementors in Amazon's electronics, apparel, beauty, and other market segments (platform layer) [38–40]. With the growth of the professional-layer market, there are more companies offering comparable goods and services [36]. The later the entrepreneurs enter the market, the greater the competitive pressure they may face, and the lower the first-mover advantage they can gain. With the growth of the platform-layer market, the platform resources are more abundant, such as more potential platform user groups, more mature platform technical support, a more suitable governance system, and so on [31]. The later the entrepreneurs enter the market, the smaller the market and technological risks they may face, and the higher the late-mover advantage they can gain. However, current research on the digital platform market is primarily based on two-sided markets, where platform owners profit by facilitating the interaction of supply and

demand [19]. Although this viewpoint emphasizes the importance of platform owners—i.e., the development of the platform-layer market—it ignores the influence of competitors in the segment, i.e., the development of the professional-layer market. In fact, the digital platform market is not only two-sided, but also dual, which means that the timing of entrepreneurial enterprises' market entry may be influenced by multiple aspects. In other words, there may not be a simple linear relationship between entrepreneurial firms' entry timing and product performance in the digital platform market. Based on this, we will develop additional research hypotheses.

3. Theoretical Background and Hypotheses Development

3.1. Entry Timing and Product Performance

Entrepreneurial firms that enter the digital platform market first can gain a competitive advantage in the following ways. First, early entrants into the digital platform market can seize scarce tangible resources, such as platform module interfaces, sharing technologies, and funding subsidies, as well as intangible resources, such as product brand, reputation, intellectual property, experience, and capabilities, which form resource preemption advantages compared to latecomers [8,41,42]. In order to create a network effect, platform owners usually offer resources and opportunities to help complementors' growth and development in the early stages of the digital platform market; however, as the platform matures and the network effect develops, these opportunities and resources tend to gradually diminish [43]. Entrepreneurial firms that enter the digital platform market early can gain access to the platform interface at a low or no cost, share platform resources and technologies, rapidly build brand reputation, and improve organizational capabilities [8,44]. Resource preemption advantages not only allow entrepreneurial firms to produce high-quality products with greater efficiency, but they also allow them to occupy customer perception space, resulting in higher product performance than latecomers. Second, by being the first to enter the digital platform market, entrepreneurial firms can gain product cost advantages over latecomers due to the scale effect and learning effect. The scale effect refers to the lower unit cost of mass-produced products as a result of fixed cost allocation and full use of professional equipment and personnel. The learning effect refers to the improvement of production efficiency and cost reduction through the repeated acquisition of production and management experience. In the early stages of the digital platform market, there are few complementors, and the platform owner provides strong support, which allows entrepreneurial firms to quickly increase market share and sales [45,46]. Higher product sales not only accelerate the growth of entrepreneurial firms by leveraging scale economies, but also allow them to accumulate learning experience, enabling them to provide customers with high-quality and affordable products. Third, first movers in the digital platform market may benefit from higher switching costs, making it difficult for users to switch to comparable latecomers. The switching cost refers to the cost that users must pay to switch from one product to another. Although the user's "currency switching cost" is lower in the digital platform market, "network switching costs" and "psychological switching costs" are still higher. Early entrants into the digital platform market could cultivate more users. Early users cannot easily abandon products due to the requirements of online interaction as the number of people using the product grows [33]. Moreover, users are often willing to accept and recognize the pioneer's product positioning, so they are hesitant to give up the original product and accept a newer product, resulting in the market pioneer obtaining higher product performance.

Thus, entrepreneurial firms that are the first to enter the digital platform market can form a "competitive isolation mechanism" by gaining advantages in scarce resource preemption, product costs, and switching costs, resulting in better product performance. Remarkably, the development of the professional-layer market facilitates in the formation of the competitive isolation mechanism. As the professional-layer market matures, competitors with similar products and customer bases gradually enter the platform segments. However, because the pioneers have taken up scarce resources, created scale effects and

learning effects, and gained user recognition, latecomers in the professional-layer market will find it difficult to break through the development bottleneck.

On the other hand, because the digital platform market is dual, the formation of first-mover advantage does not imply that the product performance of first movers in the digital platform market is superior to that of late movers [33]. Indeed, as the platform-layer market develops, entrepreneurial firms entering the digital platform market later can benefit from the late-mover advantage. First, entrepreneurial firms entering the digital platform market later face lower technical and market risks. In the late stages, the technical architecture of platforms is more complete and the platform's legitimacy is higher [47]. Entrepreneurial firms entering later gain access to mature technical resources and a large user market and avoid high development costs; furthermore, a perfect complementor exchange community allows late movers to learn from the pioneers' experience to avoid major technical and market mistakes, allowing them to obtain product performance more easily [8,41]. Second, as platform reputation and platform user numbers grow, entrepreneurial firms that enter the digital platform market later are more likely to benefit from the free-rider effect. The information asymmetry between product innovation efforts and product value output grows as the digital platform market matures, and the positive reputational spillover of first movers benefits all late movers [31]. Even if late movers invest less in innovation, they can still rely on successful pioneers to absorb a specific market demand, gaining user recognition by following the trend, and imitating and learning from successful experiences [48]. Third, entrepreneurial firms entering the digital platform market later have lower incumbency inertia. Entrepreneurial firms entering the digital platform frequently require platform-specific investments that cannot be easily transferred to other platforms [49]. However, when technologies or user demands change, specific investments will lock the first movers in the original market. Late movers are less constrained by incumbency inertia, making it easier to respond quickly to changes in platform user demands.

Thus, entrepreneurial firms that are late to the digital platform market can form a "competitive assistance mechanism" by benefiting from lower technical and market risks, the free-rider effect, and less incumbency inertia, resulting in better product performance. Remarkably, the development of the platform-layer market facilitates the formation of the competitive assistance mechanism. With the growth of the platform-layer market, platform technology has improved and the number of users has increased. As a result, late movers face lower market and technological risks, making it easier to free-ride, whereas first movers are more constrained by platform-specific investments. Thus, late movers are more likely to benefit from the platform's overall development, breaking through the advantages of first movers.

However, when entrepreneurial firms enter the digital platform market in the mid-term, they generally face the dual pressures of fierce competition in the professional-layer market and insufficient development of the platform-layer market. In the professional-layer market, entrepreneurial firms entering in the mid-term need to deal with pioneer competitors' advantages in scarce resources, cost, and user perception, but they also need to deal with later competitors' opportunistic behaviors such as product imitation and knowledge theft. In the medium term, the digital platform market is frequently in a stage of rapid growth [12]. In this stage, platform owners tend to prioritize quantity over quality, allowing the platform to develop extensively in order to attract users and complementors [12]. If platform supervision is not strict, it will easily result in a large influx of low-quality competitors, increasing the prevalence of knowledge theft and imitation, and increasing the competitive pressure faced by entrepreneurs entering the platform market in the mid-term [50]. In the platform-layer market, entrepreneurial firms entering in the mid-term not only face higher technical and market risks, but also are more likely to be locked into the platform. The network effect in the digital platform market's growth stage has just begun to take shape, and platform technology and modules are also undergoing further exploration [12], so they are still unable to offer entrepreneurs stable and dependable user and technical support. Even the turmoil and instability of platform technology and the

market itself increase entrepreneurial costs and risks [13]. In order to reduce the risks, entrepreneurial firms entering in the mid-term must increase their compatibility with platform technology through specific investment [49]. However, the increase in specific investment makes it difficult for entrepreneurs to easily leave the platform, reducing entrepreneurs' bargaining power and limiting the possibility of value capture [49]. It is clear that both the first-mover advantage and the late-mover advantage are at a low level when entrepreneurial firms enter the digital platform market in the mid-term, making it difficult to achieve high product performance.

To summarize, in the digital platform market, the first-mover advantage of entrepreneurial firms decreases as the entry order increases, affected by the professional-layer market, whereas the late-mover advantage increases as the entry order increases, affected by the platform-layer market. We hypothesize that entrepreneurial firms entering the digital platform market early or late can achieve better product performance than those entering in the middle. We propose the following hypothesis:

Hypothesis 1 (H1). *There is a U-shaped relationship between the entry timing of entrepreneurial firms and product performance in the digital platform market.*

3.2. The Moderating Effect of Product Updates

Using digital platforms, entrepreneurs can easily update their products to add new features and fix bugs in order to continuously improve product quality [26]. We argue that frequent product updates strengthen entrepreneurial firms' first-mover and late-mover advantages in the digital platform market.

Entrepreneurial firms that benefit from first-mover advantage will achieve higher product performance if they pay more attention to product updates. First, frequent product updates indicate that entrepreneurial firms are attempting to adapt to the rapidly changing digital environment [16], which can enhance early entrants' resource preemption advantages. This process enables entrepreneurs to quickly identify market opportunities and grasp demand changes, resulting in the effective use of valuable and heterogeneous resources in response to customer demand. For example, through continuous updates, entrepreneurs can provide products that are more compatible with the platform. Product updates increase the scarcity and inimitability of resources [51], which prevents subsequent competitors from surpassing the first movers to some extent. Second, frequent product updates indicate that entrepreneurial firms have the potential for continuous innovation [18], which can enhance early entrants' product cost advantages. Sustained innovation potential requires the use of technologies such as patents, copyrights, and trademarks. These technologies promote the improvement of product processes, the reduction of cost input, and the formation of experience and scale effects [52], resulting in high-quality products. Third, frequent product updates indicate that enterprises interact more actively with users [17], which can enhance early entrants' switching costs advantages. A more active interaction with users not only benefits brand perception and increases users' psychological switching costs, but also attracts more users to try products, increasing users' network switching costs [19,53]. It is thus evident that product updates will enhance the advantages of resource preemption, product costs, and switching costs, increasing the likelihood of entrepreneurial firms entering the digital platform market earlier to achieve higher product performance.

Entrepreneurial firms that benefit from late-mover advantage will achieve higher product performance if they pay more attention to product updates. First, frequent product updates demonstrate that entrepreneurial firms have strong learning and absorption capabilities [54], which can reduce the technological and market risks faced by late movers even further. Strong learning and absorptive capabilities assist late-entry entrepreneurs in quickly making the leap from knowledge acquisition to knowledge absorption and then to innovation output [55], which enables them to not only rapidly break down the technical barriers from first movers, but also quickly grasp market trends. Second, frequent product

updates indicate that entrepreneurial firms actively seek to improve product quality and value for users [17], which increases the free-rider effect. Late movers will profit from the platform's first movers' positive spillover value [31]. Users will recognize late movers more if late movers can exceed user expectations for product quality formed by the first movers. Third, frequent product updates indicate that late movers are attempting to establish new product standards [18], which may not only promote technological changes but also affect consumer cognition and habits [56]. These, in turn, enhance the negative impact of the incumbent inertia of the first movers, which may place the first movers at a disadvantage. It is thus evident that product updates will enhance the advantages of low technology and market risk, the free-rider effect, and low incumbency inertia, increasing the likelihood of entrepreneurial firms entering the digital platform market later to achieve higher product performance.

To summarize, more active product updates not only improve entrepreneurial firms' first-mover advantages, but also late-mover advantages in the digital platform market, which is conducive to improving product performance. We propose the following hypothesis:

Hypothesis 2 (H2). *Product updates moderate the U-shaped relationship between entrepreneurial firms' entry timing and product performance in the digital platform market.*

Figure 1 depicts the theoretical model.

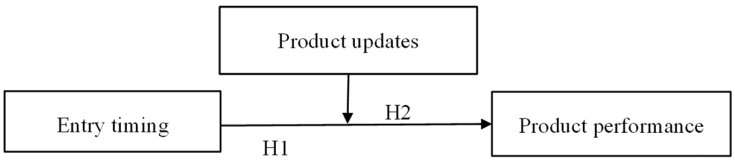

Figure 1. The theoretical model.

4. Method

4.1. Data

For the following reasons, this study chose products released by game developers on the Steam platform as samples. First, and most importantly, Steam is one of the world's largest PC game distribution platforms, using digital technology to connect game developers and gamers. As a typical digital platform market, it offers significant entrepreneurial and innovative opportunities for developers. Second, after nearly two decades of development, the Steam platform has completed a full cycle of start-up, growth, and maturity, providing a realistic context for discussing entry timing effects. Third, the Steam gaming market is vibrant and competitive. Platform-layer hardware technologies evolve quickly, and professional-layer game updates also occur quickly, which meets the requirements of product updates in this study.

Our data were collected from the third-party Steam database website—Steam DB (https://steamdb.info/) (accessed on 15 February 2022), which can query the developers, publishers, release dates, gamer changes, price adjustments, and other information of games on the Steam platform. In order to decrease missing data and guarantee a constant sample size, we first selected the top 1000 games from the Most Played Games list in January 2022 as the initial sample. Then, in order to investigate the impact of product updates, we focused on games that were updated between December 2020 and January 2022, obtaining 324 samples. Furthermore, we limited the sample to entrepreneurial firms. According to Kazanjian and Drazin (1990) [57], firms typically go through four stages: conception and development, commercialization, growth, and stability. Firms in the first three stages are entrepreneurial enterprises, while firms in the fourth stage are mature enterprises [58]. In general, it takes 8 to 12 years for a firm to reach the stability stage and become mature [59]. Because game development requires not only continuous technological update and iteration, but also all-around support such as art, script, and

planning, developer maturity often takes a long time [23]. For example, the computer game Mafia II alone took 6 years to develop, and although the development of Duke Nukem Forever began in 1997, the game was not released until June 2011. Based on this, we focused on game firms with a history of less than 12 years as entrepreneurial firms. We excluded games developed by companies established more than 12 years ago, leaving 176 samples. As a result, we created a balanced panel dataset with 2464 observations of 176 games from December 2020 to January 2022.

4.2. Measures

(1) Dependent Variable

The dependent variable is product performance. Product performance is to capture successful games. Games can often generate multiple profit models [60]. For example, game developers can obtain not only direct income from players buying games and related props, but also licensing fees by authorizing downstream additional products (such as popular game dolls, clothing, or character collection cards). In general, the greater the acceptance or popularity of a game, the greater the likelihood that the game developer will profit through multiple channels [60]. Therefore, this paper suggests that the higher the acceptance and popularity of the game, the more successful the game is, in other words, the better the product performance will be. On the one hand, consumers post online reviews based on their own product experiences [61]. If there are more positive online reviews, it indicates that more users approve and accept the product [62]. On the other hand, more users of a product not only means that users can interact with more users to obtain a better product experience, but also indicates that the product's popularity is higher [63]. Based on this, this study measures product performance by using the logarithm of the number of monthly game positive reviews and game user peaks in order to capture successful products based on game acceptance and popularity.

(2) Independent Variable

The independent variable is the entry timing. Recent research on the entry timing effect has shifted away from first movers toward the timing of entry, emphasizing the relative order of market entry [33,47,64]. Based on this, the month in which the developers released new games on the Steam platform is used as the entry time point, and the difference between this time point and each recorded month is used to calculate the value of the entry timing variable. The earlier the entry time, the greater the value, and the later the entry time, the lower the value.

(3) Moderator Variable

Product updates are the moderator variable. Through game updates, game developers can continuously improve the quality of their games by fixing bugs and introducing new features [20]. In general, the higher the update frequency, the faster the product evolves [18]. Based on previous research [9,18,65], this study measures product update frequency by the number of game updates per month.

(4) Control Variable

As control variables, this study chooses data at the platform, enterprise, and product levels. At the platform level, this study first controls the number of platform user peaks, which may affect the change in game user peaks. This study also controls the monthly number of new games added to the platform, which represents the growth of the platform-layer market. The monthly number of new games on the segment categories is then controlled, which represents the growth of the professional-layer market. The control values listed above are in logarithmic scale. Furthermore, this study controls the number of Steam platform updates, which represent platform innovation. At the enterprise level, this study controls the age of game developers first, and then the developer experience, which is measured by the number of games released by the developer in the current month.

At the product level, this study controls the price of games, which may decrease due to promotion during the data collection period.

5. Results

5.1. Descriptive Statistics

Table 1 displays the variables' mean, standard deviation, and correlation coefficient. Among them, there is a significant negative correlation between entry timing and the number of positive reviews (the correlation coefficient is -0.092, $p < 0.01$), while there is a non-significant negative correlation between entry timing and game user peaks. Because we predict a U-shaped relationship between entry timing and product performance, the presence or absence of a linear correlation has no impact on subsequent regression tests. Meanwhile, the correlation coefficient between all variables is less than 0.8, and the variance inflation factor (VIF) is less than 3.23, indicating that there is no multicollinearity problem.

Table 1. Descriptive statistics of panel data.

	1	2	3	4	5	6	7	8	9	10	11
1. Positive reviews	1										
2. User peaks	0.783 ***	1									
3. Entry timing	−0.092 ***	−0.021	1								
4. Game updates	0.016	0.102 ***	−0.128 ***	1							
5. Platform users	−0.004	0.018	0.094 ***	−0.009	1						
6. Platform games	−0.055 ***	−0.021	0.138 ***	−0.003	0.202 ***	1					
7. Segment games	0.304 ***	0.088 ***	−0.126 ***	−0.145 ***	0.005	0.040 *	1				
8. Platform updates	0.039 *	0.004	−0.080 ***	0.002	−0.336 ***	−0.546 ***	−0.021	1			
9. Age	−0.007	0.085 ***	0.204 ***	−0.068 ***	0.043 **	0.046 **	0.099 ***	−0.027	1		
10. Experience	−0.064 ***	0.046 **	−0.019	−0.035 *	0.004	0.004	0.031	−0.002	0.178 ***	1	
11. Price	0.144 ***	0.163 ***	−0.118 ***	−0.124 ***	−0.001	−0.002	0.210 ***	−0.014	0.114 ***	0.485 ***	1
Mean	2.504	3.330	1.371	2.914	7.419	2.989	2.240	1.500	7.199	2.517	48.175
Std. Dev.	0.713	0.588	0.391	6.121	0.020	0.044	0.513	1.500	3.407	7.438	50.505

Note: the number of observations (N) is 2464; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.2. Regression Equation

The Hausman test of the model reveals that the unobserved individual effect and the explanatory variable are correlated ($p < 0.05$), but the unobserved time effect and the explanatory variable are not correlated ($p > 0.05$), indicating that estimating based on the individual fixed effect model is more scientific. At the same time, because the entry timing value is the difference between the record month and the product release month, there is no possibility of mutual causality with the number of positive reviews and user peaks in the current month. As a result, the dependent variable takes on the current value. Based on this, we constructed the regression equation as below.

$$\begin{aligned} ProductPerformance_{i,t} = {} & \beta_0 + \beta_1 \times EntryTiming_{i,t} + \beta_2 \times EntryTiming_{i,t}{}^2 + \beta_3 \times GameUpdates_{i,t} \\ & + \beta_4 \times EntryTiming_{i.t} \times GameUpdates_{i.t} + \beta_5 \times EntryTiming_{i.t}{}^2 \times GameUpdates_{i.t} \\ & + \beta_6 \times PlatformUsers_t + \beta_7 \times PlatformGames_t + \beta_8 \times SegmentGames_{i.t} \\ & + \beta_9 \times PlatformUpdates_t + \beta_{10} \times Age_{i.t} + \beta_{11} \times Experience_{i.t} \\ & + \beta_{12} \times Price_{i.t} + \alpha_i + \gamma_t + \varepsilon_{i.t} \end{aligned}$$

$ProductPerformance_{i,t}$ refers to game i's performance in record month t (the month in which game data is observed and recorded), as measured by the number of positive reviews ($PositiveReviews_{i,t}$) and user peaks ($UserPeaks_{i,t}$). $EntryTiming_{i,t}$ represents the entry timing value of game i in record month t. $EntryTiming_{i,t}{}^2$ represents the entry timing value at the second power, to further determine the curve relationship between entry timing and product performance. $GameUpdates_{i,t}$ refers to the number of updates to game i in

record month t. $PlatformUsers_t$ represents the peak of platform users in record month t. $PlatformGames_t$ is the number of new games added to the platform during record month t. $SegmentGames_{i,t}$ represents the number of new games added to the market segment where game i belongs in record month t. $PlatformUpdates_t$ represents the number of platform updates in the record month t. $Age_{i,t}$ represents the age of the company developing game i in record month t. $Experience_{i,t}$ represents the number of other games developed by the company developing game i on the platform as of record month t. $Price_{i,t}$ represents the price of game i in record month t. β_0 is a constant item, β_1–β_{12} are the regression coefficients, α_i measures the difference between individuals, γ_t measures the difference between times, and $\varepsilon_{i,t}$ is a random error item.

5.3. Estimation Results

Table 2 displays the regression results. Models 1–3 in Table 2 show the regression analysis results with the number of positive reviews as the dependent variable, while models 4–6 show the regression analysis results with the user peaks as the dependent variable. Models 1 and 4 are regression models of the impact of control variables on dependent variables. Model 2 extends Model 1 by adding the entry timing and the second power of the entry timing, and Model 5 extends Model 4 by adding the entry timing and the second power of the entry timing. Model 3 adds the moderating effect of product updates based on Model 2, and Model 6 adds the moderating effect of product updates based on Model 5.

Table 2. Regression results (N = 2464).

	$PositiveReviews_{i,t}$			**$UserPeaks_{i,t}$**		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	−5.613 ***	−1.137	−0.269	−0.304	−0.686	0.207
	(1.904)	(1.781)	(1.737)	(−4.715)	(1.867)	(1.829)
$PlatformUsers_t$	1.286 ***	0.762 ***	0.684 ***	0.642	0.716 **	0.648 **
	(0.242)	(0.225)	(0.219)	(0.625)	(0.236)	(0.231)
$PlatformGames_t$	−0.241 *	−0.314 **	−0.436 ***	−0.477	−0.147	−0.265 *
	(0.146)	(0.135)	(0.132)	(0.321)	(0.141)	(0.139)
$SegmentGames_{i,t}$	0.097	0.066	0.073	0.055 *	0.051	0.058
	(0.062)	(0.057)	(0.056)	(0.024)	(0.060)	(0.058)
$PlatformUpdates_t$	0.012 ***	0.013 ***	0.012 ***	0.002	0.000	−0.001 ***
	(0.003)	(0.003)	(0.003)	(0.010)	(0.003)	(0.003)
$Age_{i,t}$	−0.119 ***	−0.120 ***	0.012 ***	0.012 **	−0.113 **	−0.130 ***
	(0.020)	(0.033)	(0.003)	(0.004)	(0.035)	(0.035)
$Experience_{i,t}$	0.004	−0.004	−0.002	−0.004 ***	−0.003	−0.001
	(0.007)	(0.007)	(0.006)	(0.002)	(0.007)	(0.007)
$Price_{i,t}$	−0.001 ***	−0.001 ***	−0.001 ***	0.002 ***	−0.001 **	0.001 *
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EntryTiming_{i,t}$		−0.986 ***	−1.031 ***		−0.782 ***	−0.916 ***
		(0.090)	(0.095)		(0.094)	(0.100)
$EntryTiming_{i,t}^2$		0.520 ***	0.570 ***		0.479 ***	0.587 ***
		(0.080)	(0.082)		(0.084)	(0.086)
$GameUpdates_{i,t}$			0.013 ***			0.012 ***
			(0.001)			(0.001)
$GameUpdates_{i,t} \times EntryTiming_{i,t}$			0.068 ***			0.088 ***
			(0.013)			(0.014)
$GameUpdates_{i,t} \times EntryTiming_{i,t}^2$			−0.078 ***			−0.103 ***
			(0.019)			(0.019)
R^2	0.939	0.949	0.952	0.908	0.918	0.922
Adjusted R^2	0.934	0.945	0.948	0.900	0.911	0.915
F-value	187.189 ***	220.503 ***	229.609 ***	119.686 ***	131.885 ***	136.206 ***

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Standard errors are in parentheses.

First, we examine the direct effect of entry time on product performance. Model 2 demonstrates that the regression coefficient of the first power of entry timing on the positive reviews is significantly negative ($\beta = -0.986$, $p < 0.01$), while the regression coefficient of the second power of entry timing on the positive reviews is significantly positive ($\beta = 0.520$, $p < 0.01$). Meanwhile, Model 5 demonstrates that the regression coefficient of the first power of entry timing on the user peaks is significantly negative ($\beta = -0.782$, $p < 0.01$), while the

regression coefficient of the second power of entry timing on the user peaks is significantly positive ($\beta = 0.479$, $p < 0.01$). The results of Models 2 and 5 show that the impact of entry timing on product performance has a U-shaped relationship. Moreover, Model 3 demonstrates that the regression coefficient of the first power of entry timing on the positive reviews is significantly negative ($\beta = -1.031$, $p < 0.01$), while the regression coefficient of the second power of entry timing on the positive reviews is significantly positive ($\beta = 0.570$, $p < 0.01$). Meanwhile, Model 6 demonstrates that the regression coefficient of the first power of entry timing on the user peaks is significantly negative ($\beta = -0.916$, $p < 0.01$), while the regression coefficient of the second power of entry timing on the user peaks is significantly positive ($\beta = 0.587$, $p < 0.01$). The results of Models 3 and 6 also show that the impact of entry timing on product performance has a U-shaped relationship. Therefore, Hypothesis 1 is supported. Furthermore, the absolute value of the second power's regression coefficient is smaller than that of the first power, indicating that the first-mover advantage is stronger than the late-mover advantage.

Second, we examine the moderating effect of product updates. Model 3 demonstrates that the regression coefficient of the interaction term between the first power of entry timing and game updates on the positive reviews is significantly positive ($\beta = 0.068$, $p < 0.01$), while the regression coefficient of the interaction term between the second power of entry timing and game updates on the positive reviews is significantly negative ($\beta = -0.078$, $p < 0.01$). Meanwhile, Model 6 demonstrates that the regression coefficient of the interaction term between the first power of entry timing and game updates on the user peaks is significantly positive ($\beta = 0.088$, $p < 0.01$), while the regression coefficient of the interaction term between the second power of entry timing and game updates on the user peaks is significantly negative ($\beta = -0.103$, $p < 0.01$). The results of Models 3 and 6 show that product updates moderate the U-shaped relationship between entry timing and product performance, supporting Hypothesis 2. To demonstrate the moderating effect of product updates more intuitively, we draw a moderating effect diagram, shown in Figure 2.

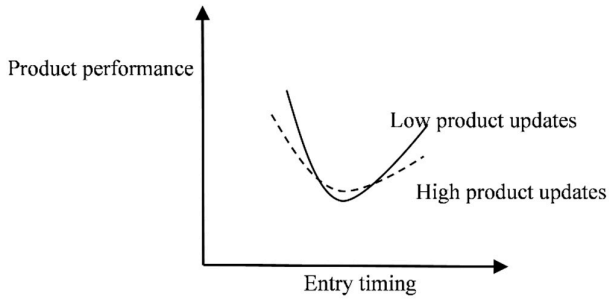

Figure 2. The moderating effect of product updates.

In addition, the regression results show some other relatively stable relationships. First, platform users have significant positive impacts on the game positive reviews (Models 1–3) and the game user peaks (Models 5 and 6). In Model 4, although the number of platform users has a positive impact on the game user peaks, it is not significant. This partially demonstrates that platforms with more users can help entrepreneurial firms achieve better product performance. As a result, entrepreneurial firms are more inclined to enter a platform market with a large user base. This finding also confirms the existence of indirect network effects in digital platform markets, which means that the value added by network participants is dependent on the number of users with whom they can interact [66]. Second, the number of new games added on the platform has a significant negative impact on the game positive reviews (Model 1–3) and the game user peaks (Model 6). In Models 4 and 5, although the number of new games added on the platform has a negative impact on the game user peaks, it is not significant. This partially demonstrates that the greater the number of games in the platform market, the more intense the competition, which reduces entrepreneurial firms' product performance. This is because as competition increases, it

becomes more difficult for products to attract user attention and gain user recognition. This also confirms the existence of the "crowding effect" in the digital platform market, according to which, as the platform market becomes more crowded, products are more likely to be lost in the market [67]. Third, product updates have a positive impact on the game positive reviews (Models 3) and the game user peaks (Models 6). This demonstrates that the more frequently the product is updated, the more likely it is that entrepreneurial firms introduce new functions or fix errors, which can not only bring about better user experience, but also attract the attention of more users, promoting product performance improvement. This also confirms that as one of the important means of innovation, product updates are not only a source of a company's long-term competitive advantage, but also the key to creating and capturing value [54].

5.4. Robustness Checks

Because this study measures product performance using positive reviews and user peaks, it is important to take into account that the annual Christmas special on the Steam platform has a significant impact on the monthly fluctuations in game user numbers. It is necessary to control the impact of this special event during the robustness test. Accordingly, we excluded the firm data from December, and the regression results are shown in Table 3. The regression results in Table 3 do not differ significantly from the previous ones, which all support the hypotheses, indicating that the results are quite robust.

Table 3. Regression results (N = 2112).

	PositiveReviews$_{i,t}$			**UserPeaks$_{i,t}$**		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	−6.169 ***	−1.624	−0.715	−4.270 **	−0.124	0.904
	(1.894)	(1.782)	(1.734)	(1.954)	(1.885)	(1.842)
PlatformUsers$_t$	1.416 ***	0.881 ***	0.793 ***	1.115 ***	0.639 ***	0.553 **
	(0.241)	(0.225)	(0.218)	(0.248)	(0.238)	(0.232)
PlatformGames$_t$	−0.436 ***	−0.489 ***	−0.601 ***	0.023	−0.028	−0.136
	(0.152)	(0.141)	(0.137)	(0.157)	(0.149)	(0.146)
SegmentGames$_{i,t}$	0.043	0.021	0.027	−0.070	−0.086	−0.083
	(0.073)	(0.068)	(0.066)	(0.076)	(0.071)	(0.070)
PlatformUpdates$_t$	0.012 ***	0.013 ***	0.012 ***	0.000	0.000	−0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Age$_{i,t}$	−0.082 ***	−0.097 **	−0.097 **	−0.075 ***	−0.113 ***	−0.133 ***
	(0.021)	(0.038)	(0.038)	(0.022)	(0.040)	(0.040)
Experience$_{i,t}$	0.006	−0.004	−0.002	0.010	0.000	0.001
	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)
Price$_{i,t}$	−0.001 ***	−0.001 **	−0.001 *	−0.001 ***	−0.001 **	−0.001 *
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EntryTiming$_{i,t}$		−1.015 ***	−1.078 ***		−0.823 ***	−1.007 ***
		(0.098)	(0.105)		(0.104)	(0.111)
EntryTiming$_{i,t}^2$		0.555 ***	0.611 ***		0.490 ***	0.627 ***
		(0.090)	(0.092)		(0.095)	(0.098)
GameUpdates$_{i,t}$			0.014 ***			0.012 ***
			(0.001)			(0.002)
GameUpdates$_{i,t}$ × EntryTiming$_{i,t}$			0.064 ***			0.089 ***
			(0.013)			(0.014)
GameUpdates$_{i,t}$ × EntryTiming$_{i,t}^2$			−0.068 ***			−0.100 ***
			(0.020)			(0.021)
R^2	0.942	0.952	0.954	0.909	0.919	0.923
Adjusted R^2	0.937	0.947	0.950	0.901	0.911	0.916
F-value	167.965 ***	196.297 ***	205.468 ***	103.395 ***	114.265 ***	118.669 ***

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; standard errors are in parentheses.

6. Discussion

Digital technologies are significant external enablers that have the potential to change the nature and process of entrepreneurship [44]. Digital platform markets have also become important places for enterprises to carry out innovation and entrepreneurship [8]. In recent years, the question of whether or not entrepreneurial firms enter the digital platform market has received little attention. Although the focus is on how entrepreneurial firms should enter the digital platform market to gain a competitive advantage—particularly how to

choose an entry timing strategy—there is no consensus on this issue. Zhao et al., (2020) [20] discovered that the higher the enterprise experience or the lower the structural embeddedness of the network, the earlier it is likely to enter the digital platform market and achieve higher performance. Rietveld and Eggers (2018) [19] found that as the platform's late users increased, unit sales of complementary products decreased due to lower willingness to pay, higher risk aversion, and greater pursuit of popularization. These findings suggest that entrepreneurs who enter the digital platform market earlier can benefit more from experience and network advantages, as well as acquire more high-quality users. Further, McIntyre and Srinivasan (2017) [66] believe that there is a strong network effect in the digital platform market, which means that users can obtain more value on platforms with more users, and the value that network participants can obtain depends on the number of users. According to Jiang et al., (2011) [39], there is a free-rider phenomenon in the digital platform market, which becomes stronger as the number of buyers increases. These viewpoints indicate that entrepreneurial firms that enter the digital platform market later face lower market risks and a greater likelihood of free-riding. Unlike those of previous studies, our findings indicate that, due to the existence of the platform layer and professional layer in the digital platform market, there is not a simple linear relationship between entrepreneurial firms' market entry timing and product performance, but that there are both first-mover and late-mover advantages. This finding not only incorporates the consensus of the preceding viewpoints, but also reconciles their disagreements, providing novel directions for the discussion of entry timing in the digital platform market.

However, the right timing alone is not enough to conquer the market. The eventual winners have been shown to not only time their entry into the market perfectly, but also to take a series of strategic actions [68]. In traditional markets, Reddy et al., (1994) [69] found that early entry requires a combination of parent brand strength, firm size, and marketing capabilities, and is positively correlated with the success of product line expansion in the cigarette industry. According to Boulding and Christen (2009) [70], firms with broad product lines benefit from pioneering only when they invoke a versioning strategy that creates incremental product assortments from standard product offerings to meet anticipated demand. Husairi et al., (2021) [71] investigated the relationship between entry behavior strategies, such as product line breadth and product innovation, and entry timing strategies across the portable media player, portable computer, digital camera, and smartphone industries. In the digital platform market, however, fewer studies investigate the impact of entry behavior strategies on entry timing effects, and more studies concentrate on market-level variables. For example, Yao et al., (2020) [33] explored the impact of market growth and market concentration on the entry timing effect in the digital platform market. Zhao et al., (2020) [20] investigated how market development impacts relevant experience, network structure embeddedness on entry timing, and firm performance. This study uses product updates as a moderating variable to emphasize the importance of matching the entry behavior strategy and the entry timing strategy in the digital platform market. The study results show that increasing the frequency of product updates improves both the first-mover advantage and the late-mover advantage of entrepreneurial firms. This finding emphasizes the importance of adopting positive behavior strategies by entrepreneurial firms, which is a beneficial spin-off of the issue of entry timing in the digital platform market.

7. Conclusions and Implications

7.1. Conclusions

The effect of entry timing of entrepreneurial firms has received extensive attention in strategy and entrepreneurship research. However, there is no consistent conclusion due to differences in market types and methodological limitations. To enrich theoretical knowledge on the subject, it is necessary to investigate the market entry timing effects of entrepreneurial firms in emerging markets. From the perspective of market duality, we explored the impact of entry timing on product performance in digital platform markets,

as well as the moderating effect of product updates. The following are the main conclusions. (1) Unlike other markets, the digital platform market is divided into two layers, the professional layer and the platform layer, both of which influence the entry timing effect of entrepreneurial firms. (2) In the digital platform market, entrepreneurial firms have both first-mover and late-mover advantages. In other words, compared to medium-term entry, entrepreneurial firms can enter the digital platform market earlier or later to achieve higher product performance. According to regression coefficients, the persistence of first-mover advantage is greater than that of late-mover advantage. (3) Product updates moderate the U-shaped relationship between the impact of entry timing on product performance. This implies that product updates can boost entrepreneurial firms' first-mover and late-mover advantages in the digital platform market.

7.2. Theoretical Contributions

First, this study focuses on the entry timing of digital games, which adds to the traditional entry timing theory. Existing studies have discovered that there are clear first-mover advantages in some markets [24,25,27] and late-mover advantages in others [26,29,30]. These conclusions, however, cannot be easily applied to the digital platform market, particularly to digital products such as games and apps. On the one hand, as competitors gradually enter the segmented market, entrepreneurial firms' early entry will result in advantages in resource preemption, product cost, and switching cost, promoting the formation of a competitive isolation mechanism, allowing enterprises to benefit from first-mover advantage. On the other hand, as the overall platform market grows, the platform network effect gradually emerges. Late-entry entrepreneurs can benefit from low technology and market risk, the free-rider effect, and low incumbency inertia, promoting the formation of a competitive assistance mechanism, enabling enterprises to benefit from the late-mover advantage. The above findings broaden the applicable boundary of the traditional entry timing theory based on the unique context of the digital platform market.

Second, this study proposes duality in the professional and platform layers, which broadens the cognitive view of the digital platform market. Existing studies interpret digital platforms primarily through the lens of a two-sided market, arguing that they serve as an intermediary between the supply and demand sides via digital technology [1,2]. Although this viewpoint is important for defining the digital platform market, it does not fully explain the entry timing effect of digital products, resulting in a multitude of conflicting views and conclusions. In fact, duality has emerged as an important perspective for understanding the issues in the digital platform market. For example, Nambisan and Baron (2021) [42] believe that entrepreneurs have dual identities in the digital platform market, as platform ecological participants and new venture managers. This study argues that the digital platform market is divided into two layers: professional and platform. Entrepreneurs will be affected not only by the overall development of the platform, but also by the development of market segments. These insights provide new solutions to problems in the digital platform market.

Finally, this study emphasizes the distinctiveness of digital product updates as well as the importance of matching to the entry time. Existing studies have focused on the interaction of market characteristics (such as market growth and market concentration) and entry timing [33], while ignoring the role of subjective initiative in entry behavior strategies. In fact, the digital platform market provides very convenient conditions for digital product updates [16], which is one of the key behavioral strategies that entrepreneurial firms will employ once they enter the market. We find that product updates not only improve the advantages of resources preemption, product costs, and switching costs in first entry, but also enhance the advantages of low technology and market risk, the free-rider effect, and low incumbency inertia in late entry. This finding emphasizes the importance of matching when and how to enter the market.

7.3. Practical Implications

First, this study inspires strategic decisions about when entrepreneurial firms should enter the digital platform market. Entrepreneurial firms frequently regard entering digital platform markets as a significant way to lower entrepreneurial risks and costs. However, deciding when to enter the digital platform market can be difficult. If the market is still emerging, the risk may be high, but it may be challenging to compete in the mature stage. According to this study, both early and late entry can achieve higher product performance than mid-term entry, and first-mover advantage lasts longer than late-mover advantage. As a result, when making strategic decisions, entrepreneurial firms can consider both the potential emerging digital platform market and the well-developed mature digital platform market. Furthermore, if they enter the emerging digital platform market earlier, it is easier to form long-term advantages.

Second, this study emphasizes the importance of matching entry behavior strategies with entry timing strategies. In fact, successful entry timing strategies often require a combination of appropriate entry behavior strategies. When selecting a potential emerging digital platform market for early entry, entrepreneurial firms should quickly seize the platform's advantageous resources, provide high-quality products, and cultivate brand reputation and user stickiness. When selecting a well-developed mature digital platform market for late entry, entrepreneurs should identify market segments that complement mature enterprises, explore new market opportunities, and gradually change market demands and user perceptions. Providing product updates can help to speed up the above two processes.

Finally, this study encourages platform owners to pay attention to entrepreneurial firms' "mid-mover disadvantage." In comparison to pioneers, entrepreneurial firms entering the digital platform market in the mid-term obtain limited platform and user resources. In comparison to late movers, entrepreneurial firms entering the digital platform market in the mid-term face not only higher technical and market risks, but also a higher risk of being "locked in" by the platform. In order to ensure the healthy development of the platform ecosystem, platform owners should provide some resources to entrepreneurial firms that fall into the "mid-mover disadvantage," assisting them in breaking through development bottlenecks.

7.4. Limitations and Future Research

First, this study only looked at the interactive effect of product updates and entry timing, and did not consider the impact of other entry behavior strategies such as product line breadth, product complementarity, and business model innovation. Future research can further explore the interplay between a range of entry behavior strategies and the entry timing effect. Second, this study used positive reviews and user peaks to measure product performance, focusing solely on the level of user preference, while other product performance factors such as market share, transfer cost, and product diffusion were not considered. These factors can be explored in future research. Third, since this study only considers the direct effect of entry timing and the moderating effect of product updates, the research model is simple. Future research could consider increasing the model's complexity, such as investigating the intermediary effects of top management team behavior integration, social capital, and network relations between entry timing and product performance. Finally, the samples were from a game platform, which is distinct from other digital platforms such as e-commerce and search engine platforms. The generalizability of this study's findings to other contexts must thus be confirmed in future research.

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