Pandora Box or Golden Fleece: Economic Analysis of Generative AI Adoption on Creation Platforms

Yi Gao
Texas Tech University
yi.gao@ttu.edu

Zhe Wang
City University of Hong Kong
zhe.wang@cityu.edu.hk

Yan Huang
Carnegie Mellon University
yanhuang@andrew.cmu.edu

Abstract

In this paper, we employ a game-theoretic approach to analyze the impact of adopting generative AI tools on various market outcomes, including creators' creativity level and pricing strategies, the platform's regulatory strength, and consumer welfare. Our results show that although generative AI tools can facilitate content creation by leading to a higher quality, creators' creativity levels and prices may experience a decline compared to the regime without such tools. We also find that even though generative AI has the potential to improve content quality, it is not always true that the utilization of such tools can lead to higher consumer welfare. Moreover, we find that the platform opts for a relatively low regulatory strength when the AI intelligence is relatively small. Interestingly, as generative AI acquires a more extensive knowledge base, the platform and creators may be less willing to adopt it.

Keywords: Generative AI, creation platforms, creativity, pricing strategies, regulatory strength.

1. Introduction

In an era marked by unprecedented advancements in artificial intelligence (AI), creativity is often praised as an inherently human attribute, seemingly less susceptible to the impact of technological upheavals and crucial for the times ahead. However, as generative AI algorithms gain prominence in facilitating automated content generation, questions regarding their economic impact on creators, consumers, and platform ecosystems become paramount. Recently, facing the tremendous advantages of generative AI, many companies and platforms have recognized the importance of adopting AI to promote the efficiency and performance of the human workforce. Platforms like YouTube and Snap have started introducing generative AI features for creators to use AI-generated video or image backgrounds by typing their visual concepts. In contrast, some platforms remain suspicious about the usage of generative AI and even prohibit using this tool. For example, Stack Overflow introduced a temporary policy to ban AI-generated content on the platform, aiming to enhance content quality without being flooded by plausible but false responses.

From the perspective of creators, it is commonly believed that generative AI has the potential to significantly boost productivity for routine works (e.g., writing polish in the literary industry), and hence, increase content quality (Davenport and Mittal 2022, Zhang and Gosline 2023). While generative AI facilitates creators' production efficiency, the impact of generative AI on creativity is contradictory. On the one hand, generative AI algorithms are trained on extensive datasets, enabling them to develop a comprehensive understanding of various subjects. As a result, the content produced tends to exhibit a depth of understanding that can surpass what an individual creator might achieve within a limited timeframe, and generative AI enables content creators to achieve more with fewer resources (Pattisall 2023). On the other hand, generative AI's strength lies in its ability to analyze and generate content based on data it has been trained on. It may not be able to create completely original ideas or concepts that haven't been encountered before, as human creators are capable of doing. Additionally, the risk of homogenization looms large as generative AI, by learning from existing trends and popular content, might inadvertently contribute to narrowing creative diversity (Doshi and Hauser 2023). Thus, striking the right balance between human creativity and AI augmentation becomes crucial for content creators.

In addition to its impact on creators, the utilization of generative AI can also affect user engagement. Advocates argue that the sophisticated content generation capabilities of AI may contribute to a surge in user demand. By automating and optimizing creative processes, generative AI can allow creators to produce more compelling materials and potentially charge lower prices due to intensified competition, thereby increasing user welfare. However, the opposite can also be true as excessive reliance on AI-

URI: https://hdl.handle.net/10125/109165
978-0-9981331-8-8

generated content may result in a less diverse or novel pool of content, hurting user welfare.

Some practitioners believe that generative AI can help people diversify and expand existing knowledge assets to unlock new creativity possibilities, while others posit that unfair algorithmic competition and inadequate governance may lead to the crowding out of authentic human creativity (De Cremer 2023). Therefore, how to regulate generative AI is important and challenging for creation platforms. On the one hand, platforms can benefit from generative AI utilization if machines can assist humans in content production with greater efficiency and performance, which in turn leads to greater user volume and higher commission revenue generated by platforms; on the other hand, as generative AI raises risks to authentic human creativity and innovation, such adoption may result in lower content creativity and hence user attrition in the long run, which negatively affects platforms' revenue. Faced with this tradeoff, platforms must be more cautious of how they regulate the generative AI usage.

In this paper, we focus on creative markets such as eToro and Patreon, where creators can market their products to consumers on creation platforms and receive payments in return. The spectrum of content products encompasses diverse items such as artwork, code, newsletters, online courses, etc. Despite the increasing importance of analyzing these issues, there is limited guidance available in the existing literature. To address these gaps, we employ a game-theoretic framework to explore the following research questions:

- *As for creators, will they become less creative due to the overreliance on generative AI, and how will their pricing strategies change in response to the utilization of generative AI?*
- *As for consumers, will they benefit from the creators' utilization of generative AI tools?*
- *As for the platform, will it benefit from adopting generative AI tools, and how to set the optimal regulatory strength?*

Our study generates several interesting findings. First, we find that when the AI intelligence is not high enough, creators' creativity actually decreases compared to the case where generative AI is not available. Our result also reveals that as AI intelligence increases, creators may sometimes be unwilling to utilize generative AI tools. Second, interestingly, we find that although generative AI can enhance content quality, consumers may not always benefit from the creators' utilization of generative AI tools, especially when the AI intelligence is relatively high. Third, our results show that the platform should set a relatively low regulatory strength and encourage generative AI adoption when the AI intelligence level is relatively small, and the opposite is true when the AI intelligence level is relatively large. Surprisingly, we also find that as the generative AI possesses a greater knowledge base (i.e., AI intelligence level increases), it is not necessarily true that the platform will incentivize more adoption of generative AI from the creators.

Our paper contributes to the literature in several aspects. First, our work is among the first to analytically examine the impact of the adoption of generative AI tools on creation platforms. We add to the literature on platform strategy by investigating how generative AI adoption affects the creators' positioning and pricing decisions and how the platform should respond to this change. Second, while prior studies on creative markets have primarily focused on identifying the driving factors that influence individual or group creativity, our contribution lies in examining how the adoption of generative AI impacts creators' creativity (positioning) decisions. In particular, since creativity is a unique competitive aspect, we extend the literature on AI and creativity (e.g., Lysyakov and Viswanathan 2023) by examining how creators' creativity strategies impact market structure and stakeholders' payoffs. Third, our work enriches the literature on human-AI interaction by capturing the two unique features of generative AI (or algorithms), which include enhancing the overall content quality and enabling creators to access the knowledge the machine possesses. Specifically, we analyze how these two features of generative AI affect the platform's and creators' decisions.

2. Literature Review

2.1. Impact of Generative AI Adoption

With the introduction of ChatGPT in 2022, there has been a heated discussion of large language models in academia, especially on the impact of generative AI model adoption. Regarding the impact of generative AI on online platforms, there are several recent papers examining knowledge-sharing (Q&A) platforms such as Stack Overflow. For instance, research has shown that the introduction of generative AI technologies reduces the overall engagement on the platform and the number of questions but increases the complexity of questions (e.g., Burtch et al. 2023, Sanatizadeh et al. 2023, Xue et al. 2023). However, its impact on question quality remains ambiguous. Sanatizadeh et al. (2023) find supportive evidence of generative AI in increasing the quality of questions users raise, while Borwankar and Khern-am-nuai (2023) do not find

significant correlation regarding the question quality. On the other hand, Xue et al. (2023) and Burtch et al. (2023) reveal that although the questions become longer and more sophisticated, there actually exists a decline in average answer quality. These seemingly contradictory results underscore the need for researchers to conduct more in-depth analysis on this issue.

While there exist empirical studies of the use of generative AI on content platforms, as discussed above, there is a lack of theoretical analysis explaining how generative AI impacts human creativity and content creation. One of the exceptions is Yao et al. (2024), where they analytically analyze the competition between human and generative AI in content creation. However, in our model, we consider generative AI as a tool to facilitate or hinder content creativity with the focus on the competition between human creators. Specifically, we capture the two benefits of utilizing generative AI tools: enhancing productivity (akin to leveraging factual knowledge) and reducing creation cost (akin to potentially extending creative thinking). Moreover, we analyze the platform's adoption decision towards generative AI and investigate how to optimally set the regulatory strength, which has been touched on in previous literature but has not been systematically addressed.

2.2. Creative Markets

Creativity is a broad concept that has been studied in various streams of literature, including innovation (Riggs and Von Hippel 1994), marketing (Toubia and Netzer 2017), information systems (Huang et al. 2014), and management science (Jiang et al. 2022). Creativity is usually defined as the production of novel and useful ideas that are built upon existing knowledge (Toubia and Netzer 2017). In this subsection, we focus on the studies of individual creativity in information systems related contexts.

In an open innovation community, Hwang et al. (2019) study how individuals' information networks shape their outcomes in generating new product ideas and find that individuals with a broad range of expertise are more inclined to create innovative ideas compared to those with more specialized knowledge. In a similar context, Aggarwal et al. (2021) find that the acquisition of knowledge through interactions impacts the outcome of creative ideation by augmenting individuals' capacity to discern and select pertinent problems for ideation.

As far as we know, the extant literature mainly focuses on studying what factors can potentially enhance or prohibit creativity (novelty, quality) in content generation contexts. Studies of creators *strategically* determining their level of creativity to position themselves in the market are rare. We contribute to this stream of literature by analyzing creativity as a strategic decision for creators and its interplay with their pricing decisions, as well as how these decisions affect the market structure and outcomes.

3. Modeling Framework

Without loss of generality, we consider two symmetric content creators $j \in \{1, 2\}$ (duopoly) on a content platform (S) competing for consumers (i). In the following subsections, we start with characterizing the consumers' utility function, then discuss creators' and the platform's problems.

3.1. Consumers' Problem

We consider that the content produced by the two creators is horizontally differentiated. The horizontal differentiation stems from unique thoughts, visions, styles, and opinions that creators put into their content. Consumers have heterogeneous preferences, and following the classical Hotelling framework, we assume that consumer i's preference (denoted by x) is uniformly distributed over the interval $[-1/2, 1/2]$. Accordingly, creators can strategically choose their positions y_j along the spectrum of consumer preferences. Without loss of generality, we assume that $y_1 \leq y_2$. For ease of exposition, consumers within the range of $[y_1, y_2]$ are referred to as *switchers*, and consumers outside this range are referred to as *loyal consumers*.

Additionally, we assume that a consumer's utility from consuming creator j's content is contingent upon two primary factors: the content value of creator j and consumer i's misfit cost associated with consuming that creator's content. We consider two creators to be symmetric, and consumers can obtain a baseline content value $v > 0$ from consuming content from either creator.

We consider two main effects resulting from the adoption of generative AI tools: a quality effect (denoted as q), which reflects the advantage derived from utilizing generative AI for content refinement, and a creativity effect (to be elaborated later), which influences the two creators' strategic decision regarding their locations on the Hoteling line. Previous study indicates that content generated by AI is perceived as higher in quality compared to that created by human experts or augmented human experts (Zhang and Gosline 2023). Therefore, consumers derive a total valuation of $v + q$ when consuming

content generated from AI, and a base valuation v for content without the leverage of generative AI tools. A higher q signifies a more substantial capacity of generative AI tools to enhance the quality of the content at a given location. Moreover, consumer i located at x_i incurs a misfit cost of $t|x_i - y_j|$ if she consumes content from creator j, where t denotes consumers' unit misfit cost.[1]

Consumers need to pay a certain fee in order to obtain the content or services supplied by a creator. To capture such a business model, we consider that consumers need to pay a fee (price) p_j for content acquisition, where p_j is determined by creators.[2] Based on the above discussion, consumer i located at x_i derives the utility of $U_{ij} = (v + \mathbb{I}_j q) - t|x_i - y_j| - p_j$ when consuming content from creator j, where $\mathbb{I}_j \in \{0, 1\}$ is creator j's adoption decision on generative AI tools.

3.2. Creators' Problem

For creators, in practice, they generate revenue from selling content products. Intuitively, the revenue accrued by a creator is tied to the volume of consumers purchasing their content. Consequently, as more consumers consume content from a particular creator, the creator will generate higher revenue. Moreover, content platforms often employ a revenue-sharing model for content sales, in which they retain a proportion γ (termed the platform's *commission rate*) itself and distribute the remaining proportion $(1 - \gamma)$ of the sales revenue to creators. Thus, creators' revenue can be calculated as $(1 - \gamma)p_j N_j$, where N_j represents the number of consumers who choose to purchase content from creator j.

Creativity is characterized as the production of novel and practical ideas that build on existing knowledge (Toubia and Netzer 2017). This definition highlights that creative ideas or content do not emerge in isolation but rather rely on accessing and drawing from relevant knowledge (Aggarwal et al. 2021). Given the capacity of generative AI tools to assimilate vast knowledge from the Internet, it is commonly believed that the utilization of generative AI can contribute to creators' creative processes. We consider that by leveraging generative AI tools, creators can reach the knowledge boundary of AI intelligence without incurring any associated costs, which is mainly because the algorithms can instantly showcase all the known information and present it in an organized manner, or even generate the creative product directly. We denote by b the knowledge boundary of generative AI, which can be interpreted as AI intelligence. When employing generative AI tools, creator 1 (*resp.* 2) can move at no cost between $[-b, 0]$ (*resp.* $[0, b]$), without incurring any costs. Combined with previous discussions, we characterize the role of generative AI as improving content quality (captured by q) and reducing creativity cost (captured by b) in this research. The values of q and b capture the effectiveness of generative AI in these two aspects.

Nevertheless, the transformative capacity of generative AI tools is limited, as they generate content based on learned patterns rather than engendering genuinely novel knowledge. Therefore, we have $b < 1/2$. Human creators can go beyond AI' knowledge boundary. However, to do so, they have to exert efforts and incur costs. To capture creators' effort cost when surpassing AI intelligence, we consider that their cost of content production is correlated with the distance they move beyond the AI knowledge boundary. Intuitively, as creators move farther away from the AI knowledge boundary, their associated costs escalate. In our model, we assume that such effort cost follows a quadratic form of the distance, i.e., $c(|y_j| - \alpha|b|)^2$, where $(|y_j| - |b|)$ captures how far a creator goes beyond the AI knowledge boundary, c is a creativity cost parameter, and the extra term $\alpha \in [0, 1]$ represents the task-dependent characteristic on cost reduction facilitated by generative AI tools within its knowledge boundary. We hereafter refer to α as the AI-enabled cost-reduction factor. If a creator does not use the AI tools, then the cost of producing a product with creativity level y_j is simply $c{y_j}^2$. In our model, we focus on the more interesting and reasonable regions where enhanced product creativity can generate higher profit for creators. In such a case, the market is not fully covered within the ranges $[-1/2, y_1]$ or $[y_2, 1/2]$, and creator 1 (*resp.* creator 2) holds a monopoly power over the consumers located within the interval $[-1/2, y_1]$ (*resp.* $[y_2, 1/2]$).

Additionally, as increasingly more generative AI firms (e.g., ChatGPT) start charging users for their services, creators may need to incur a certain cost, which is denoted by d ($d \geq 0$), when deciding to adopt such a service. We hereafter refer to d as the *adoption cost*. We treat d as exogenous in our model since it is usually determined by generative AI firms. As d increases, creators have to pay a higher cost to leverage generative AI tools.

[1] Throughout this paper, we refer to a consumer as "she," a creator as "he," and the platform as "it."

[2] Price here can be viewed as the disutility consumers incur when consuming contents with ads (interruption) on subscription-based platforms.

Moreover, there is an ongoing debate on whether the platform should permit, discourage, or ban the use of generative AI due to concerns that it may yield low-quality content and impede user engagement. In the model, we use parameter f to represent the "penalty" the platform imposes on creators if they utilize generative AI tools in their content production. We hereafter refer to f as the platform's regulatory strength. It is a decision made by the platform, where the case of $f = 0$ indicates the platform allows creators to freely use generative AI, while the case of $f = +\infty$ indicates a complete ban on its use.

Based on the above discussion, if creator j decides to adopt the generative AI tools (i.e., $\mathbb{I}_j = 1$), his profit maximization problem can be formulated as follows:

$$\max_{p_j, y_j, \mathbb{I}_j = 1} \pi_j = \begin{cases} \max_{p_j, y_j, \mathbb{I}_j = 1} N_j\, p_j(1-\gamma) - d - f, & \text{if } |y_j| \le b \\ \max_{p_j, y_j, \mathbb{I}_j = 1} N_j\, p_j(1-\gamma) - c\left(|y_j| - \alpha b\right)^2 - d - f, & \text{if } |y_j| > b \end{cases},$$

where π_j denotes creator j's profit, and p_j and y_j denote creator j's price and location decisions, respectively. If creator j decides not to adopt generative AI tools (i.e., $\mathbb{I}_j = 0$), his profit maximization problem can be formulated as

$$\max_{p_j, y_j, \mathbb{I}_j = 0} \pi_j = \max_{p_j, y_j, \mathbb{I}_j = 0} N_j\, p_j(1-\gamma) - c{y_j}^2.$$

In this case, creators obtain no benefits from generative AI tools and incur no penalty. Their effort cost on content creation solely depends on their location (i.e., how far they reach). Note that N_j in the above equations are affected by both creators' price and location decisions.

3.3. Platform's Problem

As for the content platform, it generates revenue mainly through collecting commission revenue from creators, and we consider that the platform adopts a revenue-sharing model to collect a portion of the sales revenue generated by creators. The commission revenue is calculated as $\gamma(N_1 p_1 + N_2 p_2)$. To stay focused on the impact of generative AI, we consider γ to be exogenous in our model.[3] Additionally, we use f to measure the platform's regulatory influence concerning generative AI tools, with a higher f indicating a more stringent regulation on generative AI tools. The platform decides on f to maximize its profit. Thus, the platform's problem is formulated as: $\max_f \pi_S = \gamma(N_1 p_1 + N_2 p_2)$, where both N_j and p_j are functions of f.

In our study, we consider the following multistage game. In stage 1, the platform decides the regulation strength of generative AI tools f. In stage 2, creators make their generative AI tools adoption decisions. Subsequently, in stage 3, creators make their pricing and location decisions simultaneously. In stage 4, consumers decide which creator's content to consume.

In Section 4, we focus on the last three stages to examine the impact of generative AI adoption and assume that the platform has no regulation on generative AI usage (i.e., $f = 0$). In Section 5, we take one step further to incorporate Stage 1 and explore how the platform should set the optimal regulatory strength as well as how the regulatory strength is affected by context-specific factors.

4. Equilibrium Analysis

Following the convention of backward induction, we first derive the consumers' purchasing decisions at Stage 4; and then, the creators' pricing and location decisions at Stage 3, followed by the creators' adoption decisions at Stage 2. In the rest of the analysis, we focus on the case where the AI-enabled cost-reduction factor $\alpha = 0$, which indicates that AI does not contribute to human creativity if people want to surpass the knowledge boundary.

4.1. Baseline Model: Without Generative AI

In this subsection, we first analyze a baseline scenario where the generative AI tool is not an option for creators. In such a case, our model is reduced to two stages where creators first make the pricing and location decisions, and consumers decide which creator to consume. Our analysis shows that consumers located between $[\frac{ty_1+p_1-v}{t}, \frac{t(y_1+y_2)-p_1+p_2}{2t}]$ will purchase from creator 1, the consumers located between $[\frac{t(y_1+y_2)-p_1+p_2}{2t}, \frac{ty_2-p_2+v}{t}]$ will purchase from creator 2, and the remaining ones will refrain from purchasing on the platform. By plugging the corresponding demand into each creator's profit function, we can obtain their optimal pricing and creativity level strategies.

4.2. Main Model: With Generative AI

In this subsection, we consider the scenario where generative AI becomes available and creators can decide whether to use it. As in Section 3.1, through back induction, we first calculate the demand for each creator, and then examine creators' pricing and location decisions (i.e., p_j and y_j) in Stage 3, given

[3] Our key insights still hold when relaxing this assumption.

their respective adoption decisions of generative AI (i.e., I_j). We find that depending on the value of AI intelligence b and the adoption outcome I_j, the creators may make different pricing and location decisions. Notably, when making their pricing decisions, creators face a trade-off between the aggregate demand (total number of consumers) and profit margin generated from each demand (i.e., price); when making their location decisions, creators face another tradeoff between being more creative to gather greater demand and the associated cost of being more creative.

For the non-adopting creator (with adoption decision $I_j = 0$), her decision is not directly impacted by the AI quality effect q and AI intelligence b, but may be indirectly impacted by the capacity of generative AI due to competition. For the adopting creator (with adoption decision $I_j = 1$), if he decides not to explore beyond the knowledge boundary, choosing a location at exactly $-b$ or b is a dominant strategy, as the creator can always gain a higher revenue by taking advantage of the AI intelligence to choose a location $|y_j| = b$ without incurring additional cost. We hereafter refer to the decision $|y_j| = b$ as *settling with AI*. Accordingly, the adopting creator chooses between (1) settling with AI (i.e., choose $|y_j| = b$) to save the creativity cost (the cost associated with surpassing the knowledge boundary), and (2) exploring beyond the AI intelligence (i.e., choose $|y_j| > b$) to attract more demand at an additional cost. As the AI intelligence b increases, the strategy of settling with AI benefits the creators more, and it is more costly for the creators to explore beyond the AI intelligence.

As a result, in the low AI intelligence case (i.e., $b \le b_1$), the adopting creator explores beyond the AI intelligence to attract more demand; and in the high AI intelligence case (i.e., $b > b_2$), the adopting creator settles with AI intelligence to take advantage of the creativity cost reduction due to acquisition of generative AI tools. More interestingly, in the moderate AI intelligence case (i.e., $b_1 < b \le b_2$), Figure 1 suggests that the adopting creator settles with AI intelligence in the bilateral adoption scenario while still exploring beyond the AI intelligence in the unilateral adoption scenario.

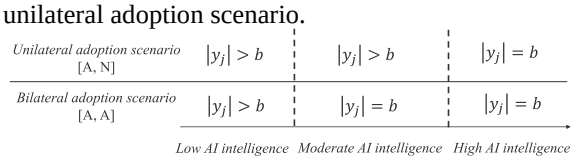

Figure 1. Creators Creativity Decisions under the Main Model.

4.3. Impact of Generative AI Adoption on Market Outcomes

We then investigate how the presence of generative AI impacts creators' pricing and location decisions in equilibrium by comparing their decisions across the two models. Proposition 1 below summarizes the findings.

Proposition 1 (Impact of generative AI on creators' decisions)

Compared to the baseline model, the changes in the creators' pricing and location decisions after one (unilateral) or both (bilateral) creators adopt AI are summarized as follows:

(1) Given the bilateral adoption case (i.e., $I_1 = 1$, $I_2 = 1$), creators' creativity level becomes higher only when AI intelligence (b) is relatively small or extremely large (i.e., $b \le b_1$ or $b > max\{\tilde{b}_1, b_1\}$), and creators' price becomes higher only when $b \le b_1$ or $b > max\{\tilde{b}_2, b_1\}$.

(2) Given the unilateral adoption case (i.e., $I_1 = 1$, $I_2 = 0$), the adopting creators' creativity level becomes higher only when $b \le b_2$ or $b > max\{\tilde{b}_1, b_2\}$, and the non-adopting creator's creativity level always becomes lower. As for the price, the adopting creator's price becomes higher only when $b \le b_2$ or $b > max\{\tilde{b}_3, b_2\}$, and the non-adopting creator's price can also become higher when $b > max\{\tilde{b}_4, b_2\}$.

The expressions of the thresholds $\tilde{b}_1$, $\tilde{b}_2$, $\tilde{b}_3$, and $\tilde{b}_4$ are omitted for brevity.

Proposition 1 suggests that the adoption of generative AI may actually hurt the creators' creativity and decrease the prices. In what follows, we first discuss the impact of generative AI on creators' pricing and location decisions under the bilateral adoption scenario. For ease of explanation, we illustrate the impact of generative AI on creators' creative decisions in Figure 2, where the solid (*resp*. dot-dashed) line represents the creators' creativity level in the bilateral (*resp*. no) adoption case (the unilateral adoption case is omitted for brevity).

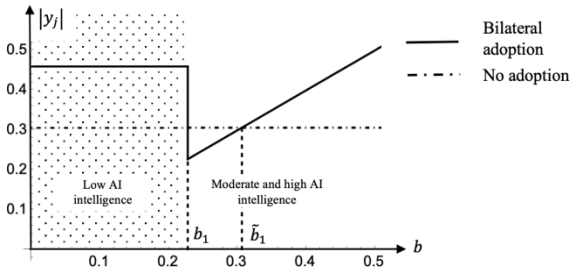

Figure 2. Creators' Creativity Levels under the Bilateral Adoption Scenario.

Under the bilateral adoption scenario, when b is relatively large (in the moderate and high AI intelligence cases, i.e., $b \geq b_1$), the creators' creativity level (and price) actually decreases when the AI intelligence is below the given thresholds. The reason is as follows. As discussed earlier, in the moderate and high AI intelligence cases, creators choose to settle with AI intelligence. However, creators' settling with AI intelligence does not necessarily mean that their creativity becomes higher than that in the no-adoption case—it depends on the level of AI intelligence. As Proposition 1 indicates, creators' creativity becomes lower when the AI intelligence is below a given threshold. To sum up, compared to the baseline model, under the bilateral adoption scenario, the creators' creativity becomes lower when the AI intelligence is moderately small (i.e., $b_1 < y < \tilde{b}_1$). In such a region, the AI intelligence is sufficiently high to induce the creators to settle with AI intelligence, but it is not enough for creators to exceed the creativity level under the no-adoption scenario. Accordingly, although creators are incentivized to set higher prices due to the increased content quality with generative AI, they may ultimately set lower prices due to increased competition resulting from the reduced creativity level and product differentiation arising from both creators settling with the AI intelligence. The impact of generative AI on the adopting creator's decision in the unilateral adoption scenario can be explained in a similar fashion.

Generative AI, at its best, can be a powerful tool for augmenting human creativity. However, the above result suggests that the direction of its effect on creativity is contingent upon its level of intelligence. When the AI intelligence is moderate, rather than being a source of inspiration, generative AI tools could end up offering little or no value in the creative process, or worse, lead creators down uncreative paths. In such a case, creators may not need generative AI tools for content creation.

Next, we examine the creators' equilibrium adoption decisions of generative AI in Stage 2 and summarize the results in Proposition 2.

Proposition 2 (Creators' adoption decisions)
Both creators adopt generative AI (i.e., the bilateral adoption scenario) when the adoption cost d is relatively low (i.e., $d \leq d_1$), only one creator adopts generative AI (i.e., the unilateral adoption scenario) when d is moderate (i.e., $d_1 < d \leq d_2$), and neither creator adopts generative AI (the no adoption scenario) when d is relatively high (i.e., $d > d_2$).

The expressions for the thresholds d_1 and d_2 are omitted for brevity. d_1 and d_2 depends on b.

In Figure 3, the dot-dashed line represents the lower threshold d_1 of the adoption cost, and the solid line represents the higher threshold d_2. Accordingly, both creators adopt generative AI in the region under the dot-dashed line, and neither creator adopts it in the region above the solid line. This is intuitive since a greater adoption cost on generative AI (d increases) imposes larger costs on creators and prohibits them from adopting such tools.

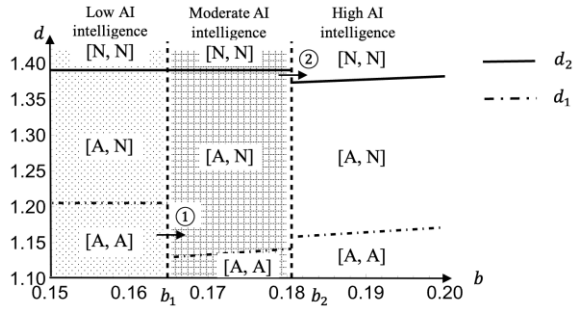

Figure 3. Impact of AI Intelligence on Creators' Adoption Decisions.[4]

Interestingly, Proposition 2 and Figure 3 indicate that the asymmetric adoption outcome can also occur even when creators are symmetric to each other. The intuition is as follows. Given that neither creator adopts generative AI, by deviating to adopting, creator 1 enjoys a higher profit due to the reduced content creation cost and the improved quality of his content. Given creator 1 adopts generative AI, although creator 2 can also enjoy the aforementioned benefits, his adoption would achieve less increase in profit compared to that when creator 1 does not adopt. The reason is that, in response to creator 2's adoption, creator 1 will price lower as he loses the content quality advantage compared to creator 2; this further reduces creator 1's incentive to go beyond the AI knowledge boundary as the benefit of further differentiating from creator 2 and acquiring more demand decreases with a lower price. This further intensifies the price competition and makes the two creators' contents less differentiated. Although creator 2's adoption may increase his content quality and has the potential to make the content more differentiated from each other, this effect is dominated by the intensified competition. Accordingly, both of creator 1's responses to creator 2's adoption hurt creator 2's revenue, which in turn prevent creator 2 from adopting generative AI conditional on creator 1's adoption.

From Figure 3, we can further observe that the degree of AI intelligence significantly affects creators'

[4] Here, "A" refers to creator's adoption decision, "N" refers to creator's not adoption decision.

adoption decisions. Our analysis suggests that higher AI intelligence may sometimes disincentivize creators' adoption of generative AI, which happens when transitions ① and ② occur. For example, when transition ① (which happens when d is relatively low) occurs, the adoption outcome changes from a bilateral adoption scenario to a unilateral adoption scenario. As such a transition occurs, if neither creator quits adoption, then both creators would settle at AI intelligence. However, if one of the creators, e.g., creator 2, quits adoption, creator 1 would explore beyond the AI intelligence, which yields, as we can analytically show, a higher content diversity compared to that when creator 2 does not quit adoption. Such a more differentiated competition benefits both creators. Thus, considering the adoption cost and the benefit of adopting generative AI, creator 2 has the incentive to deviate from adoption to quitting adoption.

Proposition 2 characterizes the creators' AI adoption decisions under varying d and b values. Specifically, they need to balance between the adoption cost and the benefit derived from using such a new technology (either through being more creative or charging a higher price). In conjunction with the results from Proposition 1, it is possible that the use of a seemingly intelligent tool could lead to lower creativity, thereby reducing creators' incentives to adopt such a tool.

Given the intricate impacts of generative AI on creators' pricing and creativity decisions, it is unclear how it would affect consumers' willingness to purchase the content and their welfare. In the next proposition, we investigate how the presence of generative AI impacts consumer surplus.

Proposition 3 (Impact of generative AI on consumer surplus)

Compared to the baseline model, under the main model,

(1) in the low and moderate AI intelligence cases (i.e., $b \leq b_2$), consumer surplus increases;

(2) in the high AI intelligence case (i.e., $b > b_2$), consumer surplus may sometimes decrease. Specifically, this happens when the AI intelligence is relatively high (i.e., $b > B$).

The expression of B is omitted for brevity.

Interestingly, Proposition 3 suggests the presence of generative AI may hurt consumer surplus in the high AI intelligence case. Accordingly, in the following, we focus our discussion on the high AI intelligence case as it's less intuitive. The reason is as follows. As shown in Figure 1, in the high AI intelligence case, both creators settle with the AI intelligence and position themselves at $|y_i| = b$. Thus, as AI intelligence increases, the creators become more creative and position farther away from each other. If we treat content prices as given, as creators become more innovative, although switchers are worse off due to the increasing misfit cost, consumers are better off as a whole as loyal consumers are better off due to the decreasing misfit cost and there are more consumers joining the platform, whose utilities increase from 0 to a positive value.

As AI intelligence b gradually increases, such a benefit of increasing AI intelligence becomes lower, as the benefit of increasing b on newly joining consumers remains unchanged but will hurt switchers more significantly. In the meanwhile, facing a larger "loyal" consumer base, the creators will strategically increase their respective prices to take advantage of such a larger consumer loyal base. As we can show, an increasing b will indirectly hurt consumers by incentivizing the creators to charge a higher price, and such an effect remains constant as b increases. To sum up, as AI intelligence b increases, the benefit of increasing b on the consumer as a whole becomes less significant whereas the downside remains unchanged. This ultimately results in a lower consumer surplus as AI intelligence b increases, leaving consumers a whole worse off with generative AI when the AI intelligence is relatively high.

While the promise of generative AI is vast in many aspects, Proposition 3 warns policymakers that they should think twice before encouraging generative AI to benefit consumers as a whole, as our analysis suggests that it may backfire by doing so. Such an unintended consequence occurs especially when the AI intelligence is very high. Therefore, platforms that possess a high level of AI intelligence and are keen on adopting generative AI should be subject to tighter regulations or additional oversight measures.

5. Impact of Platform's Regulatory Policy

In this section, we delve into the platform's optimal regulation decision on generative AI at Stage 1. We assume that the platform can either impose an additional cost on the adoption of generative AI, which is equivalent to endogenizing d. Through backward induction, we can derive the platform's regulation decision in Stage 1 and summarize the result in the following lemma.

Lemma 1 (Platform's regulatory strength decision)

The platform's optimal regulatory strength on generative AI tools adoption (i.e., f^*) is given by:

(1) in the low AI intelligence case (i.e., $b \leq b_1$), the platform sets $f^* = 0$ such that both creators adopt generative AI (i.e., $I_1 = 1, I_2 = 1$);

(2) in the moderate AI intelligence case (i.e., $b_1 < b \leq b_2$), the platform sets $f^* = f_1$ such that only

one creator adopts generative AI (i.e., $I_1 = 1$, $I_2 = 0$) if the AI intelligence is lower than a given threshold (i.e., $b \leq \tilde{b}_5$), and sets $f^* = 0$ such that both creators adopt otherwise.

(3) *in the high AI intelligence case (i.e., $b > b_2$), the platform sets $f^* = f_2$ such that neither creator adopts generative AI (i.e., $I_1 = 0, I_2 = 0$) if the AI intelligence is lower than a given threshold (i.e., $b \leq \tilde{b}_2$), and sets $f^* = 0$ such that both creators adopt otherwise.*

The threshold of $\tilde{b}_5$ is omitted for brevity.

Although the AI quality-enhancing feature provided by generative AI drives the creators to set a higher price and helps them attract greater demand, which benefits the platform, the cost reduction feature of generative AI may hinder content creativity, which hurts the platform. Consequently, when deciding the regulatory strength of generative AI, the platform trades off between the higher content quality and the potential lower content creativity driven by the adoption of generative AI. More specifically, in the low AI intelligence case, the adoption of generative AI always induces higher content creativity and quality; as a result, the platform should not regulate the utilization of generative AI. However, in the moderate and high AI intelligence cases, the adoption of generative AI may hurt content creativity, at which time the platform may restrict or even ban the adoption of generative AI depending on the market conditions.

As generative AI continues to evolve, it presents a dual-edged sword for platforms and creators. To address this issue, in Proposition 4, we specifically discuss how AI intelligence and AI quality impact the regulation decision of the platform.

Proposition 4 (Impact of AI intelligence on the platform's regulatory strength)

As the AI intelligence b increases, the platform may actually increase its regulatory strength f to discourage the adoption from creators. More specifically, this happens when the AI intelligence b is moderate (i.e., $b_1 < b < \tilde{b}_2$), where the platform should regulate the use of generative AI such that only one creator adopts or neither creator adopts.

As AI intelligence b increases, contrary to conventional wisdom, Proposition 4 indicates that the platform may be better off discouraging the adoption of generative AI from the creators. More specifically, this happens when the AI intelligence increases from a value lower than b_1 to a value between b_1 and $\tilde{b}_1$. The rationale behind this result lies in the trade-off the platform faces as AI intelligence increases. This trade-off encompasses two pivotal factors: the higher content quality driven by the quality improvement feature q of generative AI, which directly drives the creators to set a higher price and benefits the platform, the potential lower (*resp.* higher) creativity, driven by the AI creativity b, which drives a lower (*resp.* higher) demand and hurts (*resp.* benefits) the platform. To better understand such a trade-off, in the following, we discuss how AI quality q moderates the impact of AI intelligence b on the platform's regulatory strength.

We can show that when the AI quality q is sufficiently high, the first effect mentioned above is the dominant one, and the platform consistently favors the no adoption scenario, thereby setting $f = 0$. However, when the AI quality q is not sufficiently high, the platform needs to balance between the abovementioned two effects. As shown in Figure 1, in the moderate and high AI intelligence cases, creators tend to settle with the AI intelligence in their creative processes. However, it is essential to underscore that creators' adoption of generative AI does not inherently guarantee an elevation of their creative output surpassing that observed in cases of non-adoption. Rather, this outcome is contingent upon the specific magnitude of the AI intelligence at play. As indicated by Proposition 1, as the AI intelligence increases, the content creativity first decreases and then increases, leading the platform to first embrace generative AI to induce a higher content quality, and then regulate the generative AI to avoid the loss in content creativity, and then back to embracing generative AI to get both higher content quality and content creativity. As summarized in Proposition 4, when the AI quality q is relatively low, the platform may even ban the generative AI as the platform may suffer from a significant loss in content creativity that cannot be compensated by the gain in content quality. When the AI quality q is moderate, although the platform still balances between the two effects mentioned above, it would not strictly ban the use of generative AI as it can benefit from a relatively high content quality driven by the technology.

6. Conclusion

In recent years, generative AI tools/applications have been game-changers for various domains including marketing, sales, content creation, etc. However, there is an ongoing debate about whether the increasing prominence of generative AI algorithms in content generation a boom or bane for creation platforms is. In this paper, we build a game-theoretic model to systematically analyze this issue.

Our study yields several interesting findings. First, our results show that the content creativity level experiences a decline when AI intelligence is moderately low, and interestingly, as AI intelligence increases, creators may sometimes become reluctant to

employ generative AI tools. Second, even though generative AI has the potential to improve content quality, it is not always true that the utilization of such tools can lead to higher consumer welfare, particularly when the AI intelligence is relatively high. Third, we find that the platform opts for a relatively low regulatory strength and promotes generative AI adoption when the AI intelligence level is low, and the opposite is true when the AI intelligence level is high. Surprisingly, we observe that as generative AI acquires a more extensive knowledge base (i.e., higher AI intelligence level), the platform may not necessarily incentivize its adoption.

Our results can provide valuable insights that may help platforms and creators decide whether and when to adopt generative AI. For instance, our findings convey an important message to platforms that it may not be advisable to embrace the usage of generative AI when its intelligence is high. The same message applies to creators, and they should be cautious about adopting this technology as it may not always be beneficial. Another key takeaway from this study is that policymakers should be aware of the potential negative impact of this new technology on consumer welfare and impose appropriate policies when necessary.

Our work is not without limitation. For example, due to the lack of empirical evidence, we cannot empirically validate our analytical findings. Future research can leverage the second-hand data to empirically analyze this problem to enhance the generalizability of our findings. Moreover, we assume that the AI-enabled cost-reduction factor $\alpha = 0$, and mainly focus on the case where AI does not contribute to human creativity if creators want to surpass the knowledge boundary. If we relax this assumption by considering $\alpha > 0$, one can imagine that our key insights including generative AI hurts the content creativity will still hold but may exist under a smaller region since AI helps more in lowering the cost when creators decide to surpass the knowledge boundary compared to the main model.

7. References

Aggarwal, V., Hwang, E. H., & Tan, Y. (2021). Learning to be creative: a mutually exciting spatiotemporal point process model for idea generation in open innovation. *Information Systems Research* 32(4), 1214-1235.

Borwankar, S., & Khern-am-nuai, W. (2023). Unraveling the Impact: An Empirical Investigation of ChatGPT's Exclusion from Stack Overflow. Available at *SSRN 4481959*.

Burtch, G., Lee, D., & Chen, Z. (2023). The consequences of generative AI for UGC and online community engagement. *Available at SSRN 4521754*.

Davenport, T., & Mittal, N. (2022). How Generative AI is Changing Creative Work. *Harvard Business Review*. https://hbr.org/2022/11/how-generative-ai-is-changing-creative-work

De Cremer, D., Bianzino, N. M., & Falk, B. (2023). How generative AI could disrupt creative work. *Harvard Business Review*. https://hbr.org/2023/04/how-generative-ai-could-disrupt-creative-work

Doshi, A. R., & Hauser, O. (2023). Generative artificial intelligence enhances creativity. *SSRN*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4535536

Huang, Y., Vir Singh, P., & Srinivasan, K. (2014). Crowdsourcing new product ideas under consumer learning. *Management Science* 60(9), 2138-2159.

Hwang, E. H., Singh, P. V., & Argote, L. (2019). Jack of all, master of some: Information network and innovation in crowdsourcing communities. *Information Systems Research* 30(2), 389-410.

Jiang, Z., Huang, Y. & Beil, D.R., (2022). The role of feedback in dynamic crowdsourcing contests: A structural empirical analysis. *Management Science* 68(7), pp.4858-4877.

Lysyakov, M., & Viswanathan, S. (2023). Threatened by AI: Analyzing Users' Responses to the Introduction of AI in a Crowd-sourcing Platform. *Information Systems Research* 34(3), 1191-1210.

Pattisall, J. (2023). Generative AI Revolutionizes Marketing Creativity. https://www.forrester.com/blogs/generative-ai-revolutionizes-marketing-creativity/

Toubia, O., & Netzer, O. (2017). Idea generation, creativity, and prototypicality. *Marketing Science*, 36(1), 1-20.

Sanatizadeh, A., Lu, Y., Zhao, K., & Hu, Y. (2023). Exploring the effect of large language models on knowledge seeking and contribution in online knowledge exchange platforms. *Available at SSRN 4459729*.

Xue, J., Wang, L., Zheng, J., Li, Y., & Tan, Y. (2023). Can ChatGPT kill user-generated Q&A platforms? *Available at SSRN 4448938*.

Yao, Fan, Chuanhao Li, Denis Nekipelov, Hongning Wang, & Haifeng Xu. (2024). Human vs. Generative AI in Content Creation Competition: Symbiosis or Conflict?. *arXiv preprint arXiv:2402.15467*.

Zhang, Y., & Gosline, R. (2023). Human favoritism, not AI aversion: People's perceptions (and bias) toward generative AI, human experts, and human–GAI collaboration in persuasive content generation. *Judgment and Decision Making* 18, e41.