AI Economic Series

The Impact of Generative AI on Content Platforms: A Two-SidedMarket Analysis with Multi-Dimensional Quality Heterogeneity

Yukun Zhang，The Chinese University Of Hongkong；Tianyang Zhang，University of Macau

Background &Motivation

- Generative AI introduces a profound economic shock to platform economies by driving the marginal cost of content production and distribution toward zero, fundamentally reshaping surplus allocation among creators, platforms, and consumers. This near-zero marginal cost undermines traditional pricing and entry barriers, intensifies competition, and reallocates value toward scale-efficient AI producers while exerting downward pressure on human creators' revenues. As a result, platform outcomes can no longer be understood through one-dimensional quality or cost-based models.
- To capture these dynamics, we model content quality as inherently **multi-dimensional**, encompassing *Creativity*, *Technicality*, and *Personalization*. Generative AI excels at technical quality and scalable personalization but remains constrained in originality and context-sensitive creativity, while human creators retain comparative advantages in creative differentiation. This multi-dimensional perspective is essential to explain market segmentation, creator adaptation, and the coexistence of AI-generated and human-generated content under GenAI-driven platform reallocation.

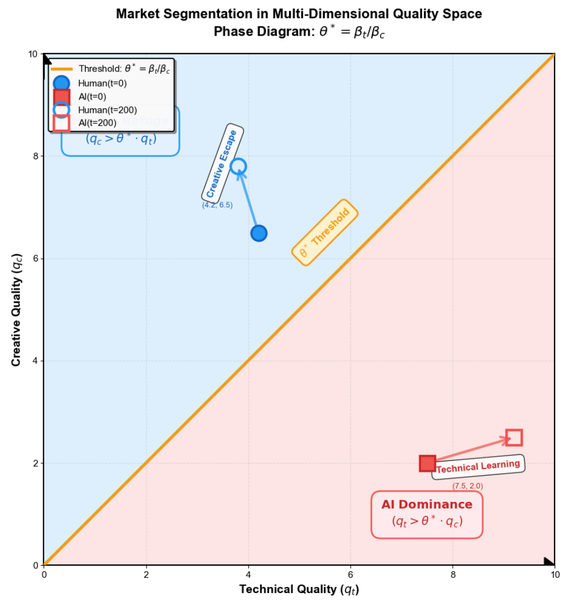
Research Questions / Contributions

1. **RQ1:** how does the entry of generative AI with near-zero marginal cost reshape equilibrium outcomes in content platforms characterized by heterogeneous creators and consumers?
2. **RQ2:** how do human creators strategically adapt when AI differentially improves technical quality and personalization, but not creativity?
3. **RQ3:** what forms of platform governance can mitigate concentration and welfare losses while preserving the efficiency gains from GenAI adoption?

- **Contributions**:

Our key contributions are threefold. We develop a unified two-sided market framework with multi-dimensional content quality that endogenizes both AI learning and human adaptation, bridging static equilibrium analysis with dynamic agent-based simulations. We identify novel mechanisms—market segmentation via quality trade-offs, creative escape by human creators, and feedback-driven concentration—that jointly determine welfare and diversity outcomes. Finally, we formalize a policy trilemma between efficiency, equity, and sustainability, providing quantitative guidance on governance regimes that achieve Pareto improvements in GenAI-augmented platform economies.

Model & Theory (Static → Dynamic)

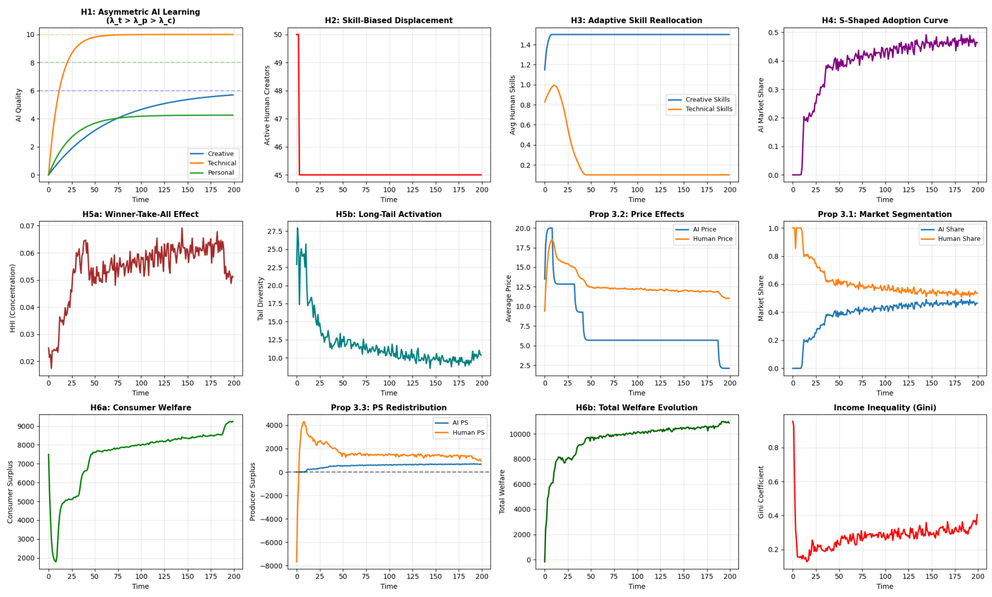


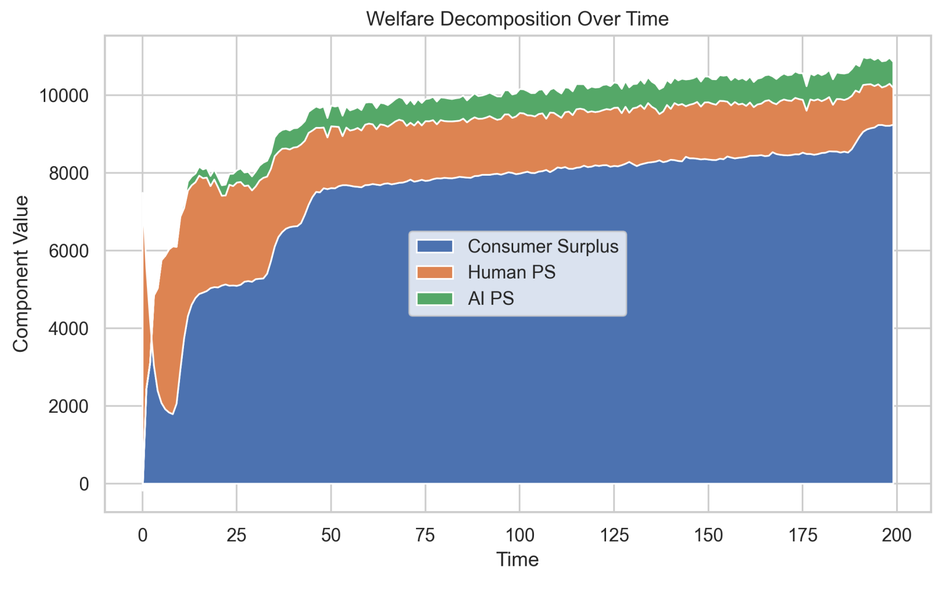
- We develop a two-sided market model in which heterogeneous consumers interact with two types of creators—human and generative AI—whose content quality is inherently multi-dimensional, spanning creativity, technicality, and personalization. Consumer demand is modeled using a Mixed Multinomial Logit (MNL) framework, allowing heterogeneous preferences over these quality dimensions and generating endogenous market segmentation. On the supply side, human creators face convex production and skill costs, while AI operates with near-zero marginal cost but asymmetric quality advantages, creating a fundamentally new competitive landscape.
- In the static equilibrium, we derive three core results. First, a **segmentation threshold** emerges in preference space: consumers with sufficiently high relative valuation of technical quality optimally select AI-generated content, while creativity-sensitive consumers remain attached to human creators. Second, the presence of AI imposes an endogenous **price ceiling** on human creators in technically substitutable segments, sharply limiting their pricing power even without monopolization. Third, this pressure induces a **creative escape** mechanism, whereby surviving human creators optimally reallocate effort toward creativity-intensive niches to reduce substitutability with AI.
- We then extend the framework to a dynamic setting that endogenizes learning and adaptation. AI quality evolves asymmetrically, improving rapidly along technical dimensions but facing diminishing returns in creativity due to reliance on human-generated data. This generates an S-shaped adoption path for AI content, accompanied by rising market concentration and systematic shrinkage of the long tail as low-cost AI output crowds out marginal human variety. Together, the static and dynamic analyses provide a coherent causal account of how GenAI transforms equilibrium structure, creator incentives, and long-run welfare on content platforms.

Evidence: Agent-Based Simulations & Validation

- **Methodology**：To validate the analytical results and explore out-of-equilibrium dynamics, we implement a large-scale agent-based simulation that operationalizes the two-sided market with heterogeneous consumers, human creators, and AI agents. The model is calibrated to reflect realistic asymmetries in cost structures and learning speeds: AI agents feature near-zero marginal cost and faster technical learning, while human creators face convex production costs and slower, creativity-oriented skill adjustment. Consumer preferences over creativity, technicality, and personalization are drawn from a continuous distribution and aggregated through a Mixed MNL choice rule. Key parameters—such as AI learning rates, human capacity constraints, commission rates, and information overload curvature—are chosen to ensure non-degenerate entry, exit, and adaptation dynamics

- **Key finding**：The simulations deliver three core empirical patterns that closely align with the theory.
- First，**welfare decomposition** reveals a large redistribution effect: AI entry generates substantial consumer surplus gains via price compression and variety expansion, while human producer surplus declines sharply, confirming the predicted surplus transfer.
- Second, we observe pronounced **concentration–diversity dynamics**: market concentration (HHI) rises steadily as AI adoption accelerates, while long-tail diversity contracts as marginal human creators exit or specialize into narrow creative niches.
- Third, a **two-stage shock experiment**—comparing a human-only monopoly phase with post-AI entry—demonstrates a discrete structural break: prices collapse, AI market share follows an S-shaped diffusion curve, and the system transitions to a new equilibrium characterized by a dominant technical head and a thinner but creativity-intensive tail. Together, these results provide quantitative validation for the segmentation threshold, price ceiling, and creative escape mechanisms highlighted by the theoretical model





Policy Implication And Conlusion

- Our analysis reveals a fundamental policy trilemma in GenAI-enabled content platforms: allocative efficiency, distributional equity, and ecosystem sustainability cannot be simultaneously maximized. Governance regimes that fully exploit AI's near-zero marginal cost deliver strong consumer surplus and efficiency gains, but at the cost of rising concentration, accelerated human displacement, and long-tail erosion; conversely, policies that strongly protect human creators preserve equity and diversity while sacrificing some efficiency. Mapping policy choices onto an explicit Pareto frontier shows that platform governance is inherently a trade-off over welfare composition rather than a single optimum, and highlights a narrow set of Pareto-dominant regimes—specifically, low commission structures combined with pro-creative or diversity-weighted recommendation nudges—that balance efficiency gains with sustained human participation and long-run ecosystem stability.