# When AI Designs Alike: Generative AI and Convergence in Trademark Design

Suhyoung An (SNU)
Hyo Kang (SNU)

## 1 Motivation and Research Question

Generative artificial intelligence has rapidly transformed creative production by dramatically lowering the cost of generating high-quality visual content. Text-to-image systems such as Midjourney, Stable Diffusion, and DALL·E are no longer confined to professional designers and are now routinely used by firms for branding, marketing, and early-stage identity formation. While a growing literature emphasizes productivity gains and individual-level creative benefits from these tools, far less is known about how generative AI reshapes market-level distributions of creative output and how such distributional shifts translate into economic welfare.

This project builds on recent empirical evidence that the diffusion of generative image AI has increased visual similarity among firms' trademarks, indicating a contraction of the design distribution toward more prototypical forms . The central premise of this proposal is that creative homogenization is not merely an aesthetic or cultural phenomenon. Instead, it has direct implications for economic measurement, competition, consumer welfare, and the valuation of intangible assets. When many firms rely on the same generative models and interfaces, the resulting convergence in symbolic assets may alter how consumers perceive variety, how firms differentiate themselves, and how regulators evaluate distinctiveness.

The project is organized around three core questions. First, how does generative AI reshape the distribution of symbolic assets such as trademarks, and how can these changes be measured at scale using modern computational tools? Second, what are the welfare consequences of AI-induced homogenization for consumers, firms, and regulators, particularly when variety and differentiation are central to value creation? Third, how should standard economic metrics, including measures of variety, quality, competition, and intangible capital, be adapted to account for algorithmically mediated convergence rather than independent creative choice?

## 2 Conceptual Framework: From Creative Technology to Welfare

Generative image models alter creative production by shifting workflows from manual construction toward generation–selection processes. Diffusion-based systems are explicitly designed to sample

from high-probability regions of a learned aesthetic distribution, which makes certain visual forms systematically easier to generate than others. When such systems diffuse widely, shared algorithmic priors can induce convergence even among independent firms that have no intention to imitate one another. This mechanism, which the underlying study refers to as algorithmic convergence, implies that AI adoption can reshape the entire distribution of creative outputs rather than simply improving average quality.

Empirically, the attached study documents a discrete upward shift in trademark visual similarity following the public release of Midjourney in mid-2022, using the universe of U.S. trademark filings from 2019 to 2024 . The evidence further shows that convergence is strongest in intent-to-use filings and in highly regulated industries, settings in which firms face greater uncertainty, tighter resource constraints, or stronger legitimacy pressures. These patterns suggest that technological affordances, cognitive selection mechanisms, and institutional constraints interact to compress both the feasible and the realized design space.

From a welfare perspective, such convergence matters because creative diversity plays a functional economic role. Visual differentiation facilitates consumer choice and brand recognition, supports non-price competition, and underpins the value of trademarks as intangible capital. At the same time, generative AI reduces production costs and lowers entry barriers, which may increase participation and short-run surplus. The welfare impact of AI therefore depends not only on output volume or average quality but also on how the distribution of symbolic variety changes. Standard economic statistics, which largely abstract from distributional shape in creative outputs, are ill-suited to capture this trade-off.

## 3 Measuring AI-Driven Homogenization

The empirical setting of trademark applications provides a unique opportunity to study AI-driven homogenization in a way that is directly relevant for economic measurement. Trademarks are persistent symbolic assets rather than ephemeral content, filing dates provide precise timing around AI diffusion, and applications span a wide range of industries, firm sizes, and regulatory environments. Each trademark image is embedded into a high-dimensional feature space using CLIP-based representations that capture semantic and structural similarity rather than pixel-level overlap, making them well suited to measuring convergence in visual identity.

Rather than focusing on pairwise similarity or direct imitation, the project adopts a distributional approach. Visual homogenization is operationalized as increased similarity of individual designs to the market centroid, which directly captures contraction toward a common aesthetic center. Complementary measures examine changes in the thickness of the distribution's tails and within-industry dispersion over time. Together, these metrics provide a scalable way to quantify changes in creative variety that can be mapped onto welfare-relevant concepts such as differentiation and choice.

## 4 From Design Convergence to Welfare Outcomes

The project extends beyond documenting convergence to examine its economic consequences. On the consumer side, increased similarity among trademarks may reduce cognitive effort in some contexts but increase confusion and reduce effective choice when many brands appear visually alike. The analysis will explore links between measured homogenization and consumer-facing proxies such as trademark opposition rates, refusal grounds related to likelihood of confusion, and other indicators of market friction where available.

At the firm level, homogenization may alter the returns to branding investments and the economic value of trademarks as intangible assets. While small or resource-constrained entrants may benefit from low-cost AI-generated designs, they may also face diminished differentiation, making it harder to build distinct brand identities. Larger or incumbent firms may respond differently, potentially amplifying distributional effects across firm types. These dynamics speak directly to how AI adoption redistributes surplus rather than uniformly increasing it.

Institutional and regulatory welfare effects are particularly salient in highly regulated industries. In these settings, legal constraints already narrow the feasible design space, and generative AI further compresses the realized space toward statistically typical forms. This double compression may improve compliance efficiency but also strain trademark examination and enforcement by raising baseline similarity across marks. Understanding these effects is essential for evaluating how AI reshapes the functioning of intellectual property systems.

## 5 Contribution to Economic Measurement

This project contributes to the measurement of AI's economic impact in three ways. First, it introduces embedding-based measures of creative dispersion that provide tractable indicators of variety in symbolic and intangible outputs. Second, it emphasizes distribution-sensitive welfare analysis by showing that AI can reshape the entire distribution of outputs even when average productivity rises. Third, it highlights the need to account for algorithmic structure when interpreting observed market outcomes, as shared models can induce convergence that standard economic frameworks might mistakenly attribute to preference shifts or strategic imitation.

By integrating these measurement innovations with a large-scale empirical setting, the project aligns closely with the goals of the NBER workshop on the welfare and economic contribution of AI and digital technologies.

## 6 Broader Implications and Extensions

Although the empirical focus is on trademarks, the framework developed here generalizes to other AI-mediated creative domains such as advertising, product design, and digital media. More broadly, the project underscores that AI's economic contribution cannot be fully assessed through output

counts or productivity metrics alone. Distributional changes in variety, differentiation, and symbolic capital are central to understanding the long-run welfare consequences of generative technologies.

# 7 Conclusion

Generative AI is not only a productivity-enhancing innovation but also a distribution-shaping force. By measuring AI-induced homogenization in symbolic assets and linking it to consumer, firm, and institutional welfare, this project advances a richer approach to evaluating the economic impacts of AI. In doing so, it contributes to ongoing efforts to develop measurement frameworks that reflect how digital technologies transform value creation in modern economies.