

The Competitive Effects of Generative AI

15 March 2024

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Key challenges

- ▶ Identify the trajectory of AI markets.
- ▶ Understand the technology stack and match it with an enforcement stack.
- ▶ Design an optimal and measured enforcement approach that can prevent the distortion of competition and innovation.

1. Opportunities

- ▶ Significant investment in new technologies.
- ▶ Large platforms *compete against each other* with different players in east and west.
- ▶ Competition in generative AI seems robust: Google's conversational AI (Bard), Chat GPT, Llama (Meta/Microsoft), Apple...
- ▶ Ability to use third party AI systems and open-source repositories. (ex: Llama 2 'open-source' large language model by Meta and Microsoft)
- ▶ Data increasingly available, and AI may use smaller data sets to achieve superior results.
- ▶ AI Startups -- AI may reduce cost of entry, cost of analysis, and make disruption more likely.
- ▶ Users benefit from better services, customised offering, and predictive functions.
- ▶ AI could be used to protect users' interests in complex settings.



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AI Competition Is Robust

As the **FTC voices "concerns" about competition in the AI space**, it's important to remember that generative AI shows how competitive and dynamic the tech sector is. Since the introduction of ChatGPT earlier this year, the tech space has undergone yet another evolution. With so much potential in new areas of AI technology, companies of all sizes are exploring the enormous potential these technologies bring. Meanwhile, startups are popping up all over the world to meet the growing demand for AI services, indicating low barriers to entry.

... Significant disruption

2. Concerns

Is this another step in the ongoing entrenchment of existing power?

- ❖ Network effects, economies of scale.
- ❖ Data & analytics
- ❖ Gatekeepers.
- ❖ Asymmetry of information and power.
- ❖ Winner takes most, or all.
- ❖ Platforms evolve to become ecosystems.

Despite antitrust litigation and regulation, markets assume ongoing success for Big Tech Barons

How contestable are AI markets?

- ❖ Data driven economies of scale → quality output → market power.
- ❖ Computational Resources - Developing AI, operation costs, processing power, generation of output and additional computing power.
- ❖ Entry barriers (High fixed and variable costs, finance, access to data, human capital...)
- ❖ Investment in reinforcement learning with human feedback (RLHF).
- ❖ Vertical integration, conglomerate business models & ecosystems.
- ❖ Control over demand and supply of innovation, innovation heterogeneity, and the nature of innovation.

Downstream operators may struggle to challenge upstream ecosystems.

How Open is the technology?

Considerations	Internal research only High-risk control Low auditability Limited perspectives Gated to public				Community research Low-risk control High auditability Broader perspectives
	Fully closed	Gradual / staged release	Hosted access	Cloud-based / API access	Downloadable	Fully open
System (Developer)	PaLM (Google) Gopher (DeepMind) Imagen (Google) Make-A-Video (Meta)	GPT-2 (Open AI) Stable Diffusion (Stability AI)	DALL-E 2 (Open AI) Midjourney (Midjourney) ChatGPT	GPT-3 (OpenAI) GPT-4 (OpenAI)	OPT (Meta) Craiyon (Craiyon)	BLOOM (BigScience) GPT-J (EleutherAI)

Ian Brown, Allocating accountability in AI supply chains: a UK-centred regulatory perspective

Project (maker, bases, URL)	Availability						Documentation						Access		
	Open code	LLM data	LLM weights	RLHF data	RLHF weights	License	Code	Architecture	Preprint	Paper	Modelcard	Datasheet	Package	API	
BLOOMZ bigscience-workshop	✓	✓	✓	✓	~	✓	✓	✓	✓	✗	✓	✓	✗	✓	
LLM base: BLOOMZ, mT0		RL base: xP3													
Pythia-Chat-Base-7... togethercomputer	✓	✓	✓	✓	✗	✓	✓	✓	~	✗	~	~	✓	✗	
LLM base: EleutherAI pythia		RL base: OIG													
Open Assistant LAION-AI	✓	✓	✓	✓	✗	✓	✓	✓	~	✗	✗	✗	✓	✓	
LLM base: Pythia 12B		RL base: OpenAssistant Conversations													

Stanford Alpaca Stanford University CRFM	✓	✗	~	~	~	✗	~	✓	✗	✗	✗	✗	✗	✗	
LLM base: LLaMA		RL base: Self-Instruct (synthetic)													
LLaMA 2-chat Facebook Research	✗	✗	~	✗	~	✗	✗	~	~	✗	~	✗	✗	~	
LLM base: LLaMA 2		RL base: Meta, StackExchange, Anthropic													
ChatGPT OpenAI	✗	✗	✗	✗	✗	✗	✗	✗	~	✗	~	✗	✗	✗	
LLM base: GPT 3.5		RL base: Instruct-GPT													

✓ open
~ partial
✗ closed

Liesenfeld, A., Lopez, A. & Dingemanse, M. 2023. "Opening up ChatGPT: Tracking Openness, Transparency, and Accountability in Instruction-Tuned Text Generators." In CUI '23: Proceedings of the 5th International Conference on Conversational User Interfaces. July 19-21, Eindhoven. ; Llama and ChatGPT Are Not Open-Source Few ostensibly open-source LLMs live up to the openness claim MICHAEL NOLAN

Meta: 'open-source release intended to make the model "accessible to individuals, creators, researchers, and businesses so they can experiment, innovate, and scale their ideas responsibly."

Using the term ‘open source’ and claiming that we benefit from *AI democratisation* maybe misleading:

- ▶ Large AI systems differ from traditional software - the ideal of open source not easily replicated.
- ▶ No sharing the model’s training data
- ▶ No sharing of the code used to train it.
- ▶ No sharing of RLHF input.
- ▶ Not ‘open source’ agreement.

Even when there is some level of openness:

- ▶ The key players develop and control the leading systems and key inputs.
- ▶ Resources needed to build AI from scratch, and to deploy large AI systems at scale, remain closed.
- ▶ Natural barriers to entry result in entrants relying on existing infrastructure.
- ▶ Open interface used to entrench existing AI (open-first, closed later tactics).
- ▶ Distortion of innovation paths.
- ▶ Tech barons remain firmly in control.
- ▶ Challenging for oversight and scrutiny.

3. Antitrust risks

- ❖ Concentration of computational power.
- ❖ Concentration of foundation models.
- ❖ Increasing downstream dependency.
- ❖ Exclusions.
- ❖ Distortion of innovation paths.
- ❖ Race to the bottom.

4. Enforcement challenges

- ❖ Power, in itself, is not condemned under the law (outside merger control).
- ❖ Complex reality with variations depending on sector and system.
- ❖ Economic modelling in competition analysis approximates reality - *In dynamic and evolving reality could it offer us tangible benchmarks?*
- ❖ High tech moves faster than industry, enforcement reactive,...
- ❖ Corporate interests, lobbying, ideology, intellectual and regulatory capture ... all play a part in our perception of the current dynamics.
- ❖ Limited enforcement capacity.

Competition law and regulation may underperform.

5. Final reflections

- ❖ Update the enforcement toolbox (competition and regulation) to match the technology stack.
- ❖ Increase enforcement capacity.
- ❖ Foster contestable market conditions.

