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IN FOCUS

April 16, 2025

Competition and Antitrust Concerns Related to Generative AI

Artificial intelligence (AI) technologies used to generate synthetic content, such as text, images, audio, video, and computer code, are broadly referred to as *generative AI* (GenAI). One type of GenAI is a large language model (LLM), which can generate responses to prompts in natural language format once it has been trained on a massive amount of text (e.g., text from millions of web pages) and defined by billions of model parameters.

Developing and operating a large-scale GenAI model may require significant computing resources, such as hardware, software, and other information technology (IT) infrastructure, which can be costly. This has raised concerns about who may be able to develop such models, whether companies with substantial resources may have a competitive advantage over smaller competitors and start-ups, and whether some companies that own IT infrastructure might be engaging in anticompetitive conduct. Some stakeholders have argued that competition is thriving in each component of GenAI development.

Some U.S. companies—including Amazon, Google, Meta, and Microsoft—own IT infrastructure used to train and deploy GenAI models and also invest billions of dollars to develop their own models. Other companies are exploring methods to reduce computing power needed to develop AI models. For example, the Chinese company DeepSeek stated that it used cost-efficient model training to develop its GenAI model. Some Members of Congress are considering whether congressional action could help promote competition to ensure America's global leadership in the development of GenAI.

This In Focus discusses some potential concerns about competition in the development of GenAI in U.S. markets and potential issues raised by antitrust enforcers. It also provides some considerations for Congress.

Development of GenAI Models

Although the terminology of AI is still evolving, an *AI model* generally refers to a computer program that uses algorithms and mathematical functions to process inputs (e.g., data and prompts) into outputs (e.g., predictions and decisions). The AI model is trained on sample datasets to recognize certain types of patterns and "learn" from the data, optimizing its performance over time to create outputs such as text that mimic human language. For an overview of GenAI models, see CRS In Focus IF12426, *Generative Artificial Intelligence: Overview, Issues, and Considerations for Congress*, by Laurie Harris.

Foundation models are general-purpose AI models pretrained on large datasets. Foundation models can be used for various downstream purposes, such as user-facing AI applications and services (e.g., OpenAI's ChatGPT model, which supports its AI chatbot), or further fine-tuned using smaller datasets of specialized knowledge for work in specific domains. If a limited number of foundation models are available, the companies that deploy these models might have market power and significant influence over GenAI developers, particularly if it is difficult for others to enter the market by developing their own foundation models.

Foundational Model Costs and Competition

Developing a GenAI model, especially a foundation model, demands significant time, effort, and computing resources. To train a foundation LLM, for example, an AI developer may acquire a large dataset from a third party or create one by scraping text from publicly available web pages. Before training, the developer cleans the data (e.g., removes incorrect, inaccurate, or duplicate texts) and preprocesses the data into *tokens*—the basic units of text that the LLM can process. The training can involve trillions of tokens to develop foundation models with billions of parameters, which require millions of hours of computer chip processing time (e.g., DeepSeek claimed that one of its LLMs required 2.8 million graphics processing unit [GPU] hours—equal to about 57 days—to complete its training on a cluster of 2,048 high-performance chips). To conduct AI training at this scale, the developer typically either purchases high-performance chips or leases computing resources from a cloud computing service provider.

According to the annual *AI Index Report 2025*, costs of training large foundation models alone "are widely estimated to reach into the millions of dollars—and continue to rise." While AI developers rarely disclose exact cost information, the *AI Index Report* published estimated training costs based on rental prices charged by major cloud service providers for accessing computing hardware and processing data. For example, the estimated cost of Llama 3.1 LLM, which has 405 billion parameters and was released by Meta in 2024, could be around $170 million (excluding other costs, such as data acquisition and labor).

The high costs and resources needed to develop large foundation models, particularly during the pretraining phase, may limit the number of companies that are able to develop these models. Some companies may also use their resources to obtain a competitive advantage. For example, some companies might be able to leverage resources that they have been investing in for years (e.g., data, cloud computing services) to develop GenAI models. This might make it difficult for start-ups and smaller companies to compete if they do not have access to these resources. Some companies, such as DeepSeek, claim that they have developed AI models cost-effectively, which raises questions about the necessity of large AI investments and

U.S. global leadership, although some analysts question the comprehensiveness of DeepSeek's cost estimates.

National Artificial Intelligence Research Resource Pilot

As part of an effort to "democratize access to critical resources necessary to power responsible AI discovery and innovation," the National Science Foundation launched a two-year pilot program in January 2024 called the National AI Research Resource (NAIRR), as directed under Executive Order 14110. The NAIRR pilot, informed by January 2023 report findings from a statutorily created NAIRR Task Force, provides access to advanced computing, datasets, models, software, training, and user support for U.S.-based researchers and educators. This can provide opportunities for individuals and entities to use resources that they might not otherwise be able to access. Smaller businesses and start-ups might benefit, which could increase competition, as asserted by some Members of Congress. Further, previous studies have estimated that more than 14,000 start-ups were formed on the basis of academic research between 1996 and 2017. Supporting academic research through the NAIRR pilot may subsequently encourage start-ups and future innovation and competition.

As of March 2025, at least 14 federal agencies and 26 private sector partners were participating and contributing resources to the NAIRR pilot, including a NAIRR Secure focus area to support AI research requiring privacy and security-preserving resources.

Antitrust Concerns

Antitrust enforcers in the United States and other countries have raised concerns about competition related to the development of GenAI. In July 2024, the Department of Justice (DOJ), Federal Trade Commission (FTC), UK Commission on Markets Authority (CMA), and European Commission released a joint statement that specifies three concerns: (1) concentrated control of key inputs, such as specialized chips, computing power, and technical expertise; (2) the ability of large incumbent digital firms to entrench or extend power in AI-related markets; and (3) arrangements among key players that might reduce competition and steer market outcomes in their favor. The FTC released a January 2025 report investigating partnerships between certain U.S. based cloud providers and AI developers. The report highlights some areas of potential concern, including whether contractual terms and technical barriers may make it difficult for AI developers to switch cloud providers and whether cloud providers have access to sensitive technical and business information.

In 2024, antitrust authorities were investigating companies for potential anticompetitive conduct related to GenAI, according to news articles. For example, the DOJ was investigating whether Nvidia, a company that produces chips, made it difficult for buyers to switch suppliers and penalized those that do not exclusively use its AI chips. The FTC sought information regarding Microsoft, including its partnership with the AI start-up OpenAI (Microsoft has invested over $13 billion in OpenAI) and its cloud computing business, specifically whether it was imposing licensing terms to prevent customers from moving their data from its Azure cloud service to competitors' services. Some of these investigations are reportedly ongoing.

Federal antitrust laws—which seek to promote competition by prohibiting certain anticompetitive conduct—may be applicable to some of the companies' actions. For example, Microsoft's investment in OpenAI might be viewed as an acquisition. However, the UK CMA determined that Microsoft's partnership with OpenAI did not qualify as a relevant merger because it "does not believe that Microsoft currently controls OpenAI's commercial policy." Additionally, for an acquisition to violate U.S. federal antitrust laws, enforcers would need to demonstrate that "the effect ... may be substantially to lessen competition, or to tend to create a monopoly." Even if the FTC determines that Microsoft's partnership with OpenAI is an acquisition, it is unclear whether the FTC or U.S. federal courts would find that the acquisition violates federal antitrust laws.

Considerations for Congress

Competition in the development of GenAI models might spur innovation, reduce prices, and provide more options for developers and users, among other potential benefits. Efforts to increase competition may have different trade-offs. For example, providing open access to foundation models and their weights can broaden AI research and development, potentially increasing competition. However, it can also raise concerns about public safety and misuse. Limited access to data might limit competition in the development of foundation models, although firms collecting, using, and sharing data might raise concerns about data privacy, copyright, and other issues.

Congress might choose not to pursue legislative action. It could determine that there is sufficient competition in GenAI development. Congress could also pursue non-legislative action, such as hearings on methods to help increase competition in GenAI development or letters to the FTC and DOJ about concerns of anticompetitive conduct.

If Congress determines that additional legislation is needed, one option could involve support for GenAI research. For example, NAIRR could be converted into a permanent program, as proposed in the CREATE AI Act of 2025 (H.R. 2385). By providing access to AI resources, NAIRR might provide opportunities for researchers and start-ups to develop AI models and potentially increase competition. However, NAIRR could also further entrench incumbents providing AI resources, such as advanced computing services or foundation models. Developers may need to continue relying on these incumbents if it is difficult to switch resource providers; additional measures—such as interoperability or uniform standards—may be considered.

Other options could include higher funding for antitrust enforcement or amending antitrust laws. While these options might increase antitrust enforcement related to GenAI, enforcers might also determine that the companies are not violating antitrust laws or choose to focus investigations on other markets instead.

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IF12968

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