IFRI
STUDIES

GEOPOLITICS OF TECHNOLOGY CENTER

APRIL
2025

European Startups and Generative AI

Overcoming Big Tech Dominance

Hugo LE PICARD

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ISBN: 979-10-373-1051-4

How to cite this publication:

Hugo Le Picard, "European Startups and Generative AI: Overcoming Big Tech Dominance", *Ifri Studies*, Ifri, April 2025.

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Résumé

L'Europe est à la croisée des chemins : face à la domination des *Big Tech* américaines sur toute la chaîne de valeur de l'Intelligence artificielle (IA) générative, des modèles de fondation aux infrastructures *cloud*, en passant par les canaux de distribution et l'*open source*, elle risque un décrochage technologique et économique durable. Néanmoins, l'IA générative pourrait aussi représenter une opportunité de transformation économique majeure, avec un potentiel de valeur estimé à 1,5 fois le produit intérieur brut (PIB) français. Mais pour en faire un moteur de renouveau économique, l'Europe doit dépasser sa quête illusoire d'indépendance technologique totale et construire un écosystème capable de tirer parti des ressources des *Big Tech* tout en renforçant ses propres capacités d'innovation.

La véritable opportunité pour l'Europe se situe aujourd'hui plus en aval de la chaîne de valeur de l'IA générative, là où s'opère l'adaptation des modèles aux besoins concrets des différents secteurs, notamment industriels. Forte de son expertise industrielle, réglementaire et technique, l'Europe peut y construire des avantages compétitifs durables. Plutôt que de viser une souveraineté totale en amont, l'enjeu est d'accélérer l'adoption sectorielle de l'IA, en s'appuyant sur ses filières d'excellence et en soutenant le développement d'un tissu de startups capables de transformer la technologie en solutions concrètes.

En amont de la filière, la compétition féroce entre les géants technologiques américains crée paradoxalement des effets d'aubaine pour l'Europe. Les géants technologiques américains se livrent une compétition de plus en plus intense, dont la course aux investissements en est l'un des symptômes les plus visibles. Pris dans un dilemme où aucun ne peut se permettre de ralentir, malgré les risques de surcapacité, ils multiplient les dépenses pour garder leur avance. Cette dynamique concurrentielle force les *Big Tech* à proposer des conditions d'accès plus favorables à leurs outils et infrastructures. Les entreprises européennes peuvent en tirer parti pour accélérer le développement de solutions innovantes, à des coûts réduits, et viser des marchés comme les États-Unis pour les monétiser rapidement.

Abstract

Europe is at a crossroads. Faced with the domination of American Big Tech across the entire generative Artificial Intelligence (AI) value chain, from foundation models to cloud infrastructure, distribution channels, and open source, it risks long-term technological and economic decline. Yet generative AI also represents a major opportunity for economic transformation, with a potential value estimated at 1.5 times France's gross domestic product (GDP). To turn it into a driver of renewal, Europe must move beyond the illusion of total technological independence and instead build an ecosystem that leverages Big Tech resources while strengthening its own innovation capabilities.

The real opportunity for Europe lies further downstream in the generative AI value chain, where models are adapted to the concrete needs of various sectors, particularly industrial ones. Thanks to its industrial, regulatory, and technical expertise, Europe can carve out lasting competitive advantages here. Rather than chasing an upstream sovereignty, the real challenge is to accelerate AI adoption across sectors by capitalizing on its areas of excellence and nurturing a startup ecosystem that turns cutting-edge technology into practical solutions.

Upstream, the fierce competition between American tech giants paradoxically creates windfall opportunities for Europe. Locked in an investment race, none can afford to slow down despite the risks of overcapacity, pushing them to multiply spending in order to maintain their lead. This dynamic compels Big Tech to offer increasingly favorable access to their tools and infrastructure. European companies can seize this moment to develop innovative solutions at lower costs and monetize them quickly by targeting large markets like the United States.

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Introduction

Confronted with the risk of falling behind the United States (U.S.) economically, generative Artificial Intelligence (AI)[1] could serve either to revitalize Europe or accelerate its decline. This technology holds considerable potential to generate value year on year, amounting to more than one and a half times France's gross domestic product (GDP).[2] Any time lost in mastering and, above all, putting these technologies to economic use may render the gap in economic development between the two continents irreversible.

Two years after the release of ChatGPT, the economic transformations associated with generative AI are accelerating, buoyed by cost reductions never before seen in the history of technology.[3] In the space of less than two years, generative AI has become part of everyday life for tens of millions of users, both at home and at work.[4] This disruptive technology[5] has already shaken up certain well-established sectors. In education, for example, the online education platform Chegg lost 99% of its stock market value after ChatGPT's release—a loss of $14.5 billion in just a few months[6]—due to students flocking en masse to the OpenAI chatbot.

Generative AI stands out from prior innovations with its extraordinary versatility: it can simultaneously assist and increase the productivity of professionals in fields as diverse as biology, engineering, radiology, and software development, while adapting to a wide range of everyday uses, from image generation to conversational assistance and virtual companionship. For the most advanced models, this versatility includes the ability to simultaneously process multiple types of data (text, code, audio,

1. Generative AI is so named for its ability to create novel content (text, images, sounds, code) using the data it has been trained on, whereas traditional AI focuses primarily on analysis, classification, and prediction based on existing data. This ability to create allows it not only to analyze but also to generate original content, enrich and transform the inputs it receives, allowing for a much wider range of applications than traditional AI systems.

2. J. Manyika and M. Spence, "The Coming AI Economic Revolution: Can Artificial Intelligence Reverse the Productivity Slowdown?", *Foreign Affairs*, November/December 2023.

3. The costs of AI are falling on average by a factor of ten each year; see G. Appenzeller, "Welcome to LLMflation – LLM Inference Cost is Going Down Fast", Andreessen Horowitz (a16z), November 12, 2024.

4. D. Gallegos, "The Many Ways WSJ Readers Use AI in Their Everyday Lives", *The Wall Street Journal*, November 23, 2024.

5. B. Pajot, "Les risques de l'IA. Enjeux discursifs d'une technologie stratégique", *Études de l'Ifri*, Ifri, June 2024.

6. M. Kruppa, "How ChatGPT Brought Down an Online Education Giant", *The Wall Street Journal*, November 9, 2024.

image),[7] and is fueled by vast quantities of knowledge: according to Yann Le Cun,[8] it would take a human more than 22,000 years of reading to acquire an equivalent amount of "knowledge" to GPT-3.

Today, generative AI is seen as what could become a major driver of economic growth in the 21st century, in line with endogenous growth theory, for which innovation and human capital play a fundamental role. Its potential to accelerate technical progress in many sectors simultaneously would transform the balance of economic power: a nation's strength would depend less on its resources or isolated technological expertise than on its ability to sustain continuous innovation in all areas and to integrate it rapidly into its society, economy, and national security.[9]

For Europe, this technological revolution comes at a time when it risks falling behind the U.S. economically, with stagnant growth since 2008, productivity slowing since the 1990s,[10] and an aging population.[11] With Europe's GDP per capita already half that of the U.S.,[12] the longer generative AI takes to be deployed, the further Europe will fall behind.

To meet this crucial challenge, Europe has a number of advantages that can help it make the most of this new technological revolution. But European generative AI development is caught in a paradox: despite its talent pool and the appearance of innovative startups like Mistral AI, it still depends heavily on U.S. tech giants. This complex relationship will require an in-depth analysis in order to define a realistic strategy for generative AI development in Europe.

This paper focuses on three complementary areas. It first examines the nature and extent of Big Tech's[13] dominance over the European AI ecosystem, revealing a structural dependency. It then identifies opportunities in generative AI's emerging value chain, particularly downstream, where European companies have the potential to secure lasting competitive advantages. Finally, it analyzes how increasingly fierce competition between the U.S. and, more recently, Chinese AI giants could open up new opportunities for Europe.

7. J. Manyika and M. Spence, "The Coming AI Economic Revolution: Can Artificial Intelligence Reverse the Productivity Slowdown?", *Foreign Affairs*, November/December 2023.
8. D. Baverez, *Bienvenue en économie de guerre*, Paris: Novice, 2024.
9. E. Schmidt, "Innovation Power: Why Technology Will Define the Future of Geopolitics", *Foreign Affairs*, March/April 2023.
10. J. Manyika and M. Spence, "The Coming AI Economic Revolution", *Foreign Affairs*, op. cit.
11. N. Eberstadt, "The Age of Depopulation: Surviving a World Gone Gray", *Foreign Affairs*, November/December 2024.
12. "World Development Indicators – GDP per capita (current US$)", World Bank, data for 2023, accessed February 22, 2025.
13. In this paper, the terms "Big Tech" and "tech giants" are used interchangeably to refer to the major U.S. technology companies dominating the sector: Alphabet (Google), Amazon, Apple, Meta (Facebook), Microsoft, and Nvidia.

This progression, starting with an objective assessment before examining actionable opportunities, aims to move beyond a binary perspective of technological dominance or independence and to outline a realistic path for Europe in generative AI.

Big Tech's structural hold over European AI

Big Tech's dominant position in the generative AI ecosystem extends across the entire value chain. This first part examines four key areas where this dominance can be observed: the foundation models[14] which constitute the core of these technologies, the cloud infrastructure needed for their development, the distribution channels used to commercialize them, and the open source tools that they support and strategically influence to facilitate the development and deployment of their technologies. This hegemonic position structures the entire European tech ecosystem[15] and explains why regulation alone cannot succeed in creating the conditions for autonomous European innovation.

A technological arms race dominated by Big Tech

The history of foundation models' development illustrates the growing dominance of Big Tech in the generative AI race. The first phase of generative AI development accelerated an unprecedented concentration of financial resources toward these companies. Since 2019, the market capitalization of major digital corporations (Microsoft, Apple, Amazon, Alphabet, Meta) has more than tripled, reaching $11.8 trillion. If we add U.S. semiconductor manufacturer Nvidia, which specializes in graphics processing units (GPUs), their combined market capitalization is more than 1.5 times that of the 25 largest traditional U.S. companies (oil, pharmaceuticals, banking, etc.).[16] Nvidia has so far been the main beneficiary of the generative AI boom, growing from less than $100 billion in market value to over $3 trillion in just a few years.[17]

This financial power gave them the means to enter a technological arms race, developing ever more powerful generative models. These improvements mainly rely on two key factors: the development of more sophisticated algorithms and greater computing power. While algorithmic

14. Foundation models are AI models trained on vast amounts of data that serve as a basis for developing more specialized applications. OpenAI's GPT-4 and Anthropic's Claude are some of the most well-known examples.

15. The tech ecosystem refers to all the interdependent components (infrastructure, tools, distribution channels) needed to develop and deploy these technologies.

16. "Why America's Tech Giants Have Got Bigger and Stronger: Whatever Happened to Creative Destruction?", *The Economist*, August 22, 2024.

17. Ibid.

improvements are fundamental, they are also less predictable and therefore more difficult to plan for. Big Tech has therefore focused its massive investments in AI on computing power, a more direct and measurable lever for improving performance. This strategy is reflected in skyrocketing training costs: while a cutting-edge model cost around $100 million in late 2024, the chief executive officer (CEO) of Anthropic estimates that this figure could reach $5 billion to $10 billion as early as 2025-2026.[18] These escalating costs have naturally restricted the number of actors capable of developing foundation models.

The introduction of the Chinese DeepSeek model, however, suggests that a different approach could also work. It reportedly achieved similar results to ChatGPT using older-generation graphics processors,[19] with a final training phase costing just under $6 million, according to its creators.[20] If these results are confirmed, algorithmic innovation could prove to be a game-changer, even against tech giants' considerable resources. This breakthrough also highlights the duality of AI development: while computational power remains a reliable and necessary factor in the development and deployment of AI models, advances in areas such as model architecture[21] and training techniques can lead to sudden technological breakthroughs that are difficult to anticipate. Foundation model development could therefore continue to experience a combination of linear growth in computing power and abrupt technological leaps.

This duality between algorithmic innovation and computational power is reflected in tech giants' investment strategies. Beyond their own research efforts, these companies are investing heavily in innovative startups such as Anthropic and OpenAI (more than $24 billion combined between Microsoft, Amazon, and Google). The Federal Trade Commission (FTC) reveals that these investments often come with circular spending agreements: startups must spend a large portion of the funding they receive on cloud services developed by their investors.[22] This approach allows Big Tech companies to optimize their strategic positioning in both segments: positioning themselves in algorithmic innovation while strengthening their dominant position in cloud infrastructure.

18. S. Fiegerman and R. Metz, "AI Startups Struggle to Keep Up With Big Tech's Spending Spree", Bloomberg, September 6, 2024.
19. "Graphics processing units" or "graphics cards" were historically developed to handle video game display calculations. Their architecture, optimized to perform numerous calculations in parallel, has proven particularly well suited for AI. Artificial neural networks, which form the core of AI systems, rely on matrix multiplications that can be broken down into parallel calculations. While a traditional processor (CPU) processes operations one at a time, a GPU can process thousands simultaneously, significantly accelerating the training and execution of AI models.
20. "DeepSeek-V3 Technical Report", DeepSeek-AI, February 18, 2025.
21. A model architecture refers to the plan or structure organizing the different parts of the neural network and determining how information flows, is transformed, and learned within the model.
22. "Partnerships Between Cloud Service Providers and AI Developers – FTC Staff Report on AI Partnerships & Investments 6(b) Study", Federal Trade Commission, Office of Technology Staff, January 2025.

Control over critical infrastructure

In addition to developing foundation models, Big Tech also strengthens its dominant position through its control of essential AI infrastructure. Their massive investments in data centers and cloud infrastructure create a double dependency: not only can they operate their own models at scale, they also control the resources needed to run any other model. Even if actors like DeepSeek manage to develop more efficient models, their impact will remain limited without access to such massive infrastructure. This reality consolidates the hegemony of the U.S. tech giants, which, thanks to their colossal investments in infrastructure, maintain a strategic advantage across the entire AI value chain.

Amazon Web Services (AWS), Microsoft Azure, and Google Cloud now control 68% of the global cloud services market,[23] while Nvidia accounts for 90% of the GPU market, an essential component for training and operating AI models.[24] This dominance is only getting stronger: since 2019, Big Tech investments in AI infrastructure have skyrocketed. The Big Five and Nvidia have doubled their capital spending, reaching $169 billion in 2023—far exceeding the $135 billion invested by the next 25 largest companies combined.[25] These massive investments are all the more critical as new GPU generations are regularly released, representing significant fixed costs that can quickly become obsolete. This technological and financial arms race accelerated further in 2024: in Q4, Amazon, Microsoft, and Alphabet invested $50.6 billion, primarily in their AI infrastructure[26]—equivalent to France's annual defense budget. Meta plans to invest $10 billion in an AI data center in Louisiana,[27] while Elon Musk has joined the race with xAI, whose Memphis data center—described as "the fastest supercomputer on the planet" by Nvidia's CEO—is set to double its capacity to 200,000 GPUs.[28]

These colossal investments will not only serve to train current models, they will also help build the infrastructure needed to deploy future AI services. With GPUs still in short supply, this infrastructure race directly addresses the strategic needs of startups.

Startups need to be able to quickly scale up their services if they become successful. Since migrating from one infrastructure provider to another is both technically complex and costly, they need to partner with providers who can effectively support their future growth right from the start. The massive

23. M. Haranas, "Cloud Market Share For $84B Q3 2024: AWS, Microsoft, Google Cloud Lead", CRN, November 7, 2024.
24. N. Khan, "NVIDIA Crushes Rivals: Secures Unprecedented 90% of GPU Market in Q3 2024", Yahoo Finance, December 12, 2024.
25. "Why America's Tech Giants Have Got Bigger and Stronger", *The Economist*, op. cit.
26. M. Kruppa and T. Dotan, "Tech Giants See AI Bets Starting to Pay Off", *The Wall Street Journal*, November 1, 2024.
27. "Meta to Invest $10 Billion for Louisiana Data Center", Reuters, December 4, 2024.
28. B. Jin and M. Bobrowsky, "Elon Musk's xAI in Talks to Raise Funding Valuing It at $40 Billion", *The Wall Street Journal*, October 29, 2024.

infrastructure investments made by the U.S. giants send a strong signal: they will be the only ones capable of meeting the rapidly expanding demand for AI services. This reality forces European startups to depend on U.S. data centers from their earliest stages of development, further strengthening Big Tech's dominant position across the entire value chain.

In this context, cloud credits, which grant European startups free access to Big Tech IT infrastructure, have a paradoxical effect. While designed to promote long-term dependency, these credits are also an indispensable resource for startups. In an ecosystem where fundraising remains difficult, they enable startups to access cutting-edge infrastructure without depleting their limited financial resources. This situation perfectly illustrates the complexity of the relationship between Europe and Big Tech: while their dominance raises legitimate strategic concerns, their technological and financial resources are, in the short term, an essential lever for the development of European innovation.

The Stargate AI project illustrates the scale of this infrastructure arms race: OpenAI, SoftBank, and Oracle plan to invest up to $500 billion over four years in the development of AI infrastructure in the United States, with an initial phase of $100 billion for a data center in Texas.

In response to this announcement, the European Union unveiled its InvestAI plan at the Summit on Artificial Intelligence held in Paris in February 2025. Amid this global scramble over AI, the European Commission wants to mobilize €200 billion through an alliance between the Commission and some 60 private companies (under the European AI Champions Initiative).[29] The Commission would provide €50 billion in public funding, €20 billion of which would be used to build major data centers specializing in AI, while the private sector would contribute €150 billion.[30] This European initiative echoes France's commitment, announced on the margins of the aforementioned summit, to mobilize €109 billion to accelerate artificial intelligence development in the coming years.[31]

It is important to note that the first wave of investment in critical AI infrastructure was spearheaded by the private sector, with tech giants having invested heavily for more than two years. While recent European initiatives are a welcome sign of a growing political awareness, they must, above all, aim to foster an environment conducive to private investment. Rather than simply injecting public funding, even when backed by large corporations, the challenge for European and French public authorities will be to promote a

29. F. Chaaban, "L'UE annonce un plan historique de 200 milliards d'euros pour l'intelligence artificielle", Toute l'Europe, February 12, 2025, available at: www.touteleurope.eu.
30. F. Y. Chee, "EU's AI Push to Get 50 Billion Euro Boost, Says von der Leyen", Reuters, February 11, 2025, available at: www.reuters.com.
31. J. Weatherbed, "EU Mobilizes $200 Billion in AI Race Against US and China", *The Verge*, February 11, 2025, available at: www.theverge.com.

self-sustaining ecosystem. This will require developing the regulatory, fiscal, and industrial conditions that will enable the private sector to naturally and massively invest in the infrastructure it needs.

Control over distribution channels

Startups' dependence on the tech giants isn't limited to AI infrastructure: it also includes distribution channels, which they need to reach their end users. And whether for consumer mobile apps or professional solutions, European startups must rely on platforms owned by U.S. giants.

For mobile apps, the Google Play and App Store application distribution platforms account for 95% of the market in Europe and worldwide (excluding China).[32] This market dominance allows them to charge commissions on all transactions, with a total of $127.3 billion spent in their stores in 2024.[33] In the professional market, integration into the dominant ecosystems is also a necessity: Google Workspace and Microsoft 365 alone control 74% of the global market for office solutions.[34] The need for interoperability means that customers often demand compatibility with the tools they use on a daily basis, making the U.S. tech giants essential partners for any startup developing business solutions.

Big Tech's dominance in distribution channels is taking on a new dimension with the emergence of generative AI. While their market position raises legitimate concerns in terms of competition, it paradoxically offers vital protections from the new risks presented by these technologies. The proliferation of services made possible by these technologies has brought with it a host of new risks: malicious software, substandard services, and sophisticated scams. While traditional regulation struggles to keep pace with innovation, the tech giants have the resources and mechanisms to effectively filter applications. The rigorous verification process Apple enforces every time an app is updated demonstrates its ability to maintain a high level of security, a feature that is all the more valuable as generative AI facilitates the widespread creation of malicious content.[35]

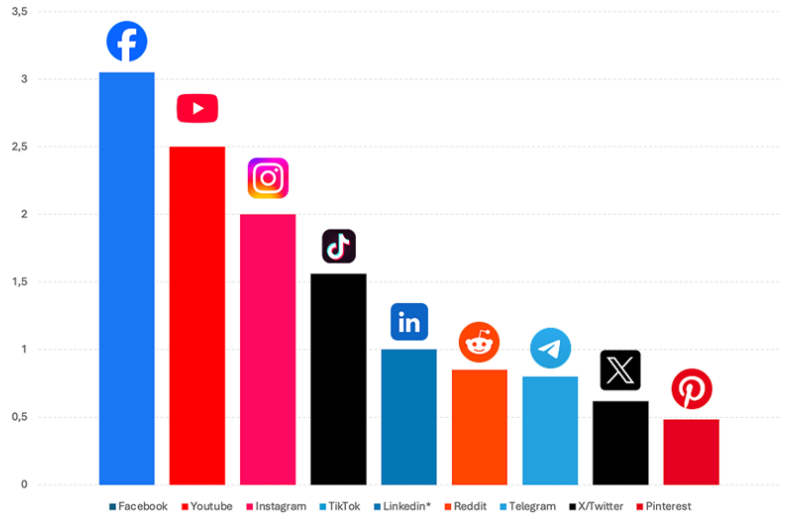
Startups depend not only on distribution channels for their growth, but also on advertising platforms, which the digital giants control as well. In today's largely digital global advertising market, valued at $933 billion in

32. D. Curry, "App Store Data (2025)", Business of Apps, January 27, 2025.
33. N. Lefebvre, "L'App Store d'Apple domine le marché avec 91,6 milliards en 2024 (la moitié en abonnement)", iPhonesoft, December 18, 2024.
34. L. S. Vailshery, "Market Share of Major Office Productivity Software Worldwide as of February 2025", Statista, February 2025.
35. While European regulators are right to seek to foster competition in the mobile app market, notably through the Digital Markets Act, they must also bear in mind that consumers' best interests are not served solely through access to more apps or at lower prices. In a digital ecosystem made more risky by generative AI, the dominant platforms' ability to provide safeguards against malicious behavior has significant value for users.

2024, Google, Meta, and Amazon account for 61% of revenue (excluding China).[36] European startups must also invest a significant portion of their marketing budget on these platforms (Facebook, Instagram, LinkedIn, YouTube) to reach new customers.[37]

This dependence on advertising platforms is all the more critical given that their effectiveness relies on sophisticated targeting algorithms, enabling startups to optimize their customer acquisition costs. Recent European regulatory changes, such as the requirement for Meta to offer less personalized advertising,[38] could paradoxically increase this dependence: higher acquisition costs could weaken European startups relative to competitors with greater marketing resources, or even drive them to shift their focus to less regulated markets, further consolidating the dominant position of established actors in the European market.

Figure 1: Number of monthly active social media users worldwide, in billions (2024)

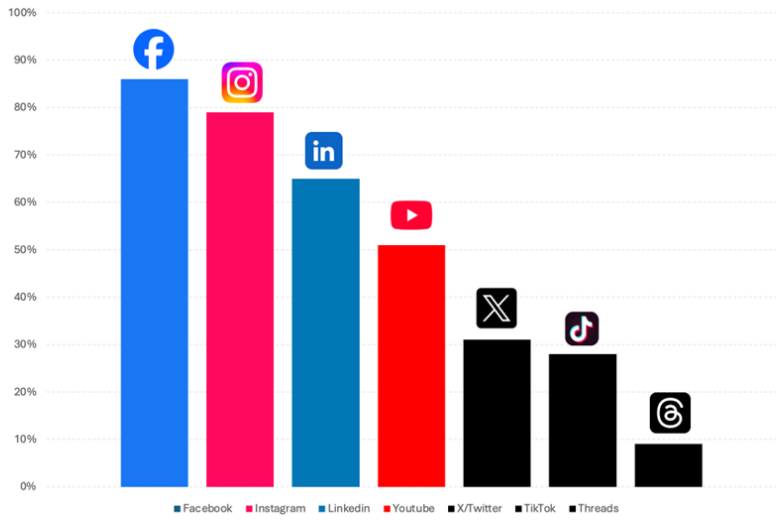


* Total number of "members", as LinkedIn does not provide data on monthly active users (MAU).

Source: "Social Media User Statistics: Social Media Report 2024", Blog2Social, 2024.

36. M. J. Levin, "Les recettes publicitaires mondiales en hausse de 10 % en 2024, selon Magna", e-marketing.fr, December 9, 2024.
37. This dynamic also explains Meta's support for open source in AI: by making its models freely available, the company is encouraging startups to develop new services. In order to grow, these services will in turn need to invest in advertising on Meta's platforms, thereby strengthening their core advertising-based business model.
38. S. Schechner and K. Mackrael, "In Europe, Instagram Ads Are About to Get Less Personal", *The Wall Street Journal*, November 12, 2024.

Figure 2: Leading social media platforms used by marketers worldwide (2024)



Source: Statista Research Department, "Leading Social Media Platforms Used by Marketers Worldwide 2024", Statista, December 10, 2024.

Influence on the open source ecosystem

Startups' dependence on Big Tech extends beyond their commercial services: it also applies to the open source ecosystem, which is essential in the development of AI tools and frameworks.[39] Through their investment in these technologies, the tech giants influence industry standards and facilitate the adoption of their innovations. They develop and maintain open source tools that have become industry standards, including TensorFlow, Go, and Flutter (Google), PyTorch (Meta), and Triton Inference Server (Nvidia).[40] By investing massively in these technologies, especially with dedicated development teams, they influence the technical direction of the entire ecosystem.[41] Open source, therefore, helps the industry giants consolidate their hold on the entire sector, a strategy which Mark Zuckerberg openly embraces: "open-source software often becomes an industry standard, and when companies standardize on

39. An AI framework is a set of tools and software libraries that facilitate the design, training, and deployment of artificial intelligence models.
40. These tools are essential development frameworks and libraries for AI and digital applications: TensorFlow and PyTorch are used to build and train AI models, Flutter helps with mobile and web app development, Go is a fast and efficient programming language often used for building scalable backend services, and Triton Inference Server helps optimize the deployment of AI models at scale.
41. A. Pannier, "Software Power: The Economic and Geopolitical Implications of Open Source Software", *Études de l'Ifri*, Ifri, December 12, 2022.

building with our stack,[42] that then becomes easier to integrate new innovations into our products."[43]

The influence of Big Tech on the open source ecosystem, while contributing to their dominance of the sector, also has significant benefits for the industry as a whole. Startups, as well as researchers, benefit from robust, free tools developed and maintained by highly qualified teams, enabling them to develop their services more quickly. Tech giants' investments in the security of these tools provide valuable protection for the entire ecosystem from the risks that come with open code (malicious code injections, backdoors, computer worms, time bombs, etc.).[44] In this regard, Big Tech's significant influence on open source helps to structure and secure the sector, creating a more stable environment for startup innovation.

Beyond the myth of European technological independence

The dominance of U.S. giants over infrastructure and development tools makes one thing clear: total technological independence for Europe in the short term is neither feasible nor necessarily desirable. But Big Tech's hold on the digital ecosystem also reveals a form of interdependence: while their dominance allows them to capture a significant share of value, their investments and services also produce the conditions necessary for European startups to develop, which in turn enhance the value of their infrastructure.

European regulation alone cannot ensure true digital sovereignty: this will require a dynamic ecosystem of strong European companies in the field. The U.S. currently boasts 9 times more tech unicorns than China, and 5.5 times more than Europe.[45] What's more, on average, European startups have one-sixth the number of employees of their U.S. counterparts.[46] This entrepreneurial deficit is not so much a consequence of Big Tech's control over the ecosystem as it is the result of structural weaknesses in Europe. The European venture capital market remains fragmented and undersized

42. A "tech stack" describes the set of technologies, languages, tools, and frameworks that a company uses to develop its digital products or services.
43. E. Gent, "The Tech Industry Can't Agree on What Open-Source AI Means. That's a Problem.", *MIT Technology Review*, March 25, 2024.
44. Malicious code injections: an attack that inserts malicious code into an application to perform unintended operations; backdoors: hidden access points built into a system to discreetly bypass normal authentication procedures; computer worms: self-propagating programs that spread automatically from one system to another, often to damage or steal data; time bombs: malicious code programmed to activate at a specific date or in response to a specific event to disrupt a system.
45. "Les États-Unis comptent 9 fois plus de licornes technologiques que la Chine et 5,5 fois plus que l'Europe", Itrnews, October 8, 2024, available at: https://itrnews.com.
46. D. Cerdeiro, G. H. Hong, and A. Kammer, "How to Awaken Europe's Private Sector and Boost Economic Growth: EU Companies Grow and Innovate Less Than American Counterparts", IMF Blog, September 11, 2024.

compared to the U.S., while pay-as-you-go pension systems and the absence of large pension funds limit investment capacity. The fragmentation of the European market, combined with its linguistic and cultural barriers, limits the size of its potential market and effectively restricts startups' ability to distribute their services on a large scale.

More fundamentally, Europe suffers from a lack of high-growth startups, which limits not only the pool of experienced professionals but also the broader development of the ecosystem. Fast-growing businesses play a key role in shaping the economy in several ways: their former employees, thanks to their experience, can launch their own startups or help other businesses grow as managers or consultants. These businesses can also become important potential customers for new startups, contribute to funding innovation through direct investment, and enrich the local tech ecosystem by developing and sharing open source tools, as Hugging Face has done with its libraries and platforms, making AI models easier to use and share. This virtuous cycle, which has become well established in the U.S. ecosystem, is still struggling to emerge in Europe, limiting development opportunities for new businesses.

Ultimately, the real issue is not so much Big Tech's dominant position, which provides essential services for innovation and startup growth, but rather the absence of European companies among these global tech leaders.

The AI value chain: identifying opportunities for Europe

This U.S. dominance calls for us to rethink Europe's position in generative AI. Generative AI's main economic value is not limited to training foundation models, but lies above all in its adaptation to the specific needs of a wide range of sectors. This perspective points to a more balanced form of interdependence in the short term: while European startups depend on Big Tech for a number of technologies and for their infrastructure, Big Tech also needs an ecosystem of innovative companies to fully leverage their platforms.

With this in mind, an analysis of the generative AI value chain reveals a more nuanced reality than one of simple U.S. dominance. While infrastructure and foundation models remain the preserve of the tech giants, underlying sectors are beginning to emerge, namely development tools and vertical industry applications. Europe can build lasting competitive advantages in these areas. This is also where most of the economic value of generative AI is concentrated.

Distribution as important as production: rethinking European ambitions

Dominating infrastructure and foundation models does not guarantee value capture: a country can generate significant economic benefits by excelling in the adoption and use of AI, rather than by producing it. Looking beyond the race to develop ever more powerful AI models, the key economic challenge lies in the ability of countries, sectors, and businesses to adopt and effectively integrate these technologies into their activities. The potential here is huge: generative AI could add up to $4 trillion per year to the global economy—about 1.5 times France's GDP—on top of the $11 trillion already projected for non-generative AI and other forms of automation.[47] This distinction between development and adoption is all the more crucial given that productivity gains do not result merely from a technology's existence, but from its effective distribution throughout the economy. The digital revolution is proof of this: significant

47. J. Manyika and M. Spence, "The Coming AI Economic Revolution", *op. cit.*

productivity gains only materialized once businesses adapted their processes and trained their employees.

In terms of AI model production, France already has its champion with Mistral AI, whose rapid growth and technical credibility have demonstrated that a European company can compete on the global stage. Rather than squandering resources in a race for sovereign models that would mainly benefit Nvidia—the U.S. company expected to generate nearly $10 billion in 2024 from GPU sales to countries eager to develop their own AI models[48]—Europe could consolidate its position by establishing Mistral AI as its continental champion, and focusing its efforts on the crucial task of deploying AI throughout its economy and encouraging the emergence of new unicorns along the generative AI value chain.

Development tools: a strategic market

AI value creation isn't just about the race to build large language models (LLMs). Were cutting-edge models like GPT-4 or Gemini to stop all technical progress today, they would still hold enormous potential for transformation into practical applications.[49] The intense competition between the tech giants, both in terms of infrastructure and foundation models, has led to a significant drop in costs and constant improvements in performance. This competitive dynamic has also helped structure the generative AI value chain, opening up new areas for opportunity.

In between core infrastructure and end-user applications, development tools[50] also play a major role. These tools make it possible to adapt, secure, optimize, and deploy AI models in real-world applications. Some key players can be used to illustrate the diversity of technological needs: Hugging Face, a French startup, has established itself as a leading platform for sharing and adapting models through its open-source tools and community. U.S.-based Langchain has developed essential solutions to orchestrate and integrate LLMs into complex applications (for example, to create assistants capable of answering questions using an internal database). For reliability and performance monitoring, U.S. firm Galileo provides critical assessment tools, while Datadog, founded by French entrepreneurs, has become a leader in model monitoring in production (providing real-time tracking of performance, errors, and response times for models deployed in applications).

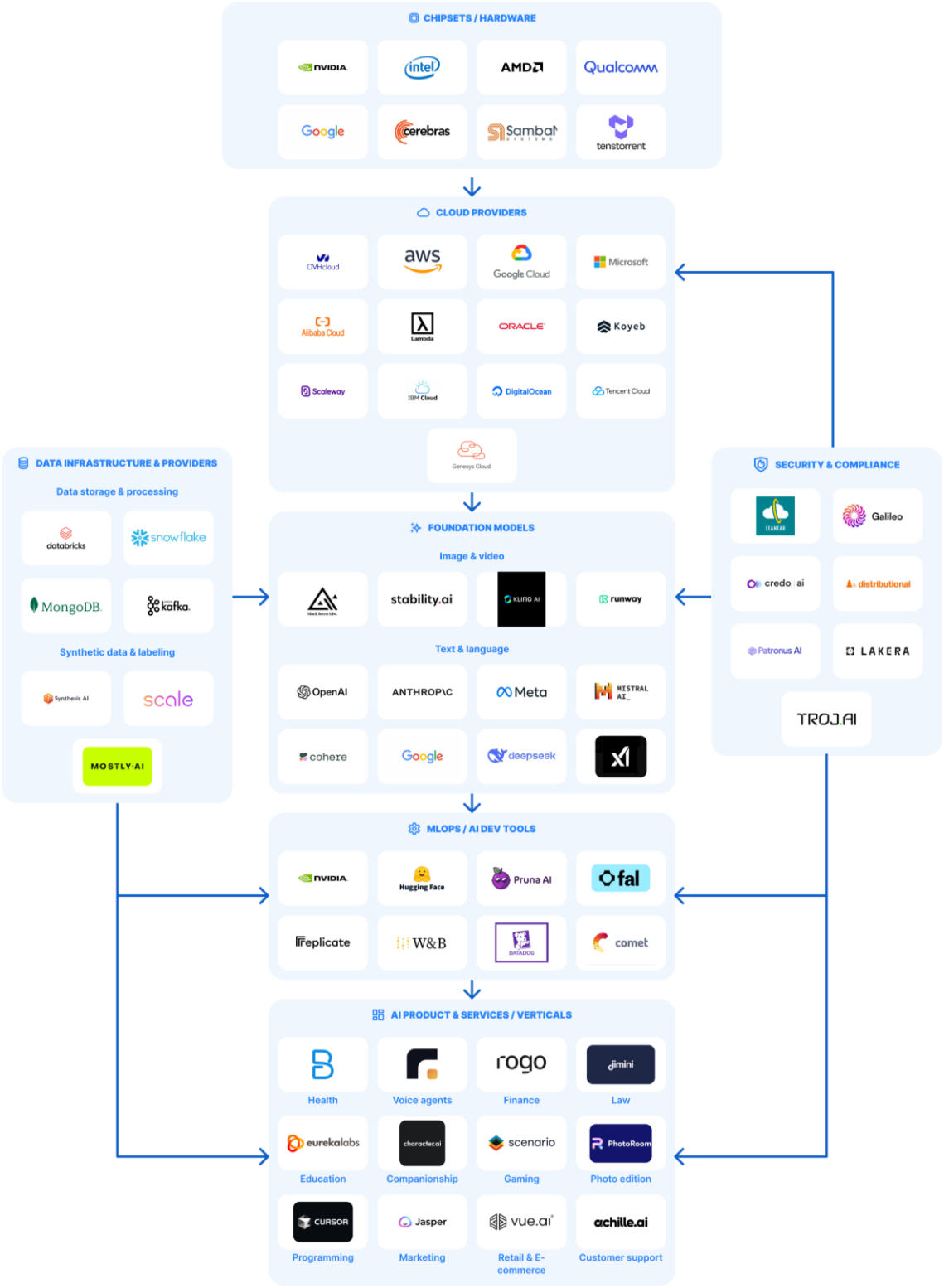
48. A. Fitch and S. Schechner, "Nvidia's New Sales Booster: The Global Push for National AI Champions", *The Wall Street Journal*, June 9, 2024.
49. "A Venture Capitalist on Where the AI Opportunities Are for Investors", *The Wall Street Journal*, October 27, 2024.
50. Development tools (including MLOps) refer to the software, frameworks, and platforms used to build, test, deploy, and maintain AI systems. They sit between core infrastructure and end-user applications, and include model training libraries, orchestration platforms, versioning tools, and monitoring systems.

New French startups are also appearing to address critical needs. Pruna AI focuses on optimizing model inference speed,[51] a major challenge with significant potential to reduce deployment costs and complexity. In the field of security, Leanear is developing innovative encryption solutions to protect AI datasets, which have become valuable strategic assets,[52] while maintaining flexibility in the choice of cloud infrastructure.[53]

In the development tool segment, where technical expertise trumps financial clout, Europe, and France in particular, has considerable advantages. Its tradition of excellence in mathematics and engineering means its talent pool is well suited to the complex challenges of AI.[54] This technical expertise, combined with a culture of pragmatic innovation, ideally positions French companies in this market, where success depends less on financial resources than on the ability to develop robust and innovative solutions.

51. Inference, meaning the execution of an AI model to produce results, often accounts for more than 90% of the operational costs of an AI application. Optimizing inference speeds is therefore crucial: not only does it significantly reduce operating costs, but it also allows more sophisticated AI models to be used in applications with real-time constraints or limited resources.
52. In the field of AI, proprietary datasets are a company's most valuable strategic asset. While advances in model architectures and algorithms are constantly appearing and, in most cases, become publicly available, proprietary databases offer a lasting competitive advantage. New algorithmic advances can be quickly integrated by retraining models on existing data.
53. These encryption solutions enable European manufacturers to secure their data regardless of the cloud infrastructure they choose, whether it is U.S.-based (AWS, Google Cloud, Azure), European (OVH, Orange), or even Asian (Alibaba Cloud). This approach allows them to select cloud providers based purely on economic and technical criteria while retaining complete control over their data, even when it is hosted outside the European Union.
54. M. Quiret, "Matthieu Courtecuisse : 'La France peut devenir à l'IA ce que l'Inde est pour l'informatique'", *Les Échos*, December 16, 2024.

Figure 3: The generative AI value chain



Source: author © Ifri, 2025.

Verticalization: Europe's key asset?

Along with these development tools, Europe has another opportunity: verticalization. While giants like OpenAI dominate the headlines, many businesses are positioning themselves by developing applications based on existing models, fine-tuning them,[55] or even creating smaller, specialized models. By leveraging existing development tools and models (open source or APIs), they can develop vertical solutions tailored to an industry's specific needs. This approach has a twofold advantage: it significantly reduces development costs while simultaneously accelerating innovation cycles, as an application can be designed and tested in just a few months.

Europe has two key strengths that will help it position itself in these segments. The first is its industrial expertise: its long-standing industrial base in highly specialized sectors, including the automotive, aerospace, and biotechnology industries, provides it with the necessary experience to develop AI applications tailored to each sector's specific needs. Its second strength is the specific nature of the European market, with its strict regulations and proximity to its customers. Such comprehensive local expertise and knowledge of regulatory constraints is particularly valuable in regulated industries.

The legal sector is a case in point, with European regulatory specificities creating natural barriers to entry for foreign actors. Despite the considerable resources of U.S. actors like Harvey (which has raised $200 million to date), the fundamental differences between the common law and civil law systems have led to the emergence of two distinct markets. This natural segmentation protects specialized European and French actors like Jimini,[56] who can focus on their specific market without facing direct competition from foreign actors in the short term.

Many French businesses are already demonstrating the potential of this sector-based approach. PhotoRoom has established itself as a global leader in photo editing, reaching a valuation of €500 million thanks to its specialized AI algorithms. In the gaming industry, Scénario has become a leader in digital asset creation for video games, demonstrating the ability of French companies to establish themselves in global markets. Customer relations is another area where French expertise stands out: CallRounded creates AI voice agents to "rehumanize" customer service in areas where cost constraints have led to automation, while Achille.ai optimizes customer support with AI-enhanced agents.

55. Fine-tuning is the process of adapting an AI model that has already been trained on large amounts of data to a specific task or domain using a smaller dataset. This approach delivers superior performance for specialized applications while avoiding the massive costs of training a model from the ground up.
56. Jimini is a French startup developing an AI assistant to help with legal research, analysis, and document drafting.

In the medical sector, Biolevate showcases the value of French industry-specific AI by addressing the "black box" effect with AI that explains its reasoning in detail and in a verifiable manner. This approach gives researchers greater control over their work while allowing them to benefit from the power of AI. These tools are particularly valuable for research into rare and orphan diseases, for which research costs are often a major obstacle.

These examples illustrate how verticalization allows European companies to create relevant and robust AI solutions. This strategy, which is particularly suited to the strengths of the European ecosystem, provides a path for technological innovation grounded in the real needs of each industry.

Model miniaturization: a trend aligned with sector specialization

This sector-specific expertise is becoming increasingly important as generative AI appears to be entering a new phase of development. While at one end of the value chain, foundation models have initially been characterized by their sheer scale, particularly in terms of GPU requirements and parameter counts, there now appears to be a trend toward model miniaturization, which could go hand in hand with the development of sector-specific applications. The success of Deepseek's model, whose inference costs are reportedly 90% lower than OpenAI's,[57] may herald the emergence of this new trend.

This targeted approach offers several important advantages. First, these smaller, specialized models enable faster response times, reducing costs while improving user experience. Secondly, their small size means they can be fine-tuned for specific uses, increasing their efficiency. Third, LLMs can be used to create smaller, more specialized models, for example by distillation.[58] Synthetic data could play a crucial role here by contextualizing information and effectively guiding these models toward their specialization. This approach is particularly well suited for sector-specific applications where the goal isn't to achieve universal knowledge, but rather to excel in a specific field. For example, a model designed to analyze industrial incident reports would not need to incorporate any knowledge of medieval literature.

57. T. Kim, "Wall Street Got DeepSeek All Wrong: Why It's a Boon for Big Tech, Especially Nvidia", Barron's, January 31, 2025.
58. Deep learning model distillation involves training a smaller model (student) to imitate a larger model (teacher) by using its predictions. This helps reduce the size of the model while maintaining good performance.

This trend towards miniaturization offers a strategic opportunity for Europe. Combining specialized models with its industry expertise and industrial data would enable the development of solutions that perform better than generalist models. Europe therefore has a natural advantage in this emerging market, which is perfectly aligned with its industrial and technological strengths.

Generative AI is reshaping the tech industry

While U.S. tech giants have the means to invest heavily in generative AI, their intensifying rivalry could paradoxically create new opportunities for Europe. This last section looks at how the fierce competition between the tech giants, fueled by their fear of missing out on AI, could actually work in Europe's favor. Beyond this rivalry, the U.S. market itself, with its significant purchasing power and appetite for new technologies, could be a major growth driver for European companies that are able to develop a hybrid approach, working across both continents.

The paradoxical fragility of the digital giants

Behind their almighty facade, the tech giants have very different profiles, with their own strengths and weaknesses. Each of them must contend with specific shortcomings, ranging from difficulty finding success outside their core business (Google with hardware, Amazon with groceries)[59] to costly experiments, such as virtual reality for Meta[60] or electric cars for Apple.[61]

Big Tech has been shaped by the history of former giants, and is haunted by the fear of missing out on the next big tech revolution. Examples abound: Fairchild Semiconductor, which dominated the semiconductor industry in the 1950s; IBM, America's most profitable company in 1983; and more recently, Nokia, which collapsed after failing to anticipate the smartphone revolution.[62]

Unlike traditional sectors like energy or heavy industry, which require significant investment in physical assets, companies in the digital sector are mainly valued based on intangible assets like software, patents, user bases, and online advertising, with marginal costs close to zero. While such a lean structure allows for outstanding profitability, it also paradoxically leaves companies more vulnerable to technological disruption: although the

59. A. Beard, "Can Big Tech Be Disrupted?" A Conversation with Columbia Business School Professor Jonathan Knee", *Harvard Business Review*, January-February 2022.
60. S. E. Needleman, "Meta Reports Record Revenue, Slower Digital Advertising Growth: The Social-Media Giant Is Spending Billions on Artificial Intelligence and Products for Virtual and Augmented Reality", *The Wall Street Journal*, October 31, 2024.
61. M. Acton and P. Campbell, "Apple Parks Its Electric Car Project in Sign of EV Industry's Struggles", *Financial Times*, February 28, 2024.
62. "Big Tech's Supersized Ambitions: From Metaverses to Quantum Computing", *The Economist*, January 22, 2022.

barriers to entry are high, they are less insurmountable than in industries where heavy infrastructure is required.

This dynamic means new players can quickly rise to the top, which would be unthinkable in more traditional industries. Facebook was created and rose to prominence in just a few years by a student under the age of 20, now one of the most powerful men on the planet. Similarly, OpenAI's emergence and the meteoric rise of its language models shows how a newcomer can challenge the dominance of giants with decades of experience.

Intensifying competition within Big Tech and with China

The tech giants are engaged in a frantic race to invest in AI, believed to be the major technological revolution of the coming decades. Infrastructure spending shot up 66% in the last quarter of 2024 as compared to the previous year,[63] creating a "prisoner's dilemma"[64] in which no company is willing to cut back on investment despite the risk of overcapacity.[65] Going beyond simple acquisitions, the U.S. tech giants are shaping the AI ecosystem from its earliest stages, with Microsoft, Amazon, Google, and Nvidia dominating funding in the sector and gradually crowding out traditional venture capital funds.[66]

This competitive dynamic is all the more striking as China is emerging as a major competitor in generative AI, despite U.S. restrictions. Alibaba has demonstrated its capacity for innovation with its Qwen 2.5 model, confirming the rise of Chinese actors in this field. DeepSeek's release has, for its part, had a dramatic impact on U.S. financial markets, temporarily wiping out nearly $1 trillion of the tech giants' market value,[67] with Nvidia alone taking a $600 billion hit.[68]

This Chinese push comes with a deliberately open-source strategy, in contrast to the closed model adopted by OpenAI and Anthropic, aiming to democratize access to high-performance models and prevent excessive

63. M. Kruppa and T. Dotan, "Tech Giants See AI Bets Starting to Pay Off: Microsoft, Google and Amazon Report Strong Growth in Cloud Revenue, but Warn of Increased Spending", *The Wall Street Journal*, November 1, 2024.
64. The prisoner's dilemma, a key concept in game theory, describes a situation in which actors, despite being aware that cooperation would be beneficial to all, rationally choose a non-cooperative strategy out of fear of coming out at a disadvantage. In the case of Big Tech, although collective restraint in AI investments could be more profitable, each company is compelled to invest heavily for fear of losing its competitive advantage should it be the only one to rein in spending.
65. S. Fiegerman and R. Metz, "AI Startups Struggle to Keep Up With Big Tech's Spending Spree", Bloomberg, September 6, 2024.
66. J. Thornhill, "The AI Revolution Is Generating Some Investor 'Hallucinations' Too: Big Tech Firms Are Muscling In on Funding the Future, Pushing Silicon Valley VCs Out of the Way", *Financial Times*, January 25, 2024.
67. T. Kim, "Wall Street Got DeepSeek All Wrong", *op. cit.*
68. B. Alpert, "After DeepSeek Claim, Export Controls Should Be Enforced, Not Abandoned", Barron's, January 27, 2025.

market concentration around U.S. players. By broadly distributing their innovations, particularly their advances in optimization and computational efficiency, Chinese companies help keep the market open and limit the ability of U.S. giants to impose their proprietary standards as the only viable option.

This intensifying competition in the field of AI is part of a broader trend of growing rivalry between major digital corporations. Since 2015, the share of their revenue generated in markets where they compete directly has doubled, rising from 20% to 40%. This growing rivalry reflects their fear of losing their historical position, prompting them to invest heavily in new markets.[69] The AI race thus represents the culmination of this competitive dynamic between digital giants, as well as the world's two leading economic powers, each seeking to quickly establish its dominance.

A changing economic model

Big Tech has historically been known for its lean business models, but generative AI could usher in a shift toward a much more capital-intensive future. This transformation raises fundamental questions about these companies' future profitability, especially as the costs of basic infrastructure—GPUs, energy, networks—remain structurally high.

Big Tech's capital expenditures are growing so rapidly that Wall Street is beginning to worry, and questions are being raised about whether these colossal investments will ever deliver a return. While Microsoft, Meta, Amazon, and Alphabet attempt to reassure investors by touting the benefits of AI for their existing services and operational costs, these advantages remain difficult to quantify, while infrastructure spending, for its part, has very tangibly skyrocketed.[70] Although these massive investments demonstrate the tech giants' commitment to long-term growth over immediate profits, there is no guarantee that the considerable sums invested in generative AI capabilities will find sufficiently profitable applications to cover these exorbitant costs.[71]

The rise of generative AI could therefore mark a fundamental shift in the economic structure of the tech sector and usher in a new, more complex era for tech giants. OpenAI is a case in point. Its CEO, Sam Altman, describes the company as "the most capital-intensive startup

69. "Big Tech's Supersized Ambitions: From Metaverses to Quantum Computing", *The Economist*, January 22, 2022.
70. R. Waters and T. Bradshaw, "Wall Street Frets Over Big Tech's $200bn AI Spending Splurge", *Financial Times*, November 1, 2024.
71. R. Armstrong and A. Reiter, "Big Tech's Big Investments", *Financial Times*, July 31, 2024.

in Silicon Valley history".[72] Despite estimated annual revenues of between $3.5 billion and $4.5 billion, the company faces operating costs estimated at $8.5 billion for 2024, of which $4 billion is spent on computing power and $3 billion on model training.[73] This cost structure could serve as a blueprint for the sector's future. Some tech giants have even started investing in nuclear energy to meet these technologies' growing power needs.[74]

Given these profound changes in tech companies' business models, driven by the high infrastructure costs of generative AI, recent developments in U.S. strategy suggest that, beyond the arms race over AI models, control over infrastructure could play a decisive role in the medium term. While innovations like China's DeepSeek model show that the race is still on in terms of technology, mass deployment of these technologies will largely depend on who controls the infrastructure chain—from GPUs to data centers, communication networks, and competitive energy supply. Washington's massive investments in projects like Stargate and its new energy policies reflect this perspective, for which technological dominance will depend as much on control of critical resources as it will on algorithmic superiority.

The U.S. market as a lever

In addition to a pragmatic approach focused on European sectoral strengths, the gap in economic development between the United States and Europe could paradoxically be an asset. Faced with declining productivity and an aging population, the U.S. market, with its high purchasing power and appetite for new technologies, represents a substantial source of revenue for European AI solutions. This suggests a promising business model: develop and validate services in Europe, with lower costs and proven technical excellence, then market them in the U.S., where they can be quickly monetized.[75]

This dynamic is further reinforced by the European market's fragmentation compared to the United States. Rather than looking to expand in Europe, where each country requires AI solutions to be adapted at great expense to local languages and contexts, European startups often prefer to market their products directly to the more unified and larger U.S. market.

72. "LLM Price War, Black Forest's Open Image Generator, The High Cost of AI Leadership, Machine Translation Goes Agentic", The Batch AI News and Insights, No. 262, DeepLearning.AI, August 14, 2024.
73. Ibid.
74. A. Salzman, "Meta Announces $10 Billion Data Center in Louisiana", Barron's, December 4, 2024.
75. M. Quiret, "Matthieu Courtecuisse : 'La France peut devenir à l'IA ce que l'Inde est pour l'informatique'", *Les Échos*, December 16, 2024.

"European champions, to be champions, need to be champions in the U.S."[76] This reality of the AI market means a hybrid model, leveraging the complementary strengths of both continents, is the way forward. Europe, and Paris in particular, has a remarkable concentration of AI talent, yet struggles to convert this academic excellence into commercial success. Faced with this reality, some companies are taking a two-pronged approach: establishing their headquarters in the United States to benefit from its mature funding ecosystem, while maintaining a technical hub in Europe, where development costs are more competitive. This strategy circumvents the challenges of the U.S. labor market, where the tech giants have driven up wages. This allows businesses to combine the best of both worlds: access to U.S. capital and markets while keeping operating costs under control with technical teams based in Europe.

Ultimately, Europe can turn what might appear to be weaknesses—market fragmentation and lower investment capacity for infrastructure—into strategic advantages. By combining its technical excellence and competitive operating costs with access to the U.S. market and capital, it can build an innovative brand of digital sovereignty. It would not rely on an illusory vision of total technological independence, but rather on its ability to develop specialized AI solutions and deploy them effectively on both sides of the Atlantic. This strategy would enable Europe to strengthen its position in the global AI value chain while preserving its autonomy.

76. F. Douetteau, "Building European Champions in AI Panel, AI Action Summit at Station F", YouTube, February 11, 2025, available at: www.youtube.com.

Conclusion

Economic history has been punctuated by technological breakthroughs that have radically transformed the production and distribution of goods and services. Just as information technology revolutionized computation and the internet revolutionized distribution, generative AI is now ushering in a new era, drastically reducing the costs associated with language, reasoning, and creation.[77] This innovation could thus pave the way for a new major cycle of economic transformation.[78]

The scale of this technological breakthrough won't simply depend on AI models' raw power, however. Its real impact will come from their effective integration into real-world economic applications. This will require value creation for AI to be reframed: productivity gains will only become real once these technologies are effectively integrated into industrial and commercial processes.[79]

The European ecosystem is currently operating within a constrained environment: all startups in the generative AI sector depend, to varying degrees, on services provided by U.S. tech giants, which control a significant portion of the value chain, from infrastructure to foundation models. Faced with this reality, Europe must adopt a pragmatic approach: relying on these platforms in the short term while leveraging its own strengths. While Europe has a strong player in Mistral AI, which, despite significantly lower funding than its direct competitors, has established itself as a leader in model production, it also benefits from renowned industry expertise across a wide range of sectors. This technical excellence, which is especially evident downstream in the generative AI value chain, allows it to position itself precisely where most of the economic value can be found.

In the short term, the goal for Europe should therefore not necessarily be to free itself from Big Tech's dominance, which currently provides essential services for innovation, but rather to maximize its economic returns from generative AI. This context presents two clear opportunities. On the one hand, the strategy of the U.S. giants, focused on massive infrastructure and general-purpose models, opens up strategic niches where in-depth knowledge of a sector is key. European companies specializing in healthcare, industry, or finance can thus leverage their expertise to offer targeted AI solutions, which are currently underserved by Big Tech. On the other hand,

77. "A Venture Capitalist on Where the AI Opportunities Are for Investors", *The Wall Street Journal*, October 27, 2024.
78. Ibid.
79. J. Ding, "The Innovation Fallacy – In the U.S.-Chinese Tech Race, Diffusion Matters More Than Invention", *Foreign Affairs*, August 19, 2024.

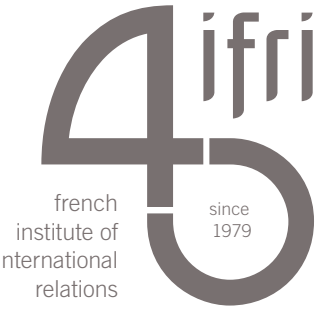
the growing rivalry between these companies is creating opportunities for European businesses. Their escalating investments in infrastructure and general-purpose models drive them to offer increasingly attractive service plans in order to gain market share. This competition gives European companies access to cutting-edge technologies at a lower costs, making it easier for them to develop innovative solutions in their areas of expertise.

In the medium term, the challenge for Europe is about more than just overcoming its dependence on Big Tech. The real issue is the absence of European companies among the world's tech leaders. While the United States and China have successfully developed their own tech giants, Europe is still struggling to convert its technical excellence into global commercial success. This absence is due to profound structural differences, as the International Monetary Fund (IMF) has underscored: since 2005, the productivity of U.S. technology companies has increased by 40%, while it has stagnated in Europe.[80] Several factors can explain this divergence: high regulatory compliance costs and, above all, chronic underinvestment in start-ups from the private sector.[81]

The problem, therefore, stems primarily from the European tech ecosystem's limited capacity for self-financing. This still too often depends on public initiatives, even when significant private funding is mobilized through public-private partnerships. The recent announcement of €50 billion in public funding combined with €150 billion in private capital is a case in point. These investments, while significant, pale in comparison to what the U.S. tech ecosystem has invested since the beginning of the generative AI wave. The four leading tech giants—Microsoft, Alphabet, Amazon, and Meta—alone plan to spend up to $320 billion combined on AI technologies and data center construction in 2025.[82] Their total capital expenditure has already amounted to $230 billion in 2024[83] and $151 billion in 2023.[84]

Europe's future in technology does not depend so much on its ability to break free from or compete directly with Big Tech, but rather on its ability to forge its own path. To achieve this, it must capitalize on its distinct strengths while correcting its structural weaknesses. Only then will Europe reap the economic benefits of generative AI and become a major player in the global technology landscape.

80. D. Cerdeiro, G. H. Hong, and A. Kammer, "How to Awaken Europe's Private Sector and Boost Economic Growth: EU Companies Grow and Innovate Less Than American Counterparts", IMF Blog, September 11, 2024.
81. B. Martens, "Draghi Disappoints on Digital – The Draghi Report's Emphasis on Hardware and Telecoms is Out of Touch with Modern Digital Developments", Bruegel, September 11, 2024.
82. S. Subin, "Tech Megacaps Plan to Spend more than $300 Billion in 2025 as AI Race Intensifies", CNBC, February 8, 2025, available at: www.cnbc.com.
83. Ibid.
84. S. Morris and R. Uddin, "Big Tech Lines Up Over $300bn in AI Spending for 2025", *Financial Times*, February 7, 2025, available at: www.ft.com.



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