

Transformation

AI: From evolution to revolution?

12 September 2024

Key takeaways

- It's difficult to overstate how rapidly generative AI (GenAI) is advancing and nearly impossible to imagine the capabilities to come. The expanding ecosystem of GenAI apps only emerged within the last 18 months and the foundation model operating systems that power them arrived just six years ago, following 80 years of iterative advances.
- Skeptics declare that GenAI's revenue potential doesn't justify the current level of AI infrastructure investment (i.e., AI's reality doesn't justify the hype), but remember that far more significant than the internet's initial consumer use cases were the thousands of use cases and companies that emerged *because* of the internet.
- A recent survey of over 150 BofA Global Research equity analysts and macro strategists on AI's impact for the ~3,500 companies covered globally found that analysts expect the newest AI wave to catalyze a technological evolution that touches every sector, begging the question: could the AI evolution become a revolution?

The AI (r)evolution

The newest AI wave may catalyze a technological evolution that touches every sector. As we've noted in previous publications, generative AI (GenAI) apps and the foundation models that power them have advanced rapidly in just the past 18 months. However, over the next five to 10 years, BofA Global Research expects GenAI to catalyze an evolution in corporate efficiency and productivity that may transform the global economy, as well as our lives.¹

Now we ask: could the AI evolution become a revolution?

AI could boost S&P operating margins

Recently, BofA Global Research examined the state of AI through a survey of BofA Global Research equity analysts and macro strategists across ~3,400 companies with an aggregate market cap of ~\$90 trillion (see methodology). BofA Global Research analysts found that enterprise AI implementations are moving from pilots to production, which could boost S&P operating margins by 200 basis points (bps) over the next five years, equivalent to approximately \$55 billion in cost savings, annually.

Surveyed analysts expect AI to drive margin expansion for 23 of the 25 industry groups globally, with implementations potentially boosting both semis and software margins by around five percent. They also note that companies within semis and software may also see AI-driven revenue increase by 34% and 25%, respectively, over the next five years (Exhibit 1).

BofA Global Research macro strategists expect enterprise AI adoption to be deflationary, but despite the common notion that AI will drive mass job loss, the strategists are split on implications for job creation/displacement (Exhibit 2).² However, it's important to note that approximately 60% of US jobs in 2018 were in occupations that didn't exist in 1940, indicating that some roles will be automated and lost, while new ones will be created.³ Companies are opening Chief AI Officer roles, but it may be difficult for some workers to compete with bots. Analysts expect contact centers to be largely automated within the next three years as companies look to reduce the ~\$118.6 billion in annual costs paid to ~2.9 million US customer service agents.⁴

¹ Generative AI (GenAI) is a field of AI that uses foundation models trained on unlabeled data to produce original, often creative, content in various forms (text, image, video, audio). In contrast, traditional AI uses models trained on labeled data to produce (unoriginal) outputs based on predefined rules.

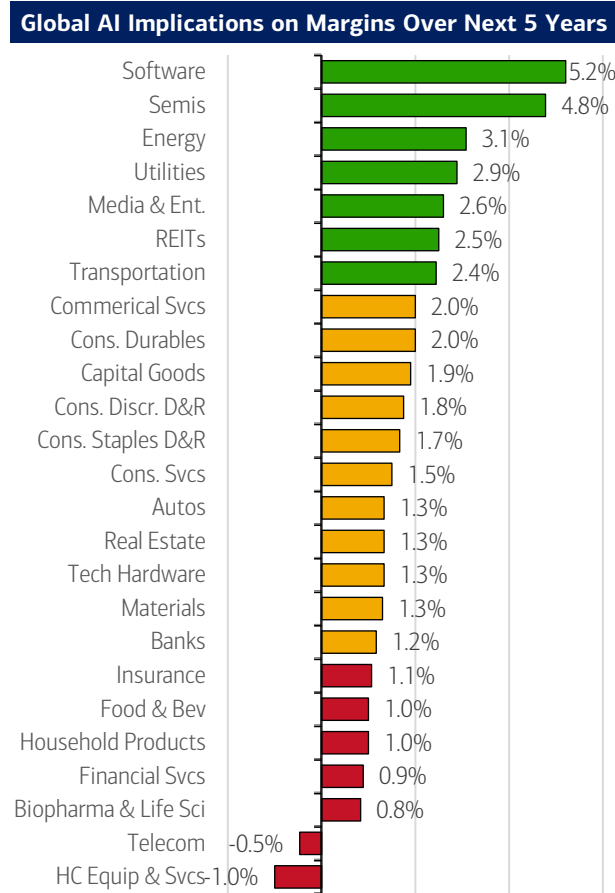
² BofA Global Research views regional differences in responses as likely due to greater Tech presence in the US and Asia, relative to Europe, and resulting demand for AI workers.

³ NBER: New Frontiers: The Origins and Content of New Work, 1940–2018.

⁴ Bureau of Labor Statistics: Occupational Employment and Wage Statistics (May'22). The same exercise could be performed across many other occupations, including data analysts, marketing professionals, paralegals, medical scribes and translators.

Exhibit 1: According to BofA Global Research analysts, AI may drive margin expansion for 23 of 25 industry groups

Global AI-driven operating margin expansion/contraction (% change)

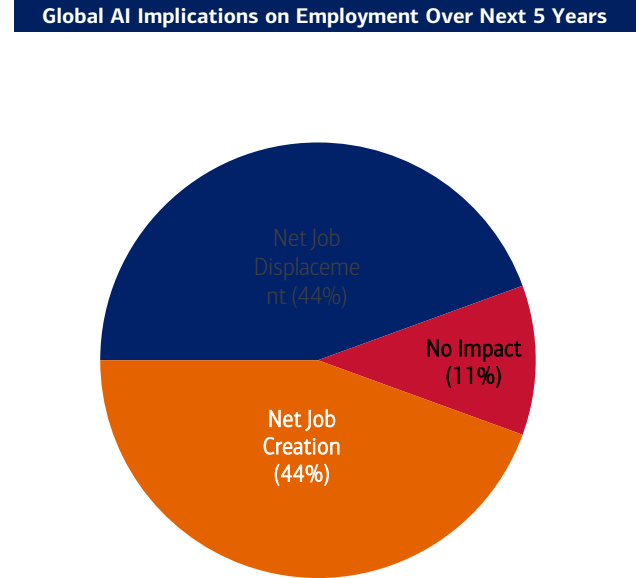


Source: BofA Global Research. Results based on May'24 responses. 5% = margins from 20% to 21%. Green/red shading indicates the top/bottom 25% of industry groups by analyst votes received.

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Exhibit 2: BofA Global Research macro strategists are split on AI employment implications

Global long-term AI implications on employment (survey responses)



Source: BofA Global Research. Results based on May'24 survey responses. Macro strategist responses are for their respective regions.

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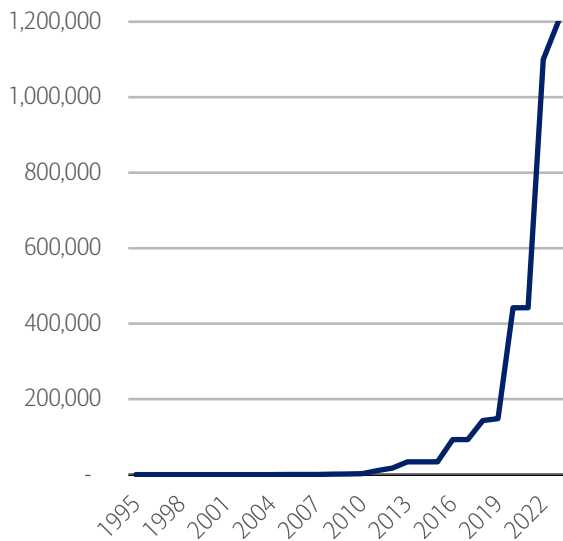
Third time's a charm

BofA Global Research views ChatGPT's launch in November 2022 as the beginning of the third major tech cycle of the past 50 years, following the introduction of the PC (personal computer) in 1981 and the internet in 1994. GenAI emerged following 80 years of advances that produced more powerful chips and new neural network architectures, which reduced the time and cost to train increasingly large foundation models powering apps like ChatGPT (Exhibit 3). As a result, GenAI apps could democratize access to powerful computer intelligence and drive a paradigm shift in corporate efficiency and productivity over the next one to three years.

However, over the next three to five years, GenAI may generate incremental revenue that drives transformation and reaccelerates the last 15 years of plateauing S&P labor productivity. Past disruptive technologies like the telephone, automobile, PC and internet have historically reached mainstream adoption after 15-30 years, but GenAI may catalyze a technological evolution that disrupts every sector and transforms the global economy over the next five to 10 years (Exhibit 4).

Exhibit 3: Computer processing power jumped 3,440% from 2015-2023

Computational capacity of the fastest supercomputer (teraFLOPS)



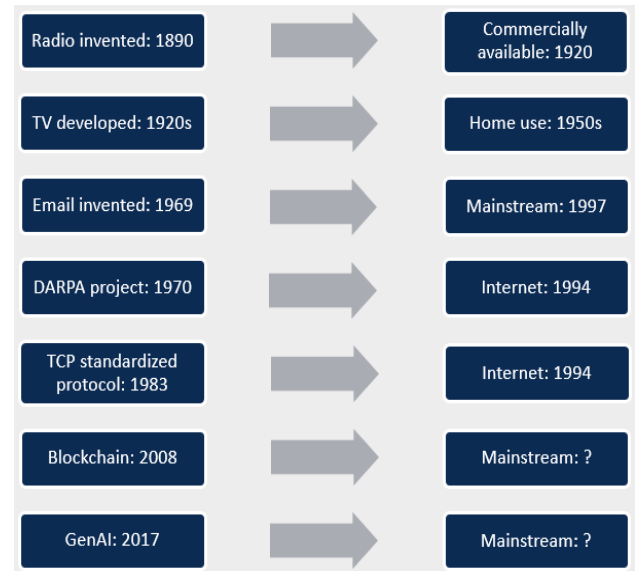
Source: Our World in Data - Dongarra et al. (2023)

FLOPS = floating-point operations/second. 1 teraFLOPS = 1,000 gigaFLOPS = 1,000,000,000,000 FLOPS

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Exhibit 4: Past disruptive technologies have reached mainstream adoption after 15-30 years

AI-driven efficiencies and productivity may appear across sectors globally as soon as the next 1-3 years



Source: BofA Global Research

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AI capex could reach \$1 trillion+ but we're only in '96

Skeptics declare that AI's reality doesn't justify the hype (or infrastructure investment), but investors frequently overestimate the magnitude of tech disruption in the near term and underestimate it over the longer term. AI capex could reach \$1 trillion+ over the next several years, but we're only in 1996 relative to the internet. OpenAI, Anthropic and Inflection AI collectively raised ~\$13 billion in 2023, but infrastructure investment and resulting model advances are prerequisites for transformative and revenue generating GenAI apps, which remain largely in version 1.0.⁵

Meanwhile, model training and ongoing operational costs required to drive adoption are high. Amazon will spend \$100 billion on data center capex over the next decade, representing 53% of total capex,⁶ OpenAI reportedly spent ~\$700,000 per day operating ChatGPT in 2023⁷ and Anthropic CEO Dario Amodei stated that compute spending accounts for over 80% of expenses and more than the salaries of the company's 600 employees.⁸ However, investors should not discount GenAI's cost savings and revenue-generating potential before usage even begins.

GenAI may catalyze an evolution in corporate efficiency, but app development and enterprise adoption will take time. BofA Global Research analysts expect a relatively short period of time between investment, model development and advances, horizontal and vertical apps for generalized and specialized use cases, respectively.

Private investment in AI companies reached \$42.5 billion in 2023, up 445% compared to 2016, but only 23% of the \$21.8 billion private investment in companies specifically focused on GenAI flowed to app developers (Exhibit 5, Exhibit 6).

⁵ According to CB Insights. A portion of funding is often provided as cloud credits.

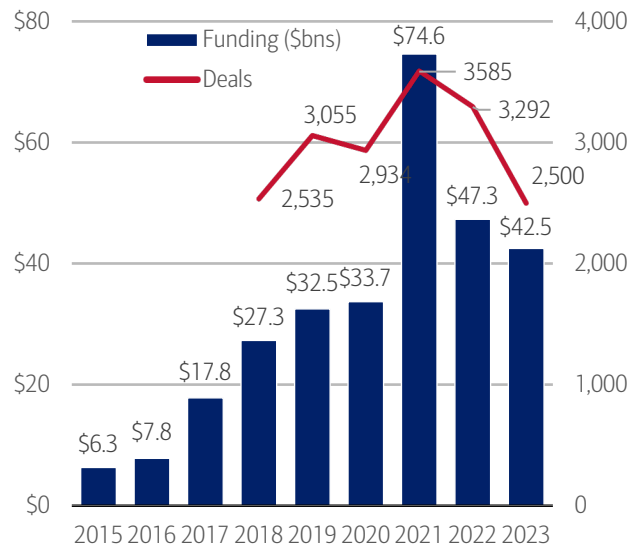
⁶ Wall Street Journal: Amazon, Built by Retail, Invests in Its AI Future.

⁷ The Information: Microsoft Readies AI Chip as Machine Learning Costs Surge.

⁸ Norges Bank Investment Management: Dario Amodei CEO of Anthropic: Claude, new models, AI safety and economic impact.

Exhibit 5: Private AI investment reached \$42.5bn in 2023, +445% vs 2016 but - 43% vs 2021

Equity funding for private AI companies (\$bn, LHS) and # of deals (RHS)

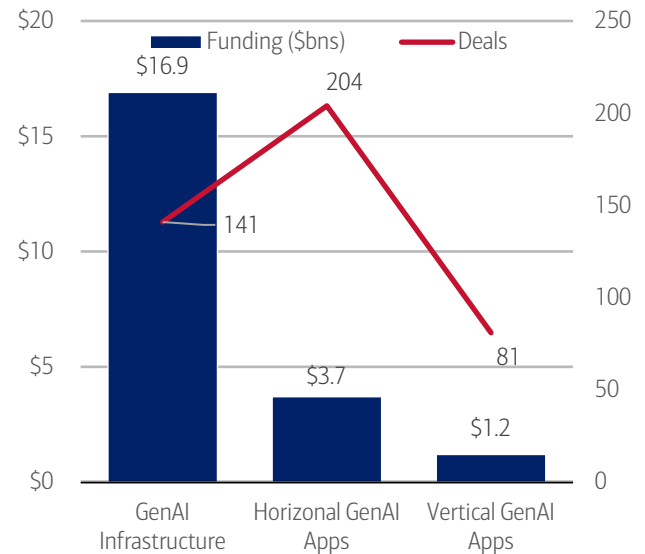


Source: CB Insights – State of AI 2023

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Exhibit 6: Only 23% of the \$21.8bn invested in private GenAI companies in 2023 flowed to companies developing applications

'23 equity funding for private GenAI companies (\$bn, LHS) and # of deals (RHS)



Source: CB Insights – State of Generative AI 2023

Microsoft's \$10bn OpenAI investment in Jan'23 accounted for 59% of GenAI infrastructure investment.

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Nascent, but disruptive nonetheless

GenAI app capabilities are advancing at an accelerating rate, but we won't need to wait for artificial general intelligence (AGI) or artificial super intelligence (ASI) before disruption becomes apparent.⁹ While software's AI moment hasn't arrived yet, tech incumbents are improving existing software and hardware products by embedding AI features, which may drive incremental revenue through upselling, new consumption-based pricing models, accelerated upgrade cycles and enhanced service-fee revenue. The newest AI wave may drive the next leg of software growth as enterprise implementations and monetization accelerate in 2025.

GenAI apps are maturing and chatbots that were as helpful as an 18-year-old intern one year ago are now displaying intelligence closer to a college graduate's, proving that AI investment is producing useful apps. For example, utilities companies may generate a 75% reduction in pole inspection costs by mounting AI-powered autonomous smart cameras on fleet vehicles, and insurance companies may expedite the process of underwriting a property by replacing manual internet searches with AI-powered aerial imagery and web scraping to determine the condition of a roof or if nearby hazards exist.

And professional and creative pursuits of the future may bear little resemblance to how they look today due to AI-powered apps. That said, the "future" may be here quickly – findings from a recently published academic paper indicate that within eight months of ChatGPT's launch, the number of jobs related to writing and coding on a global freelancing platform had dropped 21%.¹⁰

Take a rocket ship to the grocery store?

Almost all BofA Global Research covered companies have articulated an AI strategy (only 4% of covered companies have not), and according to the survey, analysts expect 2024 to be the year of enterprise AI ROI (return on investment) determination and 2025 to be the year of enterprise AI adoption. Enterprise GenAI apps are more complex than simply typing random questions into ChatGPT, which would likely be cost-prohibitive for many enterprise use cases that prioritize depth over breadth and unlikely to drive material efficiency or productivity gains. This is because the model that powers ChatGPT is like a rocket ship, but companies are unlikely to deploy a rocket ship if the use case is the equivalent of driving to the grocery store.

Enterprise GenAI apps will likely leverage small-language models (SLMs) and retrieval-augmented generation (RAG) solutions to enable deployment of enterprise-specific use cases that integrate internal, proprietary, and real-time data. For example, some

⁹ Artificial general intelligence (AGI) refers to AI systems that possess capabilities in line with human intelligence. Artificial super intelligence (ASI) refers to AI systems that possess capabilities that surpass the intelligence of the most gifted humans.

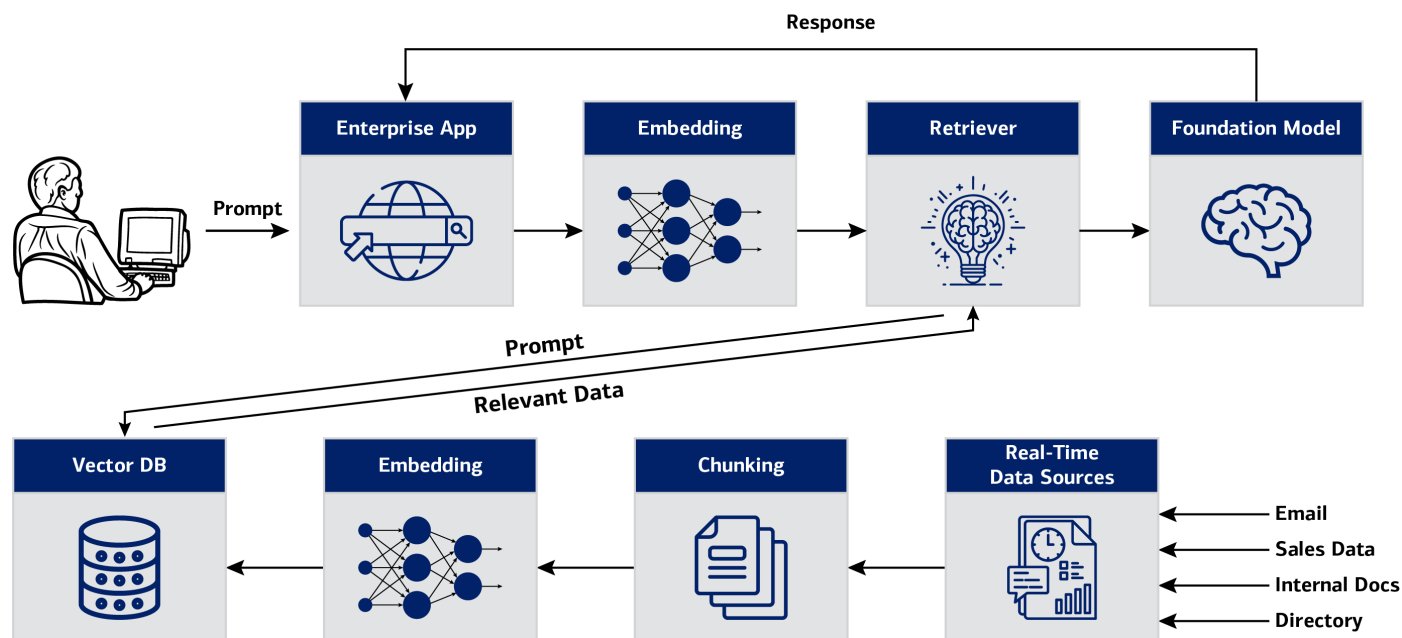
¹⁰ Demirci, Ozge and Hannane, Jonas and Zhu, Xinrong, Who Is AI Replacing? The Impact of Generative AI on Online Freelancing Platforms (October 15, 2023).

companies are integrating AI-powered products into their respective cloud platforms, including customer relationship management (CRM) and contact center as a service (CCaaS) offerings that merge and leverage real-time data across numerous communication channels to identify inefficiencies and drive process optimizations. SLMs and RAG also decrease usage costs, improve contextual awareness, increase output accuracy, and reduce output latency (Exhibit 7).

While enterprise spending on GenAI products is expected to reach \$38.8 billion in 2024,¹¹ it could take a large corporation up to a year just to modernize its data assets. However, implementations may drive meaningful efficiency and productivity gains relatively quickly. Take for example an e-commerce service-provider that implemented an AI-powered customer service bot to reduce the need for 700 (human) customer-service agents, which, in turn, may boost 2024 they company's profits by \$40 million. The company also leverages GenAI apps to bring marketing partially in-house, which reduced external agency spend by 25% in 1Q24.

Exhibit 7: GenAI apps+ RAG solutions may increase output accuracy, decrease usage costs and mitigate risks

Retrieval-augmented generation (RAG) solutions enable enterprises to deploy specialized use cases



Source: BofA Global Research

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AI-native startups introduce a new SaaS model

Tech incumbents are embedding AI features into existing software and hardware products for generalized use cases that aim to drive efficiencies and increase productivity but are unlikely to develop point solutions for specific verticals. However, AI-native startups are introducing new service as a software (SaaS) business models that may increasingly cannibalize the significantly larger \$12.3 trillion US Services industry. The new SaaS model leverages vertical GenAI apps for specialized use cases that aim to transform previously unscalable businesses reliant on human capital into software products. Non-tech companies, specifically those with large proprietary data sets, may implement vertical GenAI apps to generate new revenue streams and long-term competitive advantages.

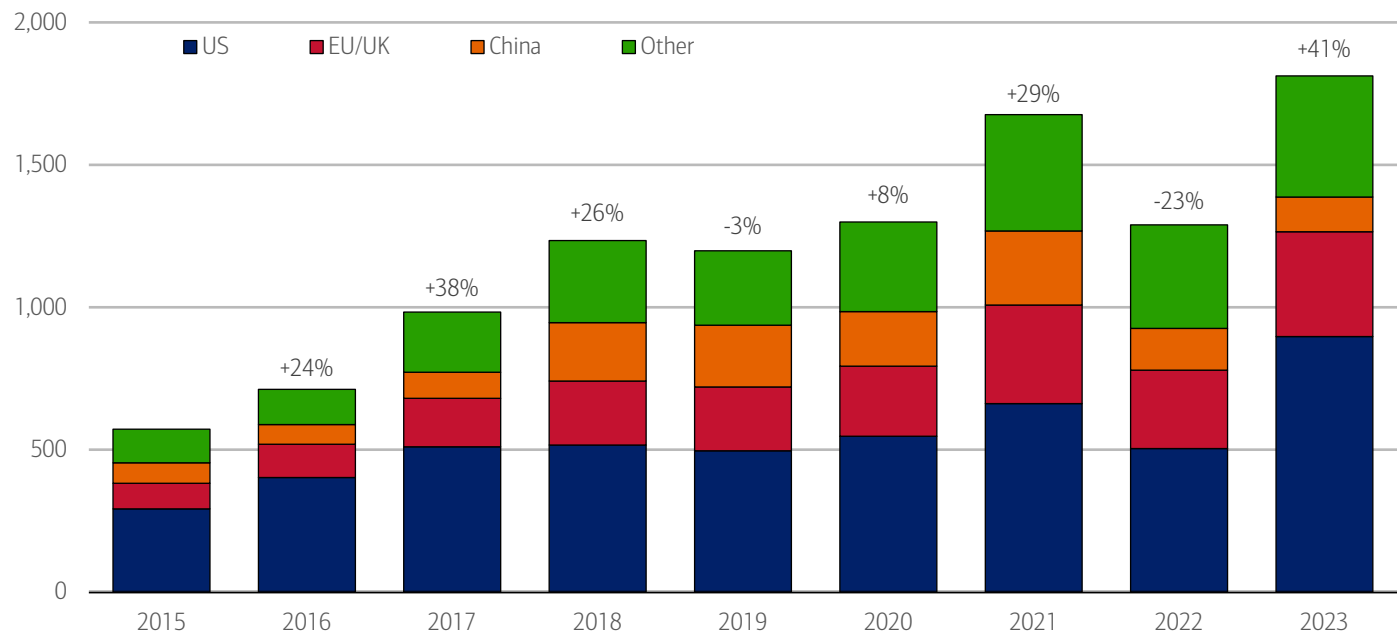
According to BofA Global Research, we have yet to see the potential momentum of the thousands of innovative AI “dot com” startups that are likely to emerge over the next several years. Accelerating GenAI investment in 2023 reached \$21.8 billion, up 407% year-over-year (YoY). As a result, approximately 1,800 new AI startups that received >\$1.5 million emerged in 2023 (Exhibit 8). These newly funded AI startups follow the ~9,000 that received over \$1.5 million in funding from 2015 to 2022, of which 36 have already reached unicorn status.¹²

¹¹ According to IDC (International Data Corporation).

¹² NetBase Quid via AI Index Report (2024).

Exhibit 8: Newly funded AI startups reached new highs in 2023, +41% YoY, as GenAI funding surged

Newly funded AI companies that received investment of \$1.5mn+ from 2015-2023



Source: NetBase Quid via AI Index (2024)

Data labels indicate the percentage change y/y in the total number of newly funded AI startups globally that received a \$1.5mn investment.

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Robot takeover isn't coming (yet)

Although BofA Global Research doesn't expect the dystopian humanoid robot takeovers portrayed in the movies to occur soon (or ever), robot functionality has improved significantly since General Motors incorporated the 2,700-pound Unimate (co)robot into its assembly line in 1959. Private investment in AI-startups focused on robotics reached ~\$4.5 billion over the past 12 years.¹³ However, the improved functionality of next-generation humanoids may help assemble a vehicle, reduce the time required for process an order by 25% or move a product onto a conveyor belt.

Warehouses are getting closer to "lights out" or the ability to operate without lighting because robots, humanoid or otherwise, have replaced workers. However, further advances are needed and BofA Global Research expects advancing humanoid functionality and decreasing costs to drive adoption and use cases that accelerate AI-driven efficiencies and productivity. Humanoids are unlikely to displace a significant number of warehouse workers in the near or intermediate term, given high costs and improving but still limited dexterity, spatial awareness and battery life. However, over the longer term, humanoids may gradually displace the 13 billion US manufacturing workers and 1.3 million US warehousing and storage workers.¹⁴

The tip of the iceberg

GenAI-driven disruption will take time, but will likely occur far more rapidly than past technologies and investors anticipate, indicating that upside is unlikely to be fully priced in across the AI investment stack (Exhibit 9). Upside may also emerge where it's not expected. For example, AI consulting generated \$300 million for Accenture over 2023 and \$1 billion in sales commitments for IBM.¹⁵ and insurance companies may generate incremental revenue streams by leveraging AI-powered tools to enable new cyber insurance products.¹⁶

S&P companies are increasingly mentioning AI during earnings, but it's not just semis companies and the hyperscalers. BofA Global Research expects focus to shift to the second phase of AI beneficiaries over the next year and broaden from there.

¹³ Coatue: The Path to General-Purpose Robots.

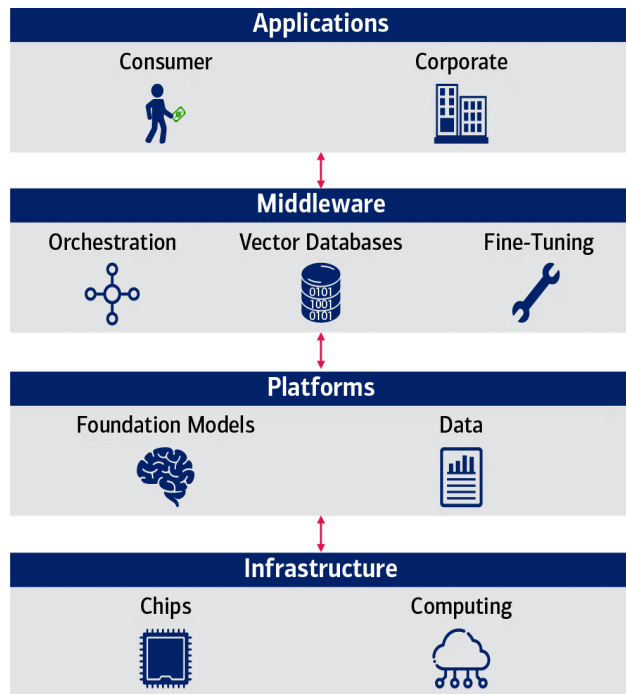
¹⁴ Bureau of Labor Statistics: Warehousing and Storage. Both statistics reflects 2023 employment.

¹⁵ New York Times: The A.I. Boom Has an Unlikely Early Winner: Wonky Consultants.

¹⁶ The Chief Strategy and Innovation Officer at Arch Capital Group expects cyber insurance premiums to grow 20% YoY until 2025.

Exhibit 9: Pick & Shovel beneficiaries have already emerged

The AI Tech Stack – from Infrastructure to Applications



Source: BofA Global Research

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Survey methodology

In this publication, we include results from a survey of 130 BofA Global Research fundamental equity analysts on the implications of enterprise AI strategies across ~3,400 covered companies with an aggregate market capitalization (cap) of ~\$89tn across the 25 GICS2 Industry Groups. The survey was conducted in early August 2024.

Respondents answered 13 survey questions, which focused on 1) Corporate AI investment and strategies for AI implementation, 2) Potential implications of corporate AI investment and strategies on the operating and financial performance of their covered companies in the near and long term, and 3) The degree to which specific industry groups are likely to be positively or negatively disrupted in the near and long term.

Additionally, 27 BofA Global Research macro strategists and economists were surveyed on the economic implications of the newest AI wave, in addition to the financial implications of enterprise AI implementation strategies across sectors globally. Macros colleagues answered seven survey questions focused on: 1) The specific industry groups that are most likely to see AI-driven benefits in the near and long term, 2) Potential implications of enterprise AI implementation on operating margins for respective benchmark indices over the long term, and 3) Potential implications of enterprise AI investment and implementation on employment and inflation in the near and long term.

Note that percentages throughout this publication that originate from survey responses refer to the aggregate market cap of specific covered companies relative to the aggregate market cap of all covered companies.

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