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Introduction

AI's rise is becoming increasingly tied to the real economy.[1] The push by leading developers to control compute, data, and distribution marks a shift from pure software models to vertically integrated platforms.[2] Concurrently, AI is starting to be applied in the physical world, through robotics and automation systems that can reason, plan, and execute.[3]

However, the demand for chips, power, and metals is exposing how digital growth relies on physical capacity that's showing signs of an inability to scale at the same speed.[4] Governments are stepping in to secure these inputs, turning energy and materials into strategic assets.[5] But the surge in tech-driven capital expenditure now faces hard limits: power grids are stretched, energy infrastructure is lagging, and metals markets are tightening after years of under-investment.[6] The next phase of progress will belong to those who can bridge that gap — matching digital ambition with the hard realities of power and metal.[7]

Key takeaways:

- **From Compute to Consume: The Emergence of AI's End-to-End Ambition –** OpenAI's recent moves show that artificial intelligence may be shifting towards a vertically-integrated model.[8] Taking control of compute, distribution, and the point of transaction could transform AI from a technology race into an infrastructure and commerce game.
- **AI Rollout Optimism Collides with Weakening Commodities Supply Outlook**: Explosive demand for power and metals is colliding with years of under-investment, making energy and materials the potential constraint in the tech expansion.[9]
- **AI Meets Physical Robots –** Robotics is stepping beyond automation as AI equips machines with reasoning, adaptability, and real-world intelligence.

From Compute to Consume: The Emergence of AI's End-to-End Ambition

The recent strategic moves by OpenAI, spanning distribution, commerce, and foundational compute, could signal a structural transformation in how leading large language model (LLM) developers operate, potentially shifting from pure technology providers towards vertically integrated platform companies.[10] This shift suggests that future AI market dominance may depend less on incremental model improvements and more on mastering the supply chain, owning the application layer, and capturing the transaction interface.[11] These moves are not unique to OpenAI; rather, they reflect an industry-wide trend in which major players seek to reduce dependence on traditional cloud or software partners, thereby centralising value capture.[12] A closer look at these developments reveals significant potential implications for adjacent industries.

This push for control and exploration of opportunities to monetise their large user bases is highly visible at the application layer, where LLMs are aiming to increase functionality.[13] With a recent study showing that approximately half of all messages on ChatGPT relate to users "asking" (a conversational prompt),[14] several new features could boost usage. OpenAI's integration of "Instant Checkout" capabilities within ChatGPT is a push into agentic commerce, enabling users to complete purchases without leaving the chat interface.[15] While this provides access to hundreds of millions of users, e-commerce retailers and platforms may face trade-offs around customer ownership and control of the retail journey.[16] Another strategy to control the application layer is via app integrations. OpenAI has announced seven partner integrations (such as Booking.com, Canva and Spotify), with apps from eleven more partners expected later this year. [17] The structural risk is that incumbent Software-as-a-Service (SaaS) providers could potentially be disintermediated if the AI platform captures the valuable customer relationship and transaction data.[18] While OpenAI has not yet disclosed how it and its partners will monetise these new features,[19] LLMs appear increasingly to be competing with search engines as the new "portal to the Internet", leveraging their significant active user base.[20]

Underpinning these distribution and application plays is an industry-wide pursuit of dedicated compute capacity. This arms race is a reaction to the massive computational requirements needed to maintain technological leadership.[21] For example, OpenAI CEO Sam Altman has projected demand for up to 250 gigawatts (GW) of capacity by 2033.[22] To secure scale, OpenAI has engineered customised supply arrangements. One example is its reported strategic partnership with NVIDIA, investing up to $100 billion to deploy at least 10 GW of next-generation systems.[23] Complementing that, OpenAI has reported that it has recently struck a multi-year agreement with AMD to purchase 6 GW of chips, with a warrant allowing up to a potential 10% equity stake, linking the chip supplier's success to OpenAI's deployment goals.[24] This pattern is not unique: Meta, Google, and other hyperscalers are likewise committing to reported significant compute and infrastructure deals.[25] The implication is that specialised, cost-controlled access to compute is becoming a potential barrier to entry and the essential foundation for sustained progress in model performance.

AI Rollout Optimism Collides with Weakening Commodities Supply Outlook

The commodities cycle has begun to enter a phase where re-accelerating demand is clashing with structurally constrained supply.[26] This year, markets have started to recognise the physical constraints underpinning the AI rollout and its second-order effects – from the availability of reliable, low-cost energy to the critical inputs of copper, silver and other conductive metals required to expand data-centre and grid infrastructure.[27] [28] The surge in realised and forecast power consumption from data centres, grid modernisation, defence and infrastructure build-outs has revived the demand outlook for industrial metals as the pipeline of new production hast thinned.[29]

The weakening backdrop of scheduled new mining supply reflects a prolonged under-investment cycle, with global mining capex still below pre-2015 levels.[30] Consequently, global supply growth of copper concentrate, for example, is well below long-term averages.[31] The market has therefore become increasingly sensitive to short-term supply shocks, where operational disruptions or policy shifts have triggered strong price reactions, such as with Freemont McMoran's Grasberg incident in September.[32]

Lithium has also staged a sharp rebound following a seemingly chronic period of oversupply, with prices reacting to the first signs of production cutbacks in response to low prices.[33] While near-term inventories remain ample, the speed of the recovery highlights how quickly supply can respond once prices fall below breakeven levels.[34]

Meanwhile, governments are taking a more interventionist role in shaping commodity markets.[35] In the U.S., the administration's focus on reshoring critical-mineral supply chains – from HALEU (high-assay

low enriched uranium, used in SMRs) to lithium, copper and rare earths – marks a decisive shift towards raw material security.[36] China's continued control of rare-earth exports, and new policy in the West to counter it, underscore how geopolitics can play a key part in forward-looking supply-demand dynamics.[37] The return of policy-driven demand points to enduring structural, non-cyclical support for underlying metals and energy sources, but also make the near-term dynamics harder to map and model.[38] [39]

AI Meets Physical Robots: The Dawn of Intelligent Automation

The robotics and physical AI theme appears to be accelerating rapidly as advances in reasoning, simulation, and automation converge.[40] Google DeepMind's Gemini Robotics 1.5 and Robotics-ER 1.5 mark a breakthrough toward machines that can think, plan, and act with intent in real-world settings.[41] The two models function like a brain and body, one reasoning, the other executing, allowing robots to interpret context, explain their logic, and adapt in real time.[42] It appears to be a defining shift as AI moves from digital cognition into physical execution.[43]

NVIDIA is emerging as the infrastructure backbone of this potential transformation.[44] Its open-source Newton Physics Engine, built with DeepMind and Disney Research, enables highly realistic simulations so robots can safely transfer virtual training to the physical world.[45] Combined with the Isaac GR00T N1.6 foundation model and Cosmos Reason system, NVIDIA is giving robots humanlike understanding and adaptability.[46] Supported by Jetson Thor hardware and the Omniverse simulation platform, NVIDIA is effectively becoming the operating system for physical AI, powering the full cycle from training to deployment.[47,48]

Meanwhile, applied research is potentially pushing industrial automation to new levels. The RoboBallet system, developed by UCL in partnership with DeepMind and Intrinsic, uses reinforcement learning to coordinate teams of robotic arms like a choreographed dance.[49] It can plan and execute complex, multirobot workflows in seconds, versus days for conventional systems, all while reducing collisions and idle time.[50] RoboBallet's ability to learn general coordination principles makes it highly adaptable for car manufacturing and other large-scale production.[51] Though still in testing, it signals a move toward AI orchestrated factories that operate as synchronised, self-optimising systems.[52]

Capital markets are also taking notice. SoftBank's $5.4 billion acquisition of ABB's robotics division highlights rising conviction that AI and robotics are merging into a single, transformative platform.[53] Masayoshi Son's push to integrate superintelligence with advanced robotics positions SoftBank at the core of this revolution, while ABB redirects resources toward its automation and electrification strengths.[54] The convergence of AI cognition with robotic embodiment is becoming one of the decade's most significant technological transitions, set to redefine productivity, labour, and capital allocation across global industries.[55]

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