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# The Production Economics of Intelligence

*Why the AI investment bottleneck may migrate from electricity to capability*

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# Observation

Artificial intelligence is usually analysed from the top down: models, chips, data centres, applications and productivity. The physical and organisational production system underneath it is treated as supporting infrastructure.

That may invert the economic problem.

> ***Electricity*** → ***Compute*** → ***Inference*** → ***Cognition*** → ***Capability*** → ***Functional Output*** → ***Productivity*** → ***Economic Output***

Seen this way, the investment question is not simply which AI technology grows fastest. It is which link currently constrains throughput, who controls that constraint, how much economic rent the constraint can capture, and where the bottleneck moves next.

# Accepted Wisdom

The accepted AI investment narrative has moved through successive shortages: frontier models, accelerators, advanced packaging, high-bandwidth memory, networking, data-centre sites, electricity generation, grid connection, transformers and cooling.

This is broadly correct. Industrial-scale cognition requires an industrial-scale physical system. But treating each shortage as a permanent investment theme misses the mechanism that connects them.

# Tension

Scarcity attracts capital. Capital expands supply. The economics of the scarce input then change.

> ***Economic rents migrate toward the current production constraint.***

Structural demand can remain strong while an investment deteriorates. A growing industry is not necessarily a profitable security.

# New Lens

The Industrial Revolution industrialised mechanical work. Computing industrialised calculation. The internet industrialised communication. AI is beginning to industrialise cognition: reasoning, prediction, planning, memory, language and optimisation can increasingly be produced independently of proportional increases in human labour.

But cognition is not the final economic product. Cognition creates potential. Capability creates repeatable outcomes.

Capability is the repeatable ability of a system to achieve intended outcomes under varying conditions. It requires cognition to be integrated with authority, workflow, data, governance, incentives, people and organisational learning.

For a high-value AI facility, electricity may represent a relatively small fraction of the economic value ultimately dependent on it. Yet without continuously available power, downstream compute, inference and cognition cannot be produced.

> ***As economic output per unit of electricity rises, willingness to pay for electricity reliability should rise with it.***

Physical constraints can generally be built around. Computational constraints can generally be innovated around. Organisational constraints behave differently. They depend on learning, decision rights, culture, governance and accumulated operating knowledge.

# Investment Implication

> ***Constraint*** → ***Location*** → ***Rent capture*** → ***Duration*** → ***Valuation*** → ***Catalyst*** → ***Exit***

A bottleneck becomes attractive when scarcity is worsening, supply responds slowly, the business can retain the resulting rent and valuation does not already assume permanent scarcity.

The same asset can later become a short candidate when capacity expansion becomes irreversible, pricing begins to normalise and investors continue capitalising peak scarcity economics.

> ***If cognition becomes widely available, enterprises will still differ in their ability to turn it into repeatable capability. The scarce asset may migrate from the producer of cognition to the organisation capable of using cognition better than its competitors.***

# Better Question

> ***If cognition becomes abundant, which organisations will remain scarce in their ability to convert it into capability?***

# Publication Note

Derived from the Celerity Research working paper *The Production Economics of Intelligence*. Quantitative electricity-system estimates are research assumptions and scenario inputs rather than forecasts.

# General Research Disclaimer