UNIVERSITY OF CAMBRIDGE

Bennett School of Public Policy

AI & Geopolitics Project (AIxGEO)

The invisible AI supply chain

Policy note



The invisible AI supply chain at a glance

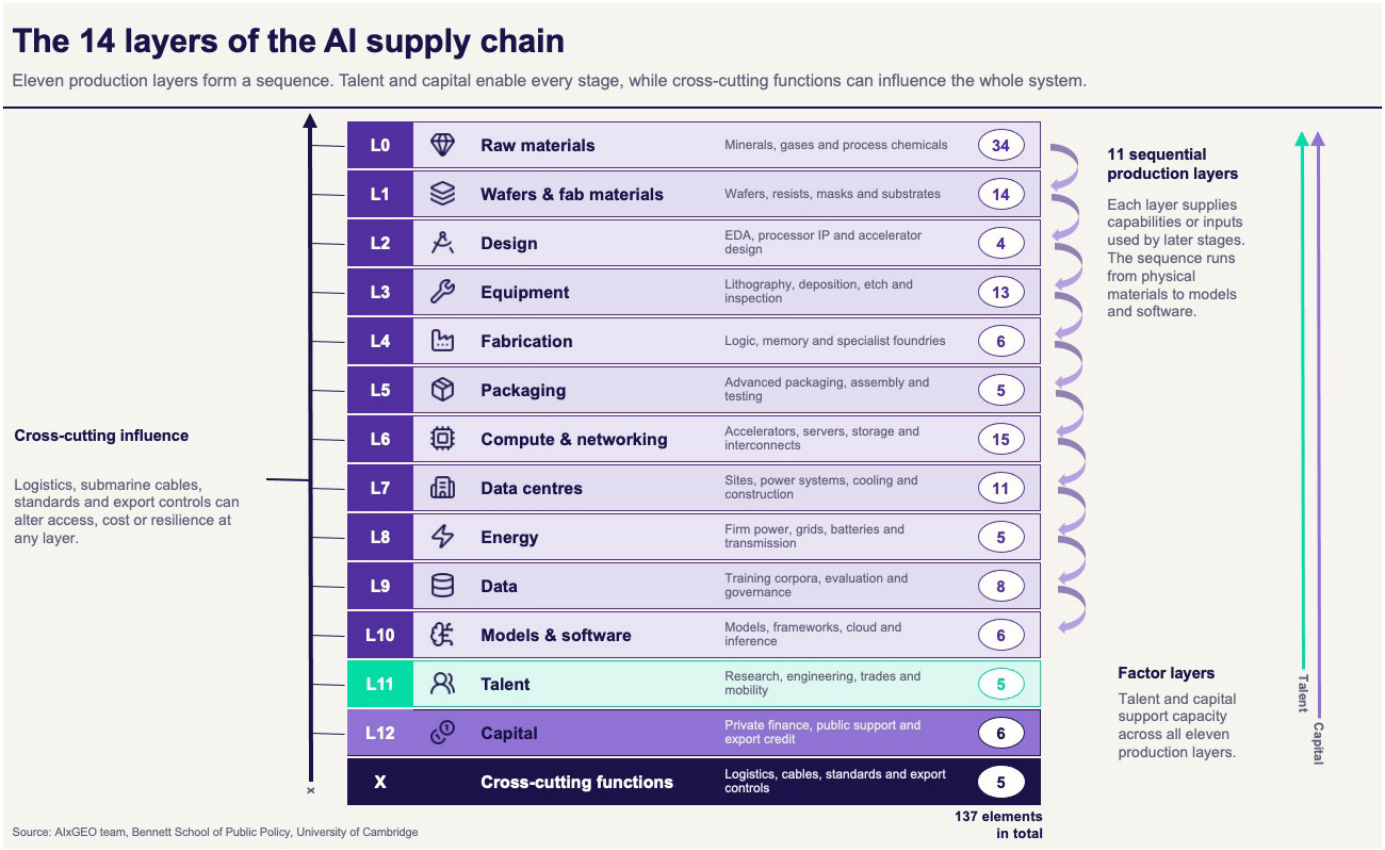
The current narrow view of the AI supply chain typically focuses on the same few inputs: **compute, data, models, talent and capital**. This framing positions the United States (US) and China as the dominant powers within the chain, with the role and agency of middle powers and other nations diminished. Our research challenges this narrative, through illuminating a more complex understanding of the AI supply chain than typical policy discussions allow for.

Across two papers - our policy paper ***The invisible AI supply chain*** and the corresponding **country report** - we explore where policy is currently focused, how countries are positioned across the AI supply chain, and how they can better assess their strengths, vulnerabilities and interdependencies.

What this means for governments

The research introduces a new framework which maps the supply chain in detail, across 14 layers, 137 elements and 351 sub-elements, as well as a **territory-sensitive audit** which we run on a dataset of over 800 firms, 117 policy documents, and over 40 countries and territories. This process reveals nuanced national positions and cross-border interdependencies that ultimately highlight that **no single country can control the entire AI supply chain.** For governments this means that their focus should not solely be on building sovereign capabilities, but on identifying how their country is currently positioned across the supply chain, and which countries that have complementary capabilities can help build trusted, effective and collaborative agency.

This research provides governments with a detailed starting point towards this goal, helping them to better understand the supply chain, their country's own strengths and dependencies across it, and where their existing policy focus is concentrated or lacking. This can both inform future policy development, and enable more focused discussions with international partners by identifying shared interests - ultimately providing clearer evidence to inform what to develop or govern domestically and what to secure by working with other countries.



The AI supply chain framework - find out more in the policy paper

Key insights

- **The supply chain is far more complex than most current national policies capture.** Our research found that a third of all elements in our AI supply chain framework receive no reference in the assessed policy documents. This means that much of the AI supply chain is absent from policy discourse, and that policymakers are giving insufficient attention to areas of the supply chain that have the potential to be leveraged.

- **This means that policy attention often ignores underlying national strengths.** Countries may have strong positions in the supply chain, however we identify many instances where their government's policies do not directly address these strengths. This lack of policy focus can result in both areas of unforeseen risk and unleveraged opportunities for influence.

- **There is a pattern to which parts of the supply chain are falling through the policymaking gaps.** This pattern is dictated by both areas of public media focus and regulatory inertia in which policy largely only addresses elements of the supply chain already captured by existing frameworks and mechanisms. Policymakers should consider directing attention to these identified underaddressed areas of the supply chain, and exploring how to broaden coverage to those parts of the stack untouched by current policy and less discussed in the public domain.

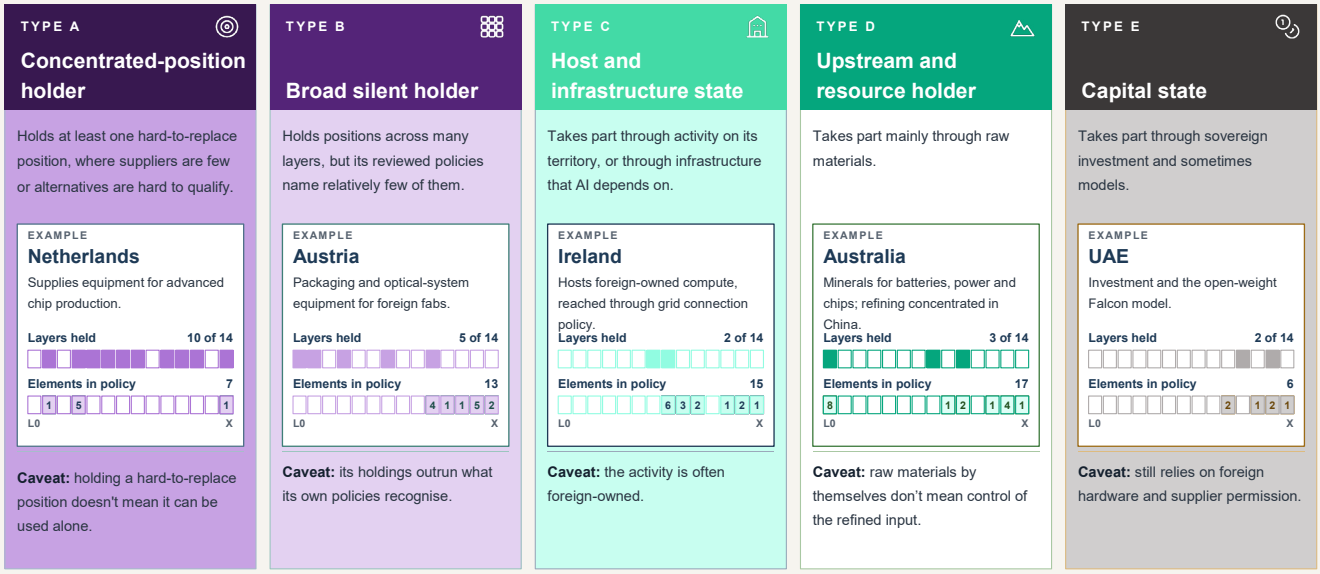
- **Our recommended country audit offers policymakers a practical route to strengthening their understanding of their supply chain strengths and policy positions.** The audit, outlined below, underpins our findings.



Find out more in the policy paper

- **Most assessed countries fall within one of five identified national profiles:** By classifying each country type, we can more readily identify the relative strengths, weaknesses, and available options of different countries. Figure 2 illustrates the five types with country examples.

Five identified national profiles of AI supply chain positioning



Strips: each runs from L0 to X. The top strip shades the layers where the example country holds positions through firms; the bottom strip gives the number of elements captured in its reviewed policies, by layer.

Find out more in the country report

Case study: Japan

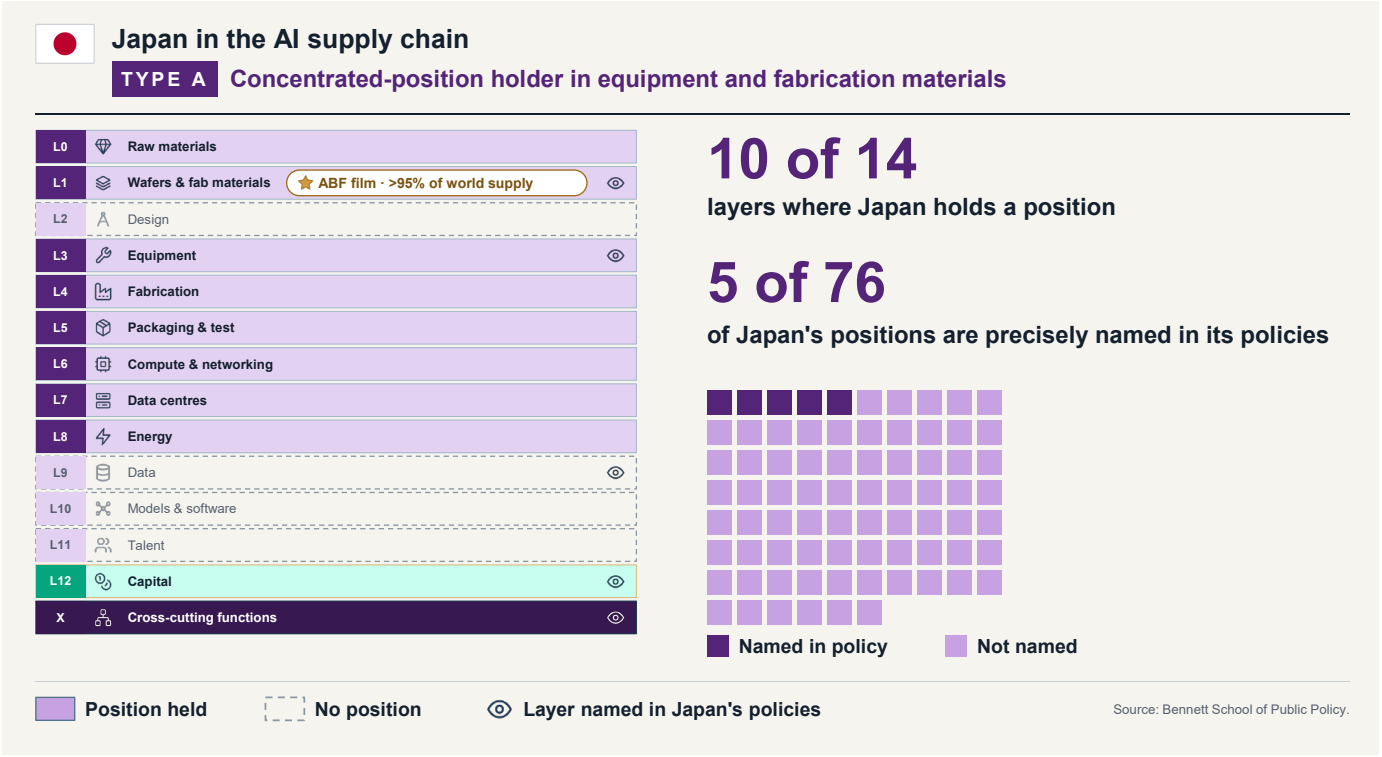
NB This case study uses figures from the country report's expanded criteria for capturing national positions. See country report for additional details.

Japan illustrates both the complexity of the supply chain and the significant leverage held by middle powers. It holds the second largest number of supply chain positions across all 47 countries analysed, ahead of China and behind only the United States.

Positioning in the AI supply chain

Japanese organisations and its government hold positions across 10 layers of our AI supply chain framework, supplying many of the materials and equipment that advanced chip production relies on.

Several of these positions have few alternatives outside Japan, making it a **Type A: Concentrated position holder** in our classification system. Most significantly, the Ajinomoto Group supplies more than 95% of global ABF film, the insulating material used to build the substrates that AI chips are mounted on. These substrates feed into advanced packaging - led by TSMC's chip-on-wafer-on-substrate (CoWoS) process in Taiwan - which links AI processors to high-bandwidth memory to form the accelerators that run in data centres. Japan's leverage therefore ripples through stages of the supply chain it does not own, showing how upstream strength shapes what is possible downstream.



Current national policy coverage

Our audit however finds that Japan's existing policies do not cover some of its strongest positions. Extreme ultraviolet (EUV) mask blanks, the specialised glass plates from which chip-printing masks are made, are essential to EUV lithography and therefore to most advanced AI chips. Japanese firms AGC and Hoya supply around 93% of EUV mask blanks, yet across all policy documents reviewed, EUV mask blanks appear only once (relating to US export-control). This gap shows how uneven policy attention can leave a national strength neither fully leveraged, nor protected.

Insights

By applying our more detailed framework and country audit, we are able to see that Japan's leverage lies in upstream materials whose value is realised in stages owned by other countries. Its goals are therefore best served by partnerships built on complementary positions: with Taiwan, whose advanced packaging uses its materials; South Korea, on memory and materials integration; and the United States, whose accelerators and design platforms depend on these upstream elements.

Find out more

The Invisible AI Supply Chain policy paper introduces the framework and analyses how national policies cover the AI supply chain. The accompanying country report applies it to individual countries, showing where each sits in the chain and where its policies diverge from its industrial position.

- Read *The Invisible AI supply chain* policy paper here
- Read the corresponding country profile report here
- Find out more about AIxGEO and our research here