Policy Brief

Assessing AI Capabilities Across Six Major Countries and Economic Blocs: An Eight-Dimensional Comparative Framework

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Executive Summary

As artificial intelligence (AI) shifts from a research and innovation domain to a core component of national execution capacity, traditional comparisons based solely on compute, frontier models, and investment no longer capture the full scope of strategic competitiveness. This policy brief introduces an Eight-Dimensional Global AI National Competitiveness Index System (GAI-NCIS) and applies it to six major countries and economic blocs: the United States, China, the European Union, Japan, South Korea, and Russia.

The framework builds on six conventional structural dimensions: Compute, Models, Data, Industry, Chips, and Military Integration, by incorporating two execution-oriented dimensions: Domestic Task Competence (DTC), defined as AI capability in executing tasks within domestic institutional, linguistic, and industrial contexts; and Foreign Task Competence (FTC), defined as AI capability in executing cross-border, cross-cultural, and cross-institutional tasks. The addition of DTC and FTC materially alters comparative rankings and highlights structural asymmetries that are not visible under production-oriented metrics alone.

1. Introduction

Most cross-national AI assessments measure structural capacity: compute scale, frontier model output, data resources, industrial adoption, semiconductor capability, and defense integration. These indicators remain essential for evaluating a country's ability to develop and deploy advanced AI systems. However, as AI systems increasingly operate within governance processes, regulatory compliance, industrial workflows, cross-border negotiations, and complex information environments, production capacity alone is an incomplete proxy for national competitiveness.

The critical differentiator is whether AI systems can reliably execute high-stakes tasks in real institutional settings. This includes their performance within domestic legal and administrative systems (DTC) and their ability to function effectively across foreign languages, regulatory regimes, cultural contexts, and information ecosystems (FTC).

Accordingly, national AI evaluation frameworks must move beyond a supply-side lens and incorporate execution capability. Doing so provides a more policy-relevant assessment of how AI contributes to governance effectiveness, economic competitiveness, and international strategic positioning.

2. Countries and AI Systems Assessed

Table 1. Major AI Ecosystems and Representative Leading Systems Across Six Countries and Economic Blocs

Country / Bloc	Number of Major AI Ecosystems Considered	Representative AI Companies / Systems
United States	4	OpenAI (GPT series); Google DeepMind (Gemini); Anthropic (Claude); Meta AI (LLaMA family)
China	4	Baidu (ERNIE); Alibaba (Qwen); SenseTime; Huawei AI stack
European Union	4	Mistral AI; Aleph Alpha; Hugging Face ecosystem; SAP enterprise AI integration
Japan	4	NTT (tsuzumi LLM); Preferred Networks; SoftBank AI initiatives; Fujitsu AI platform
South Korea	4	Samsung AI; Naver (HyperCLOVA X); Kakao Brain; LG AI Research (EXAONE)
Russia	4	Yandex (YaLM); Sber AI (GigaChat); MTS AI; Rostec / state-linked AI initiatives

3. GAI-NCIS Eight-Dimensional Indicator Framework

Table 2. GAI-NCIS Sub-Indicators

Dimensions	Abbreviation	Core Focus	Representative Sub-Indicators (Illustrative)
Compute Power Index	CPI	National AI training and inference capacity	Effective AI compute (ExaFLOPs equivalent); High-end GPU availability; Inference throughput; Energy reliability for AI loads
Frontier Model Index	FMI	Production of globally competitive frontier models	Number of top-tier models; Multimodal maturity; Long-context/tool integration stability; Alignment and safety engineering maturity
Data Capability Index	DCI	Scale, quality, and governance of training and structured data	Internet population scale; High-value structured data coverage; Data accessibility; Data traceability and compliance
Industry Adoption Index	IAI	Depth and diffusion of AI in economic systems	Enterprise AI adoption rate; Core workflow embedding; Verified productivity gains; AI investment and ecosystem density
Chip Sovereignty Index	CSI	Control over semiconductor and AI chip supply chain	Advanced node fabrication share; AI chip availability; EDA/IP control; Domestic substitution rate
Military Integration Index	MII	AI integration within defense systems	AI-enabled ISR ratio; Autonomous systems deployment; AI-embedded command systems; Defense expenditure scale
Domestic Task Competence	DTC	AI capability in executing tasks within domestic institutional context	Legal/regulatory task accuracy; Domestic workflow success rate; Institutional language precision; Policy update latency
Foreign Task Competence	FTC	AI capability in executing cross-border and cross-cultural tasks	Multilingual coverage quality; Foreign compliance task success; Cross-cultural communication robustness; Information environment resilience

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4. GAI-NCIS Results

Table 3. GAI-NCIS Eight-Dimensional Results (0–100 Scale, Equal Weight Scenario)

Region	CPI	FMI	DCI	IAI	CSI	MII	DTC	FTC	Total
United States	98.7	96.4	84.9	97.2	74.6	86.1	81.3	88.8	**88.5**
China	83.9	74.1	89.5	71.6	63.8	79.2	91.4	69.8	**77.9**
European Union	68.2	32.7	71.4	63.9	69.1	54.3	76.8	84.6	**65.1**
South Korea	56.8	41.2	61.7	57.4	84.3	56.1	74.9	66.2	**62.3**
Japan	63.4	36.9	59.6	47.8	78.7	51.4	73.6	64.9	**59.5**
Russia	41.7	27.6	46.2	34.1	22.8	73.9	68.4	58.7	**46.7**

Note: (a) Total score is calculated using an equal-weight scheme across all eight dimensions. (b) All dimensions are normalized to a 0–100 scale using structured benchmark ranges calibrated to current global frontier levels rather than theoretical maxima. Dimension-specific anchors include effective AI training capacity and high-end GPU availability (Compute); frontier model production and benchmark performance (Models); internet population scale and structured data coverage (Data); enterprise adoption and private investment (Industry); advanced fabrication share and domestic substitution capacity (Chips); defense expenditure and AI deployment ratios (Military); institutional task success rates and error profiles (DTC); and multilingual coverage and cross-cultural task performance (FTC). (c) Scores reflect structured benchmark calibration based on publicly observable indicators and analyst-informed assessment. They are intended for comparative analysis and policy discussion rather than econometric precision. (d) Sensitivity testing under alternative weighting schemes does not materially alter overall tier groupings, though mid-tier rankings show moderate variation. (e) Tier groupings are defined as High Capability (80+), Upper-Middle (65–79), Middle (50–64), and Constrained Capacity (<50).

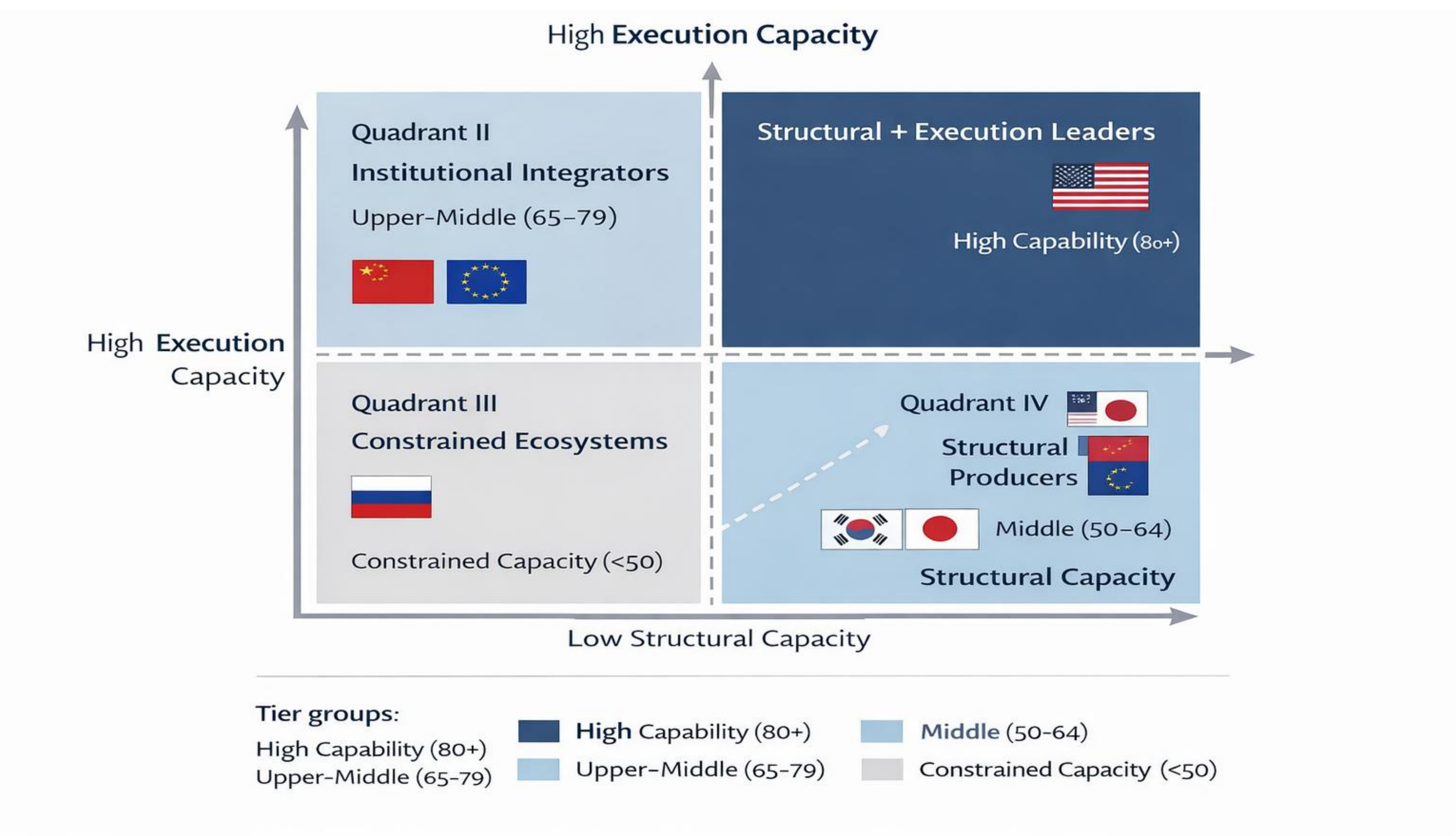

Figure 1. Strategic Map of Global AI Capability (Structural Capacity × Execution Capacity Framework)
Note: Global AI competitiveness is best understood as a two-dimensional strategic space defined by structural production capacity and institutional execution capability. Tier positioning reflects the interaction between these axes rather than scale alone.

5. What the Results Show

5.1 Tier Structure of Global AI Capability

Based on the eight-dimensional assessment, countries cluster into four capability tiers:

- **High Capability (80+)**: United States
- **Upper-Middle (65–79)**: China
- **Middle (50–64)**: European Union, South Korea, Japan
- **Constrained Capacity (<50)**: Russia

This tiered distribution indicates that global AI competitiveness is stratified rather than evenly distributed with one clear high-capability leader and a differentiated upper-middle group, shown in Figure 1.

5.2 Structural Leadership and Execution Effects Within Tiers

Within the **High Capability tier**, the United States maintains dominance across compute, frontier model production, and industry integration, while also sustaining strong Foreign Task Competence (FTC).

Within the **Upper-Middle tier**, China narrows the structural gap through strong Data capability and high Domestic Task Competence (DTC), reflecting deeper institutional integration.

Within the **Middle tier**, the European Union, South Korea, and Japan exhibit varied structural strengths:

- The EU benefits from strong FTC and regulatory interoperability but faces frontier model constraints.
- South Korea and Japan demonstrate semiconductor strength but comparatively weaker model ecosystems.

The **Constrained Capacity tier**, represented by Russia, shows divergence between military integration and civilian AI capacity, indicating partial modernization without ecosystem breadth.

5.3 Execution Capacity as a Tier Modifier

Incorporating DTC and FTC materially affects tier stability.

- China’s strong DTC solidifies its position within the Upper-Middle tier.
- The EU’s strong FTC prevents downward tier slippage despite lower frontier model output.
- The United States’ balanced performance across structural and execution dimensions reinforces its tier separation.

These findings suggest that structural production capacity and execution capability interact to shape tier stability.

5.4 Semiconductor Sovereignty as a Cross-Tier Constraint

Across tiers, semiconductor sovereignty functions as a structural bottleneck variable. Middle-tier states with strong chip ecosystems (South Korea, Japan) remain constrained in frontier model production, while states with limited chip autonomy face longer-term scaling challenges.

6. Why It Matters

The tiered structure suggests that AI competitiveness is evolving toward a stratified equilibrium shaped by three interacting components:

a) Structural capacity (compute, models, data, chips)

b) Economic diffusion (industry adoption)

c) Execution capability (DTC and FTC)

Movement between tiers likely requires coordinated progress across all three domains rather than incremental gains in a single dimension.

7. Implications for Policymakers

7.1 From Rank Competition to Tier Strategy

Rather than focusing solely on ordinal ranking, policymakers should consider:

- What conditions enable upward tier mobility?
- What factors stabilize tier positioning?

Tier transitions appear dependent on execution integration and semiconductor resilience, not frontier model scale alone.

7.2 Institutional Data Access as Execution Infrastructure

Sustained DTC performance depends on structured and legally accessible data ecosystems. Without regulatory clarity, tool integration, and update mechanisms, structural model strength will not translate into operational reliability.

7.3 Multilingual and Cross-Border Capability as Strategic Differentiator

FTC increasingly shapes economic and diplomatic leverage. Cross-cultural robustness, regulatory interoperability, and information-environment resilience function as strategic assets in international AI competition.

7.4 Semiconductor Sovereignty as a Stability Variable

Long-term tier stability across all countries depends on secure semiconductor supply chains. Fabrication capacity, packaging capability, and AI chip substitution rates influence both innovation velocity and deployment sustainability.

7.5 Strategic Bottom Line

The eight-dimensional framework demonstrates that global AI power is tiered and increasingly defined by execution capability in addition to frontier innovation. States that integrate AI into institutional workflows, maintain cross-border operational competence, and secure semiconductor resilience are more likely to sustain durable strategic positioning in the next phase of AI competition.