

GLOBAL VALUE CHAINS, INDUSTRY 4.0, AND KOREAN INDUSTRIAL TRANSFORMATION

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KIET-DUKE PROJECT – KOREA IN GVCs

- One year joint project between KIET and Duke
 - Initiated by KIET; first study to focus on GVCs in Korea
- *Objective:* Identify upgrading opportunities for the Korean economy using a global value chain (GVC) perspective
- Research report covers
 - GVC and Industry 4.0 trends
 - Two GVC case studies on electronics and shipbuilding
 - Recommendations and future directions for Korea
- Today's presentation highlights Korea's position in GVCs, key findings from the research, and a global perspective on GVCs, Industry 4.0 and industrial policy trends.

KOREA IN GLOBAL VALUE CHAINS: PATHWAYS FOR INDUSTRIAL TRANSFORMATION

- Korea's economic development to date based on considerable strength in manufacturing
- Global playing field is changing → Industry 4.0 technologies are creating new digital economy
- Competitiveness of traditional manufacturing base under potential threat
 - Lower cost locations (e.g., China, Vietnam)
 - Innovation hubs (e.g., US, Europe, Japan)

Key Questions:

What pathways should Korea pursue to drive economic growth?

Can GVC Analysis help identify opportunities?

Key Features of GVC Analysis

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GLOBAL VALUE CHAINS & DEVELOPMENT: CHANGING PARADIGMS

Shift from movement between sectors to movement within sectors

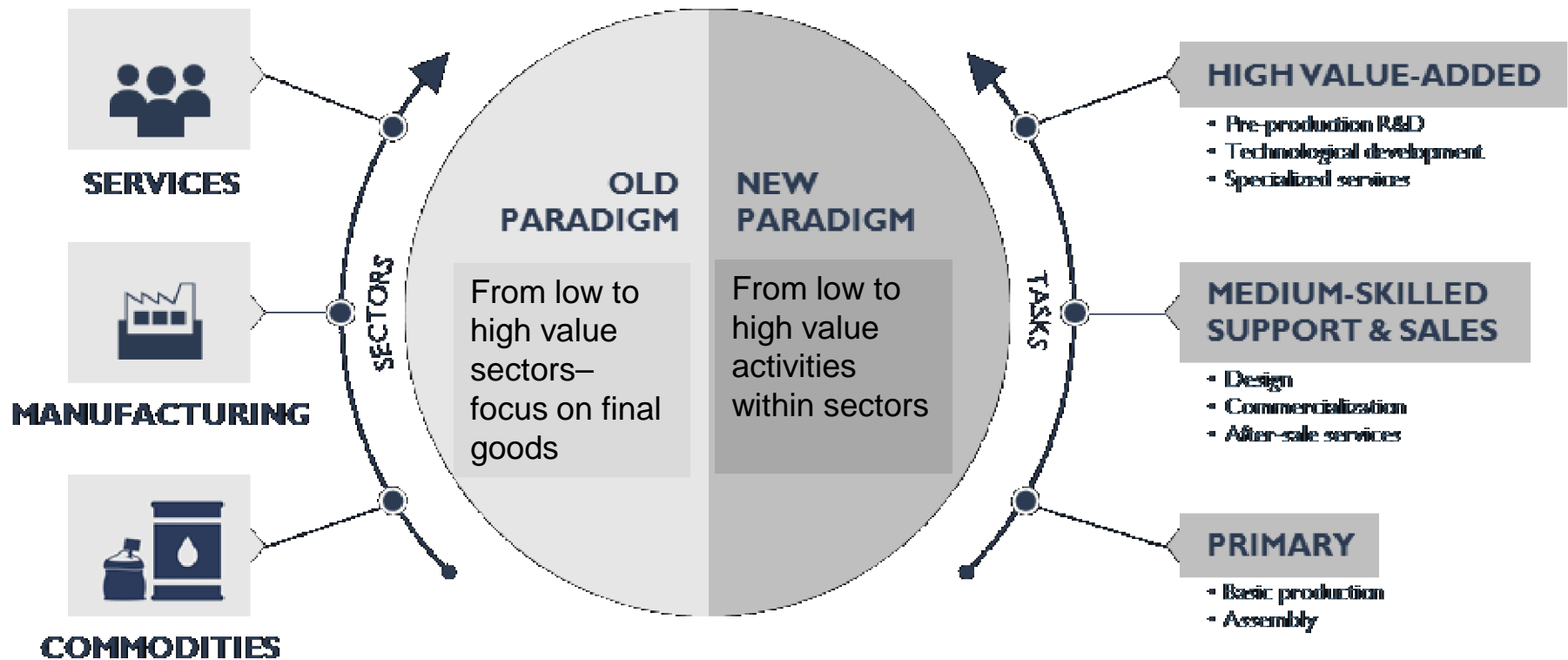


Image Source: Taglioni and Winkler. (2016). *Making Global Value Chains Work for Development*. Washington, DC: World Bank.

KEY TRENDS IN GVC'S & IMPLICATIONS FOR DEVELOPMENT POLICY

• Rationalization

- Lead firms preference to work with large suppliers/partners
 - SMEs cut out from volume business, must focus on niches

• Asian regionalization

- Early GVC regionalization (e.g. NAFTA, EU)
- Strong demand drive & relocation of production activities
 - New products for Asian markets

INDUSTRY 4.0

• Changing production technologies

- Automation –scale industries/segments
- 3D Printing – niche sectors
 - Capital substitution of labor; geography of chain

• Servicification

- New services activities → Big Data/Internet of Things (IoT)
 - Increased value of after-sales & knowledge-intensive services

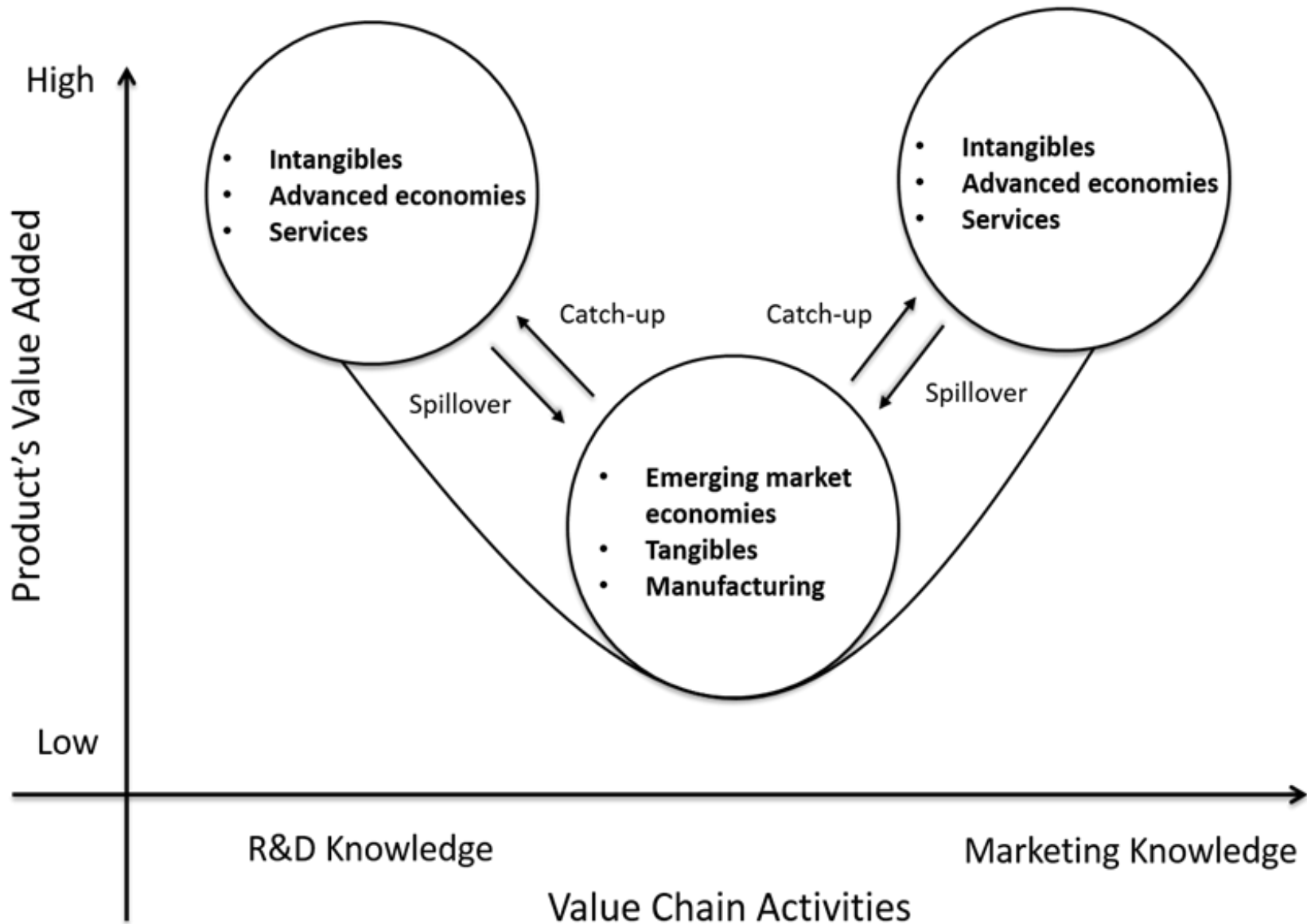
ECONOMIC UPGRADING

- **Strategies used by firms and countries to improve their positions in global and regional value chains**

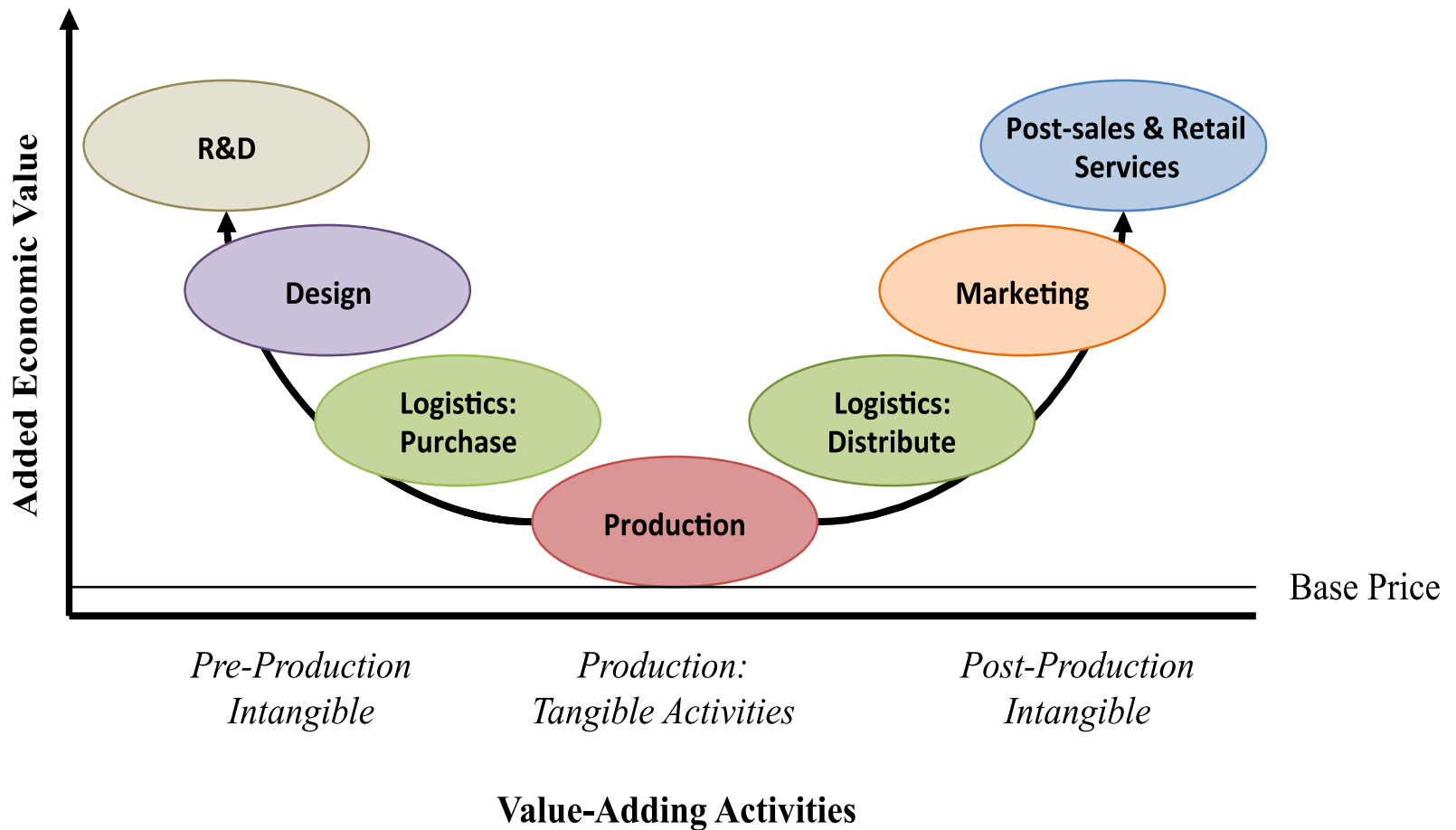
- *Entry upgrading* – participate in GVCs
- *Product upgrading* - moving into more sophisticated product lines
- *Process upgrading* - transforms inputs into outputs more efficiently by reorganizing the production system or introducing superior technology
- *Functional upgrading* - acquiring new functions (or abandoning existing ones) to increase the overall skill content of the activities (OEM → ODM → OBM)
- *Intersectoral (chain) upgrading* – entry or diversification into new value chain by leveraging the knowledge and skills acquired in the current chain (e.g., new materials – graphite in Taiwan; high-tech textiles)

Key Frontier
Upgrading
Strategies

STAN SHIH'S SMILING CURVE



WHERE DOES THE VALUE LIE IN GLOBAL VALUE CHAINS?



Korea in Global Value Chains



KOREA IN GVCS: DUKE GVCC STUDY



Two Key Sectors
+650,000 jobs
30% exports
 (US\$240,000 /employee)



Electronics		Shipbuilding
\$120 billion	Exports (2015, US\$)	\$38 billion
23%	Share of Korea's Exports	7.3%
396,000 (2012)	Employment	260,000
Samsung, LG, SK Hynix	Key Lead Firms	HHI, SHI, DSME
Components/subassemblies (for export) Lead firm (final 3C products)	Main Stages of GVC Participation	Components Lead firms; Integration
Cost-driven consumer market	Current Competitiveness Strategy	Higher-value, niche markets

KOREA IN GVCs: KEY FINDINGS

- **Upgrading driven by indigenous firms**, not FDI
 - Transfer knowledge via licensing rather than collaboration
- **Limited outsourcing** → Firms have maintained manufacturing capabilities in-house (unique to Korean lead firms)
- **Process & product upgrading** (i.e., productivity & new technologies, incremental product improvements) → major drivers of competitiveness
- Functional upgrading mainly occurred **upstream in GVCs** → applied R&D, new product development

KOREA IN GVCS: KEY FINDINGS (cont'd)

- **Small and medium enterprises** not well linked to innovative activities outside *chaebol* economy
- **Weak presence in services** in value chain
 - Poor services sector overall
- Focused on **small number innovative products** & select end markets
 - China is in all products; Japan declining presence

GVC UPGRADING: POTENTIAL PATHWAYS FOR THE FUTURE

- **Upgrading into Production Technologies** → position Korea at forefront of Industry 4.0
- Functional Upgrading into **Services** → very strong R&D but only in select GVCs
 - **After-sales services** → Big data
 - **IT services** → IoT
 - **Manufacturing-related** services → use GVC approach to identify these (use manufacturing to move into services)
- **Intersectoral (chain) upgrading** → Leverage existing knowledge across tech leaders to move into & define new sectors on the **technological frontier**

UPGRADE INTO SERVICES: POST PRODUCTION & MANUFACTURING-RELATED SERVICES

2017 KOREAN STRENGTHS

Products



HYUNDAI
HEAVY INDUSTRIES CO., LTD.



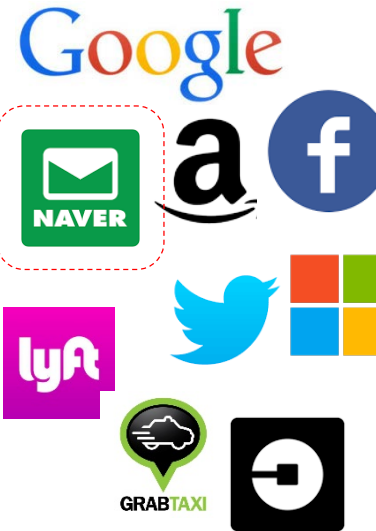
GVC OPPORTUNITIES

Products & Services

Smart Services

Benchmarking & Performance Consulting

Design services
ERP
CRM
e-Commerce
Logistics
Insurance



Potential Markets

- Advertising/targeting marketing
- Political campaign targeting
- City planning/urban development
- Autonomous car programming
- Port logistics
- Navigational services
- Safety services
- Weather forecasting

THREE KEYS TO UNLOCKING THIS POTENTIAL



Human
Capital



Innovation
Systems



Services
Regulation

COHERENT & CONSISTENT INSTITUTIONAL APPROACH

Korea in Comparative Perspective



INNOVATION SYSTEMS IN EAST ASIA

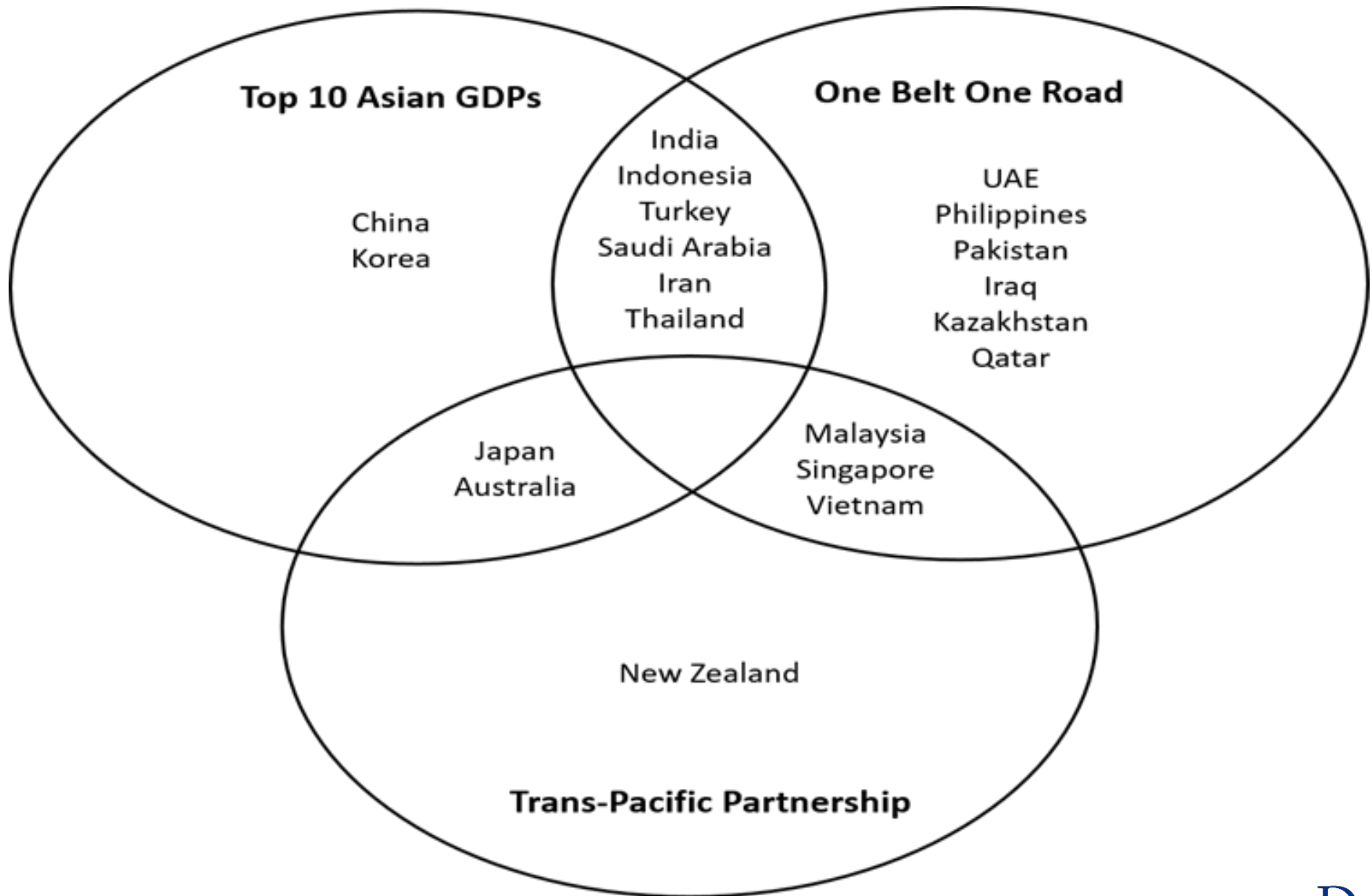
	China	Japan	Korea	Singapore	Taiwan
GVC/Integration Approach	FDI	National Champions	National Champions	FDI	FDI/National Champions
Capability Development in GVCs	Membership of GVCs	Indigenous Innovation	Indigenous Innovation/Licensing of foreign tech	Membership of GVCs	Membership of GVCs
Policy Approach	SME & Industrial Space		Supporting national champs & core technologies	SME & Industrial Space, Targeted FDI	SME & Industrial Space

CHINA'S ONE-BELT, ONE-ROAD INITIATIVE



Source: Xinhua News Agency

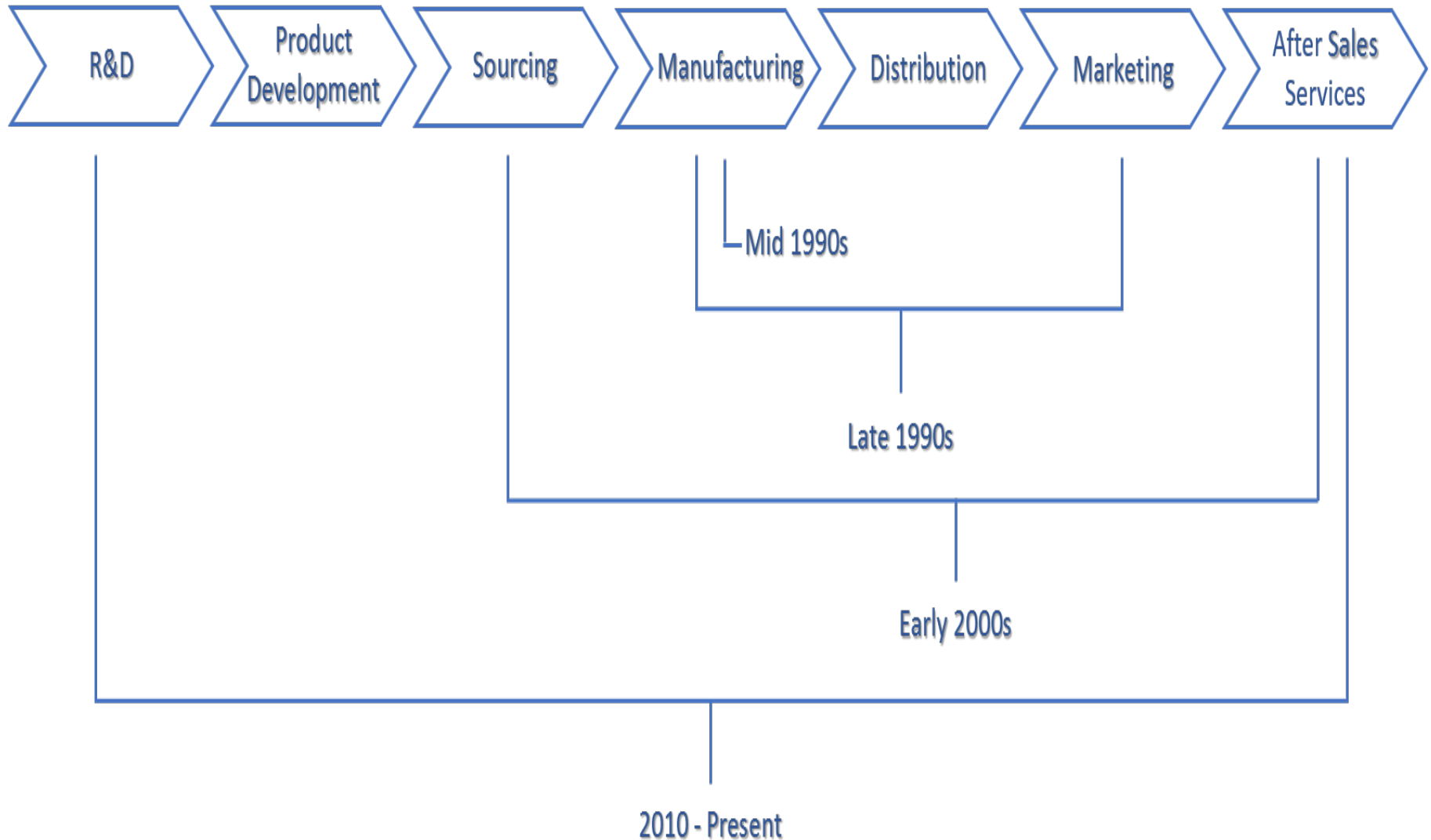
ASIAN-PACIFIC TOP 10 GDP COUNTRIES, ONE BELT ONE ROAD AND TTP MEMBERS



MADE IN CHINA 2025: STRATEGIC INDUSTRIES AND ULTIMATE GOALS

<i>Decision (2010)</i>	<i>MiC2025 (2015)</i>	Ultimate Goals
Energy Efficiency & Environmental Conservation	Energy Saving & Clean-energy Vehicles	Green and Sustainable Growth
New-Energy Vehicles		
New Energy	Power Equipment	
Biotechnology	Biomedical & High-performance Medical Devices	Indigenous Innovation ³⁸
New Materials	New Materials	
Next Generation Information Technology	Next Generation Information Technology	
/	Computer Numerical Control Tools & Robotics	
/	Agricultural Machinery	
	Aerospace Equipment	
High-End Equipment Manufacturing	Advanced Rail Equipment Marine Engineering Equipment & High-tech Ships	
		Global Competitiveness in Infrastructure

UPGRADING STRATEGIES FOR CHINESE VEHICLE MANUFACTURERS, MID-1990s - PRESENT



Source: Chun Jiang, "China in Global Value Chains," Duke GLS program (2016).

MAJOR R&D CENTERS FOUNDED BY MNCs IN CHINA

Industries	MNCs	Year	Location
Electronic Appliances	Intel	1994	Shanghai
	3M	1994	Shanghai
	General Electric	2003	Shanghai
Software	IBM	1995	Beijing
	Microsoft	1998	Beijing
	Hewlett Packard	2002	Shanghai
Chemicals	Dow	2004	Shanghai
	DuPont	2005	Shanghai
	Proctor & Gamble	2010	Beijing
Telecommunications	France Telecom	2004	Beijing
	Vodafone	2005	Beijing
Pharmaceutical	Johnson & Johnson	1994	Shanghai
	Pfizer	2005	Shanghai
	Novartis	2009	Shanghai

Source: Chun Jiang, "China in Global Value Chains," Duke GLS program (2016).

The Digital Economy



THE ARCHITECTURE OF THE DIGITAL ECONOMY & CATEGORIES OF DIGITAL & ICT FIRMS

Digital MNEs, performing activities based on or strictly linked to the internet

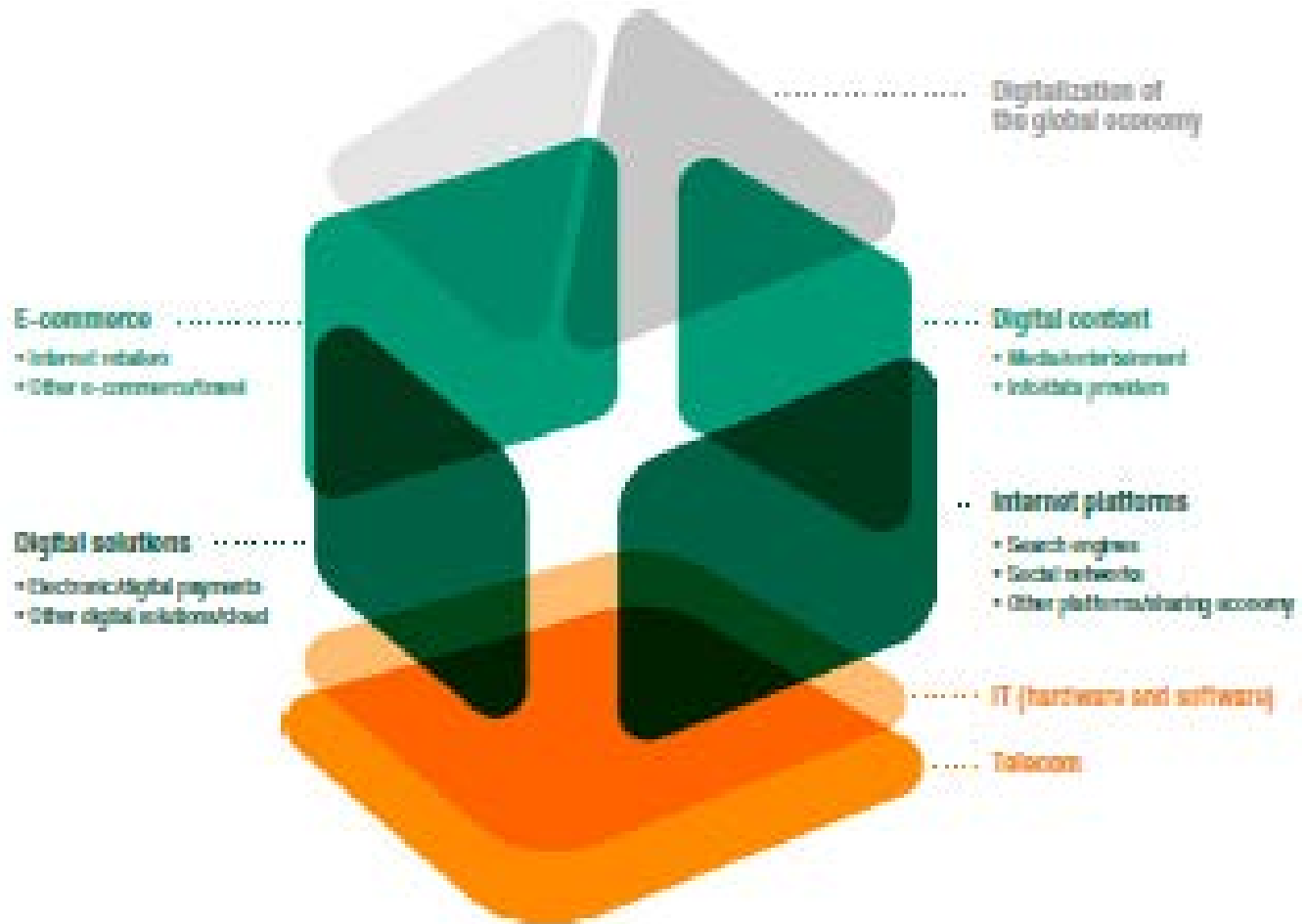
- Purely digital
- Mixed

Korea: Very limited participation (1/100 firms); < 1 % sales or assets
 Dominated by US and European firms (90/100)
 E-commerce is a focus area for China

ICT MNEs, providing the enabling infrastructure supporting the internet

Korea: 4% of firms; 8% of sales

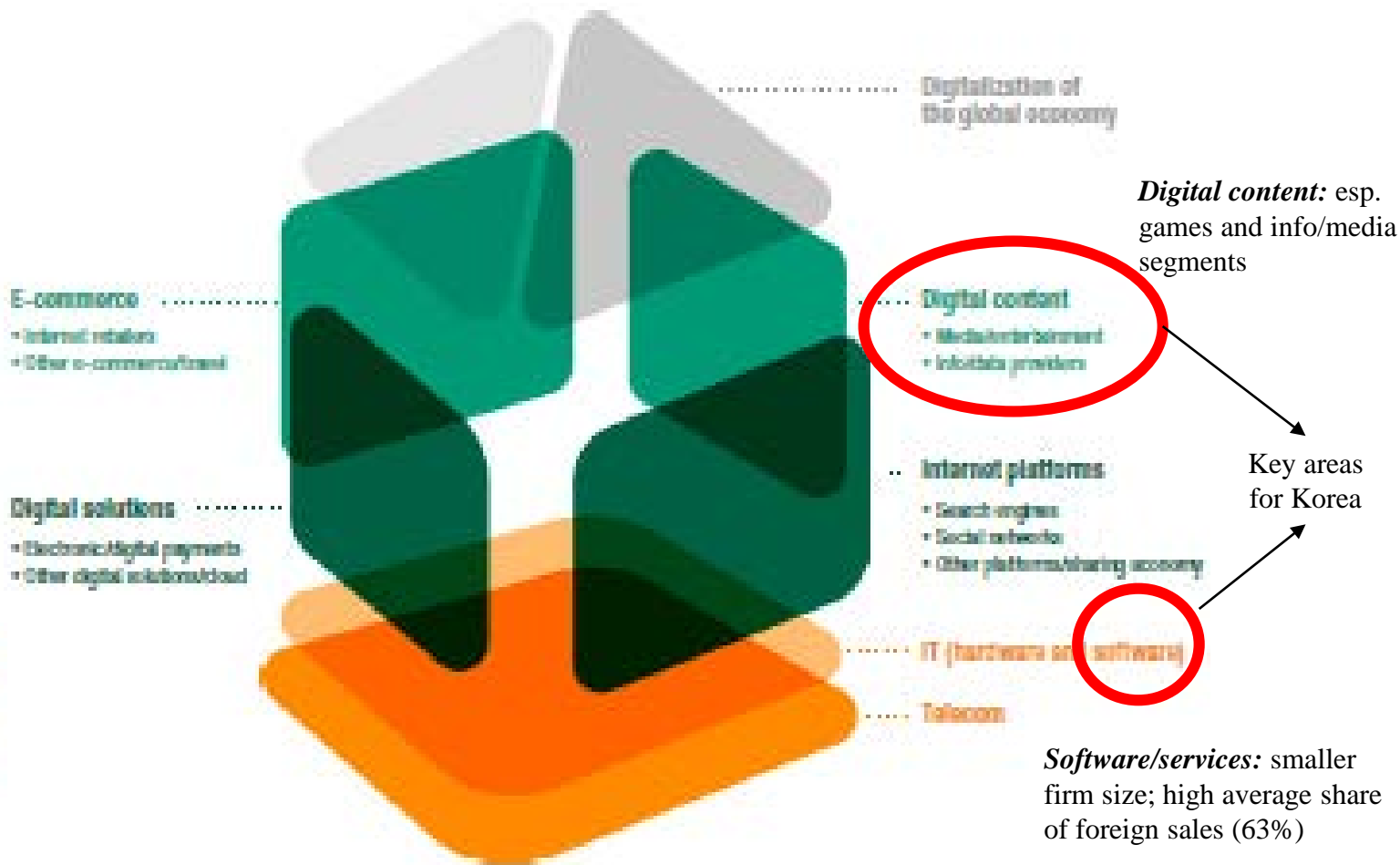
IT devices and components (3/52 firms) (Samsung, LG, SK Hynik)
 IT software and services (1/21) (Samsung SDS)
 Telecommunications (0/27)



THE ARCHITECTURE OF THE DIGITAL ECONOMY & CATEGORIES OF DIGITAL & ICT FIRMS

Digital MNEs, performing activities based on or strictly linked to the internet

- Purely digital
- Mixed



ICT MNEs, providing the enabling infrastructure supporting the internet

MADE IN CHINA 2025: GVCS & INDUSTRY 4.0

- **No more catching-up:** Upgrading in GVCs has been exhausted as a economic growth driver
- **Innovation-driven development** #1 priority, not a S&T policy
- **Benchmarked to global leaders**, esp. Germany “Industrie 4.0”
- **China’s Supply Chain Integrator Model:** Accelerate upgrading through GVCs
 - **Platform companies:** Innovation, technology, and services
 - *E-commerce and shared economy*
 - **Increased use of IT** in SMEs
 - **Automation** -- productivity & labor shortage/labor costs
 - **Environmental upgrading**

Still a vision – long way to go.

POLICY RESPONSE TO INDUSTRY 4.0 IN EAST ASIA

Country	Major Institutional Characteristics	Current Policy Approach	Examples of Recent “Industry 4.0” Policy/ Program
China	Platform/Supply Chain Integrator	Developing indigenous (private) lead firms	Made in China 2025
Korea	Integration of more domestic actors; low foreign input	Strengthening indigenous lead firm innovation in select sectors	Comprehensive Action Plan for Future New Growth & Industrial Engine
Singapore	Global integration (Foreign input plays key role)	Leading services hub in region; regional HQs	National Additive Manufacturing Innovation Cluster
Taiwan	Global integration (Foreign input plays key role)	Developing software capabilities & design services in IT	Industrial Technology Research Institute (ITRI)’s Cloud Computing Center for Mobile Application (CCCMA)

KOREA'S SUCCESS IN GVCs: LEVERAGING STRENGTHS, NEW OPPORTUNITIES

- **Korea in East Asia** → most dynamic global region
- **Korea's strategy:** indigenous R&D, a few core industries, upgrading driven by large national firms
- **China's strategy:** diversified GVCs, export-oriented, links to FDIs, use domestic market for innovation & growth
- **Industry 4.0:** Internet use driving digital economy, upstream (sourcing) and downstream (e-commerce)
- **Platform economy:** digital and tech MNEs are creating new markets for SMEs (e.g., sharing economy)
- **IT services:** complement what large companies do, and allows innovation for SMEs (apps, 3DP, health care)



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