TECH TENSION, DATA AND GVCS

HOW THE US-CHINA TECH WAR CAN AFFECT TECHNOLOGY AND GVCS

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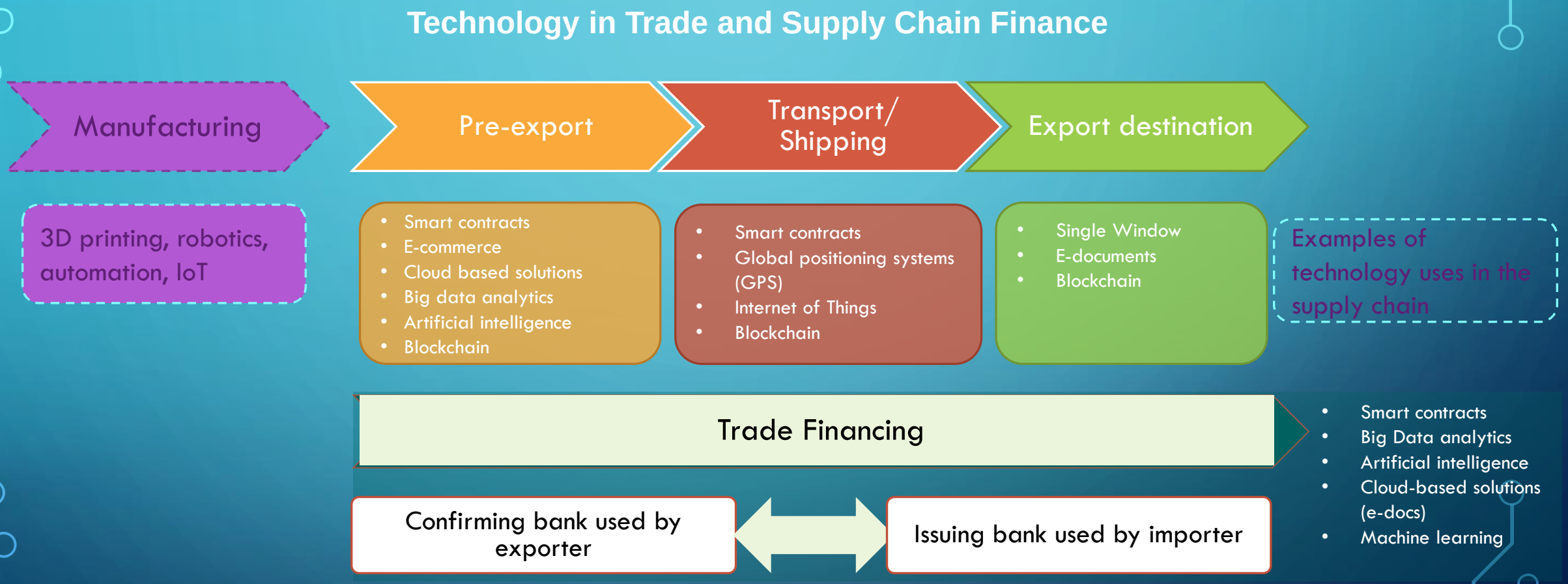
PRESENTATION OUTLINE

- The context: Why compete in technology?
  - Race for supremacy in industries of the future
  - Race for patents and standards
  - The US-China tech tension in terms of policy measures
- Data policies, GVC and trade
- Impact on GVC and trade

- References
- GVCs in the Post-Pandemic New Normal (Thematic Chapter of AMRO Regional Economic Outlook 2021)
- https://www.amro-asia.org/wp-content/uploads/2021/04/AMRO-AREO-2021_C2-rev.pdf
- Next Generation Non-tariff Measures: Emerging Data Policies and Barriers to Digital Trade
- https://www.unescap.org/sites/default/d8files/knowledge-products/AWP%20187%20%282020.01.24%29.pdf

CONTEXT: PERVASIVE USE OF TECHNOLOGIES IN THE VALUE CHAIN, FROM PRODUCTION TO TRADE TO FINANCE



Banks are more conservative than Fintechs in applying technology, especially in shifting from paper transactions to e-documents

REASON FOR THE INTENSE TECHNOLOGY COMPETITION

- ❑ Modern technologies exhibit network effects
- ❑ Network effects create a 'winner-takes-most' outcome -> i.e. monopoly or oligopoly
- ❑ Huge benefits from being the "first mover" that can dominate the global standard
  - huge user base
  - obtain the 'architectural franchise'
  - Example: Ethernet became the standard protocol for the local computer network
- ❑ Cannot discount the **security aspect** of the technology competition (technology powers defense capabilities)

"…he that dominates technology, dominates the world…"

CRITICAL ROLE OF SEMICONDUCTORS IN ICT TECHNOLOGIES

Semiconductor Supply Chains

First stage
Integrated circuit (IC) design

EDA (Electronic design automation) software used for IC design has US intellectual property rights and subject to export control

Second Stage
Fabrication/ chip manufacturing

Manufacturing equipment for chip manufacturing supplied by US firms;

High-end chip fabrication uses lithography technology not available in China

It takes years to develop fabrication capacity

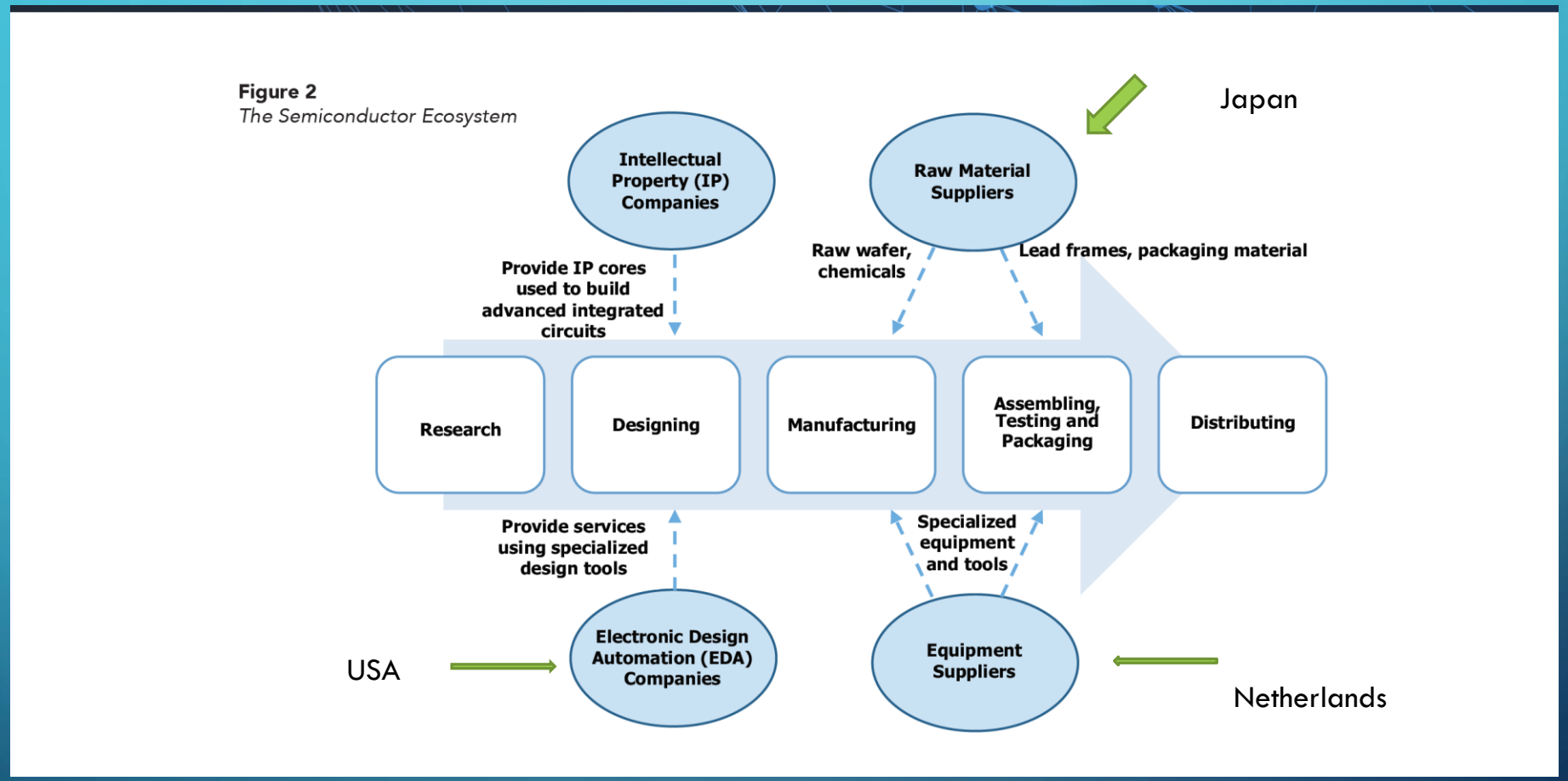
Third Stage
Assembly and testing

Labor-intensive; China making inroads

But Japan dominates materials: silicon wafer, photoresists, essential packaging chemical

- US is industry leader
- Germany, Japan, Netherlands, South Korea and Chinese Taipei are leaders in the semiconductor ecosystem which consists of:
  - R&D
  - Design
  - Manufacturing
  - Semiconductor manufacturing equipment
- Challenges to US leadership in semiconductor industry

Semiconductor supply chain: major chokepoints

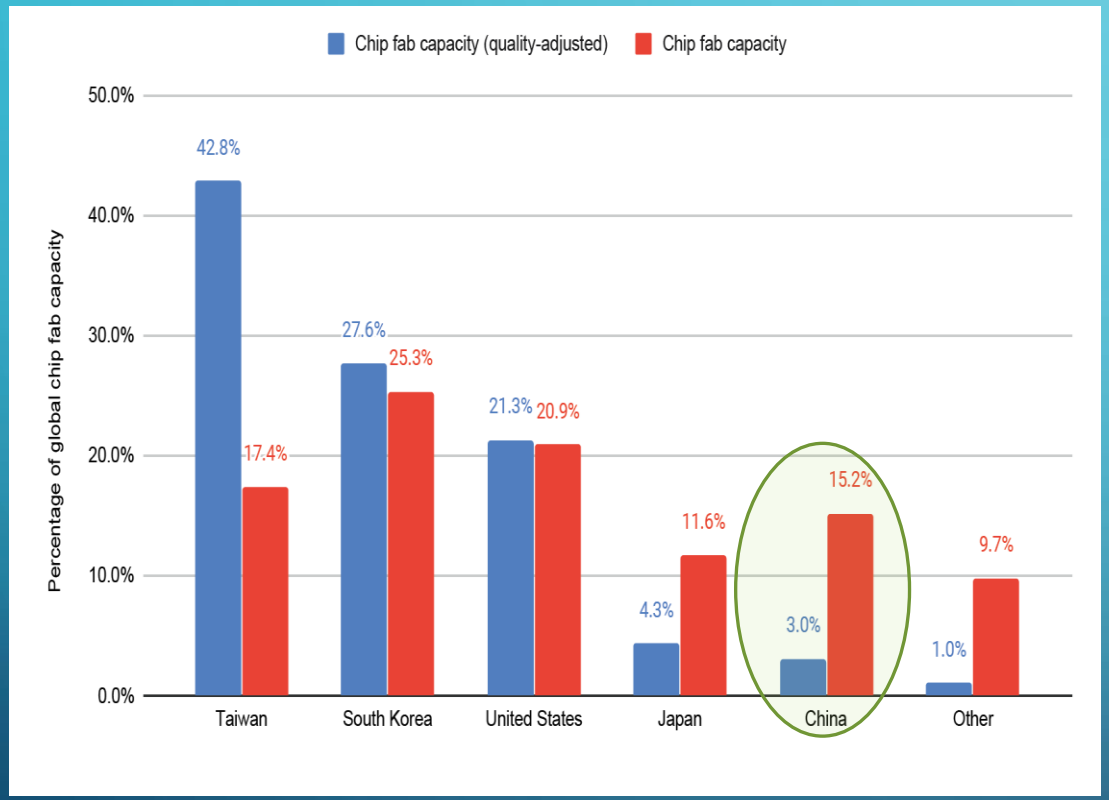


Key players: TSMC (Chinese Taipei); SMIC, HiSilicon (Huawei) (China); Samsung (South Korea); Intel (US)

ASML (Netherlands – extreme ultraviolet lithography equipment (EUV) – for state of the art chips)

SEMICONDUCTORS MANUFACTURING CAPACITY

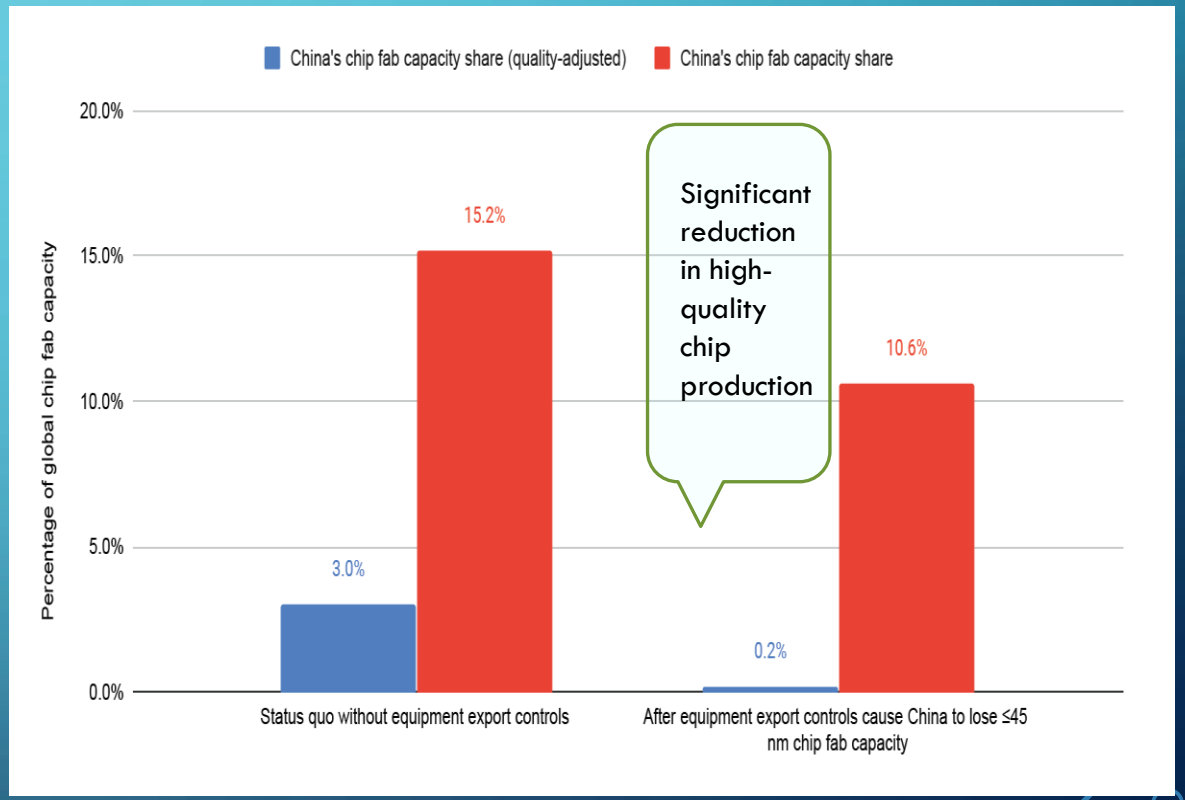
Chip Fab capacity (by Fab headquarter)



Source: Georgetown University WP

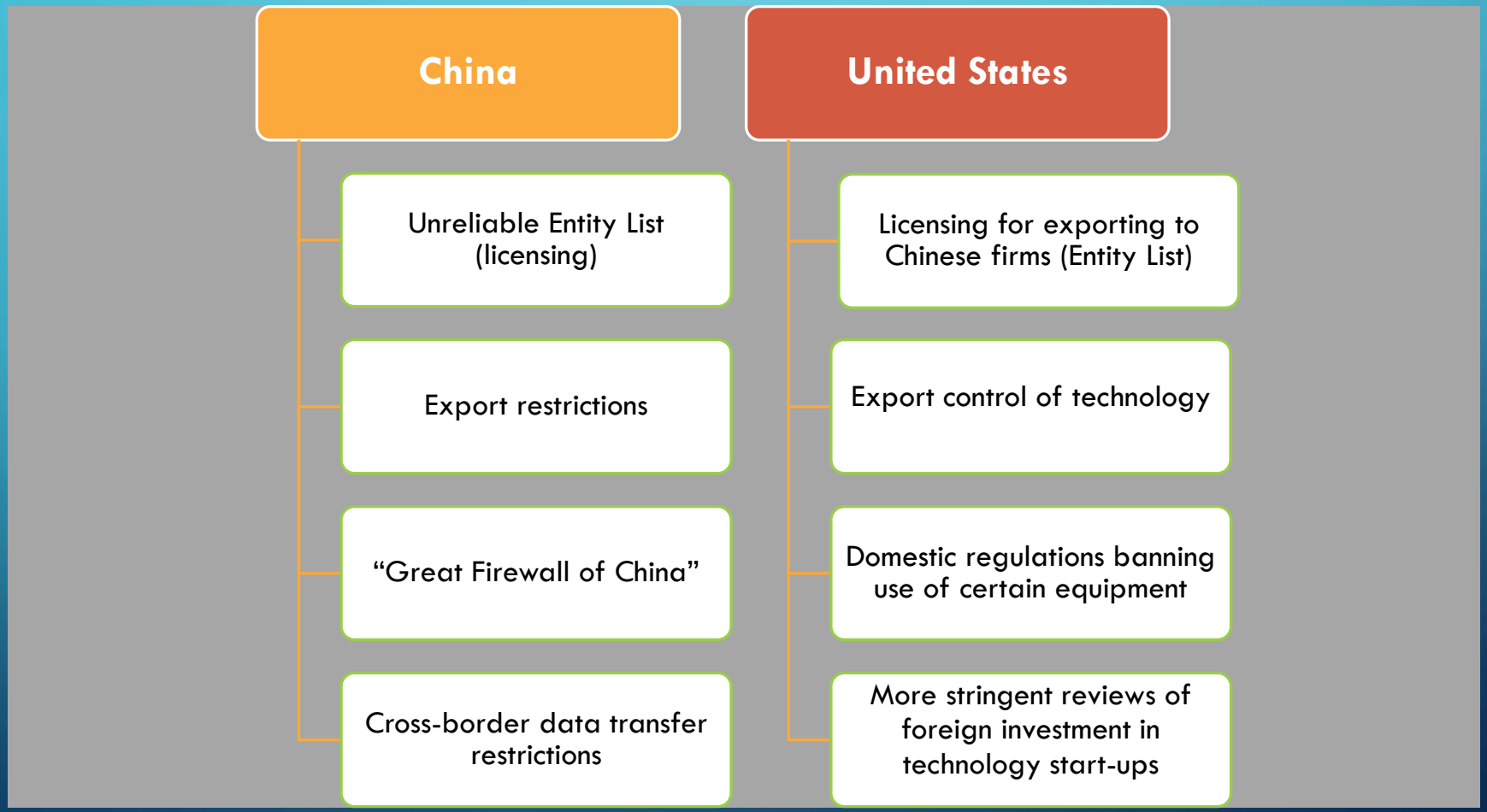
Chinese Taipei manufactures 43% of the advanced chips; China only 3%

Chip Fab capacity (with and without export controls)



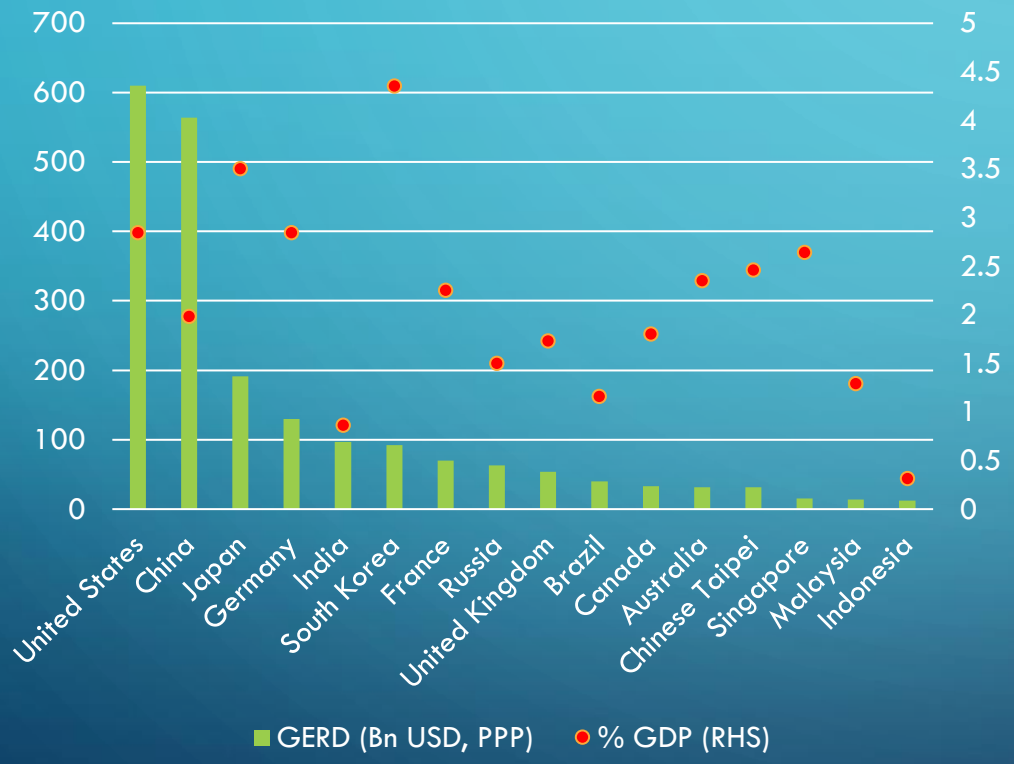
China's capacity for advanced chips production can fall from 3% to 0.2% with the tech war

TIT-FOR-TAT TECH-RELATED TRADE AND INVESTMENT MEASURES

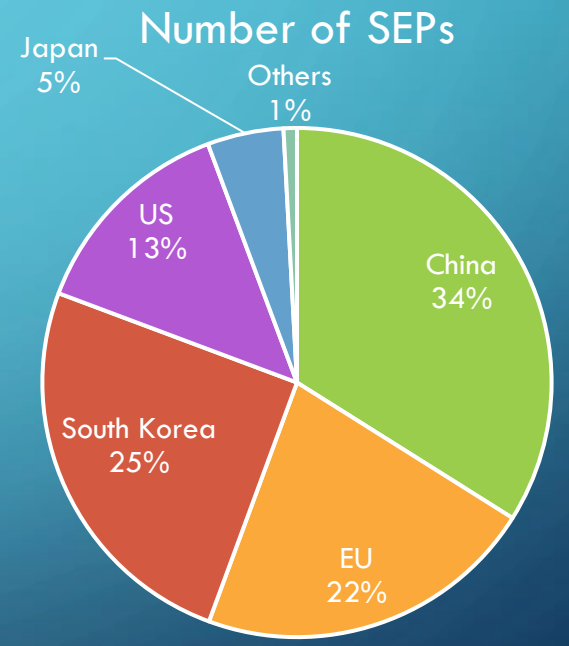


TECH COMPETITION SHOWN IN R&D SPENDING AND INCREASINGLY IN GLOBAL STANDARD SETTING

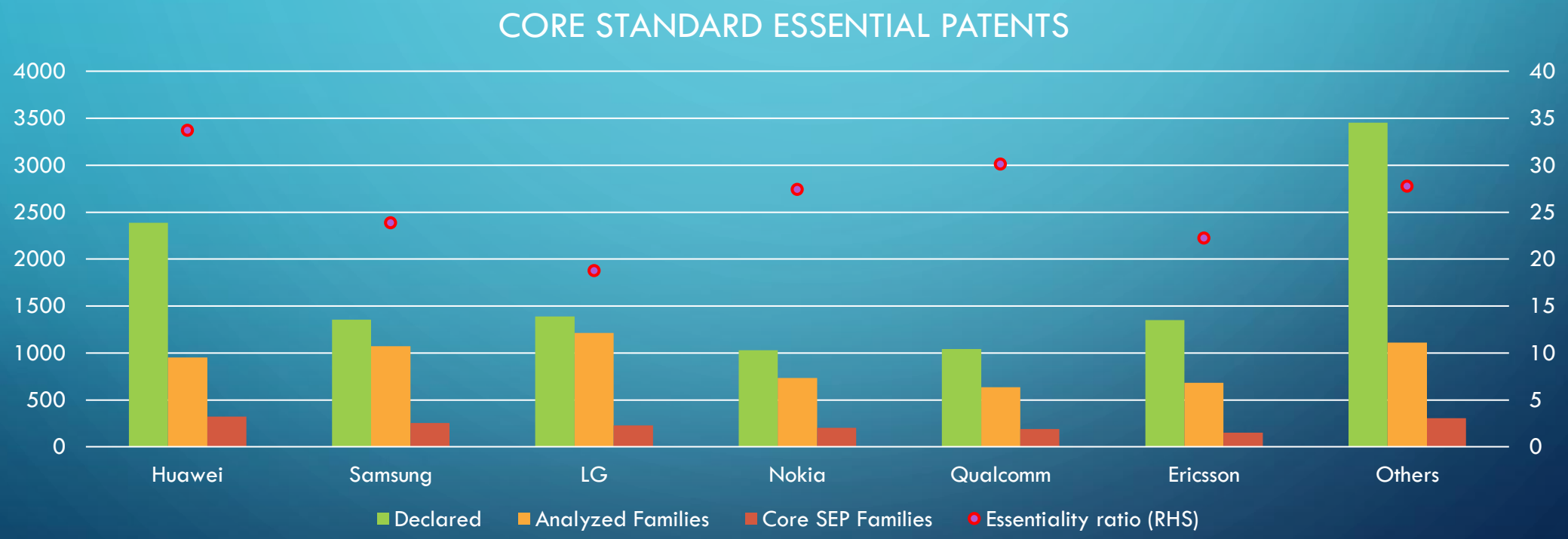
GROSS ESTIMATED EXPENDITURES IN R&D
(PPP BILLION USD, PERCENT 2019 GDP)



SHARES IN 5G STANDARD ESSENTIAL PATENTS (SEP)
(PERCENT SHARE TO TOTAL)



COMPETITION IN STANDARDS



LESSONS ON STANDARDS; GALAPAGOS SYNDROME

WAPI

-home-grown security protocol for WLAN to supplant international wireless standard WiFi.

- Allegedly for national security considerations

- lack of global standard ->lack of seamless connections across borders and device platforms

- Many WiFi products cannot be used in China market

- Intense pressure -> China allowed alternative protocol

TD-SCDMA

- Time division-synchronous code division multiple access; Chinese standard of third generation 3G mobile telecom technology

- China sought approval for it be an international standard like WCDMA and CDMA2000

- Didn't get worldwide adoption but experience of how to seek international recognition was fruitful for China

Japan ICT

- Galapagos syndrome

- Japan's technology standards that gave local companies advantage in the local market

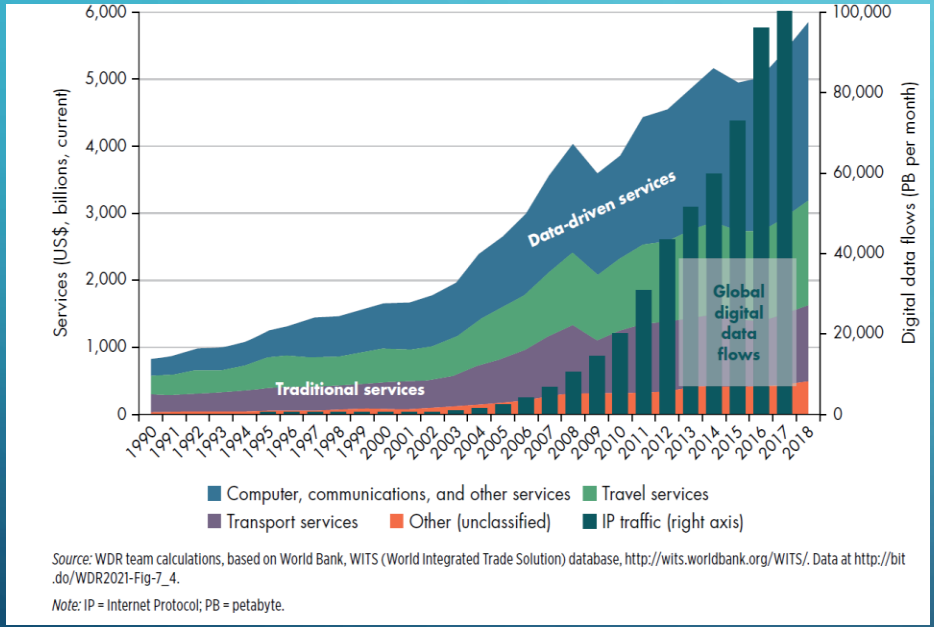
- Very advanced and innovative in 1980s-90s

-But because standards were for the local market, Japanese manufacturers had difficulty exporting products globally

- Eventually left behind by other manufacturers that used global standards

DATA POLICIES ARE IMPORTANT FOR GVCS

GROWTH IN DATA-DRIVEN SERVICES



Source: WDR team calculations, based on World Bank, WITS (World Integrated Trade Solution) database, http://wits.worldbank.org/WITS/. Data at http://bit.do/WDR2021-Fig-7_4.

Note: IP = Internet Protocol; PB = petabyte.

EVEN WITHIN MANUFACTURING GVCS, USE OF DATA IS PERVASIVE

R&D, Design, Testing, Raw materials → Input of goods and services; Assembly → Sales marketing; After-sales services monitoring

All stages of production depend on data

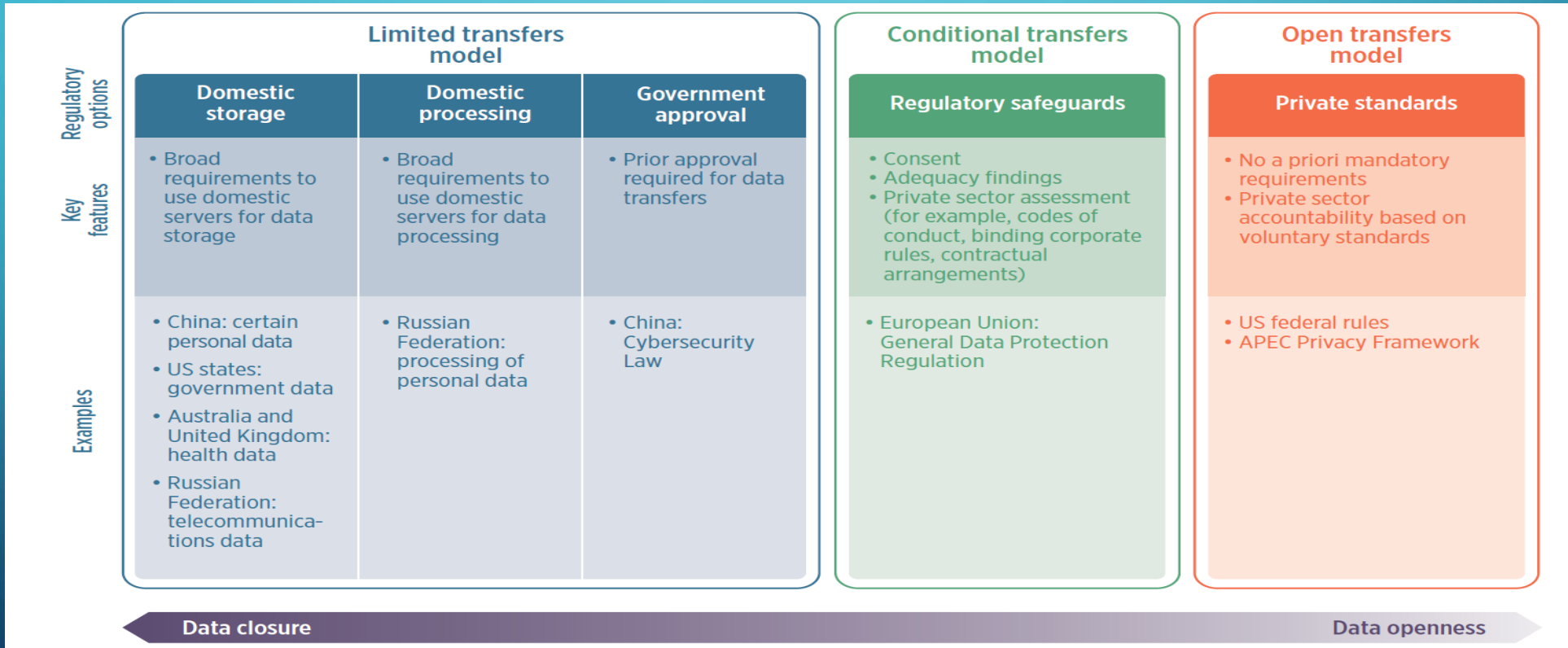
EXAMPLE OF DATA THAT NEED TO BE MOVED IN PRODUCTION

Control and coordination	Pre-production	Supply chain management	Production	Post-sales
• Employment data, market data, market prices, operations, planning, and processing, production data, production planning • Performance monitoring, demand forecast, know-how/training, licensing, customer data, energy/matl consumption, internal communication	• Market information, usage data, social media data, technical data, virtual design, test results • Names of scientists, location data, know-how, customer data, communication, project info	• Customs data, customer data(address/names), package tracking, payments, inventory levels, transport route optimization and transport time, procurement details • Communications, info to logistics partners, orders, sales data, production sked, performance metric	• Data from sensors, instructions for robots, incl communication between robots, know-how/training, testing final product • Diagnostics, maintenance and repair; market data, product data, quality control, technical data	• Usage data, performance data, social media input, customer reactions, Diagnostics, condition monitoring, maintenance and repair incl spare part management • data from third parties (e.g. retailers), content as part of product, storage management, "life of product", technical dat, product offer data, sales guides

Source: Kommerskollegium

Some data may be personal data

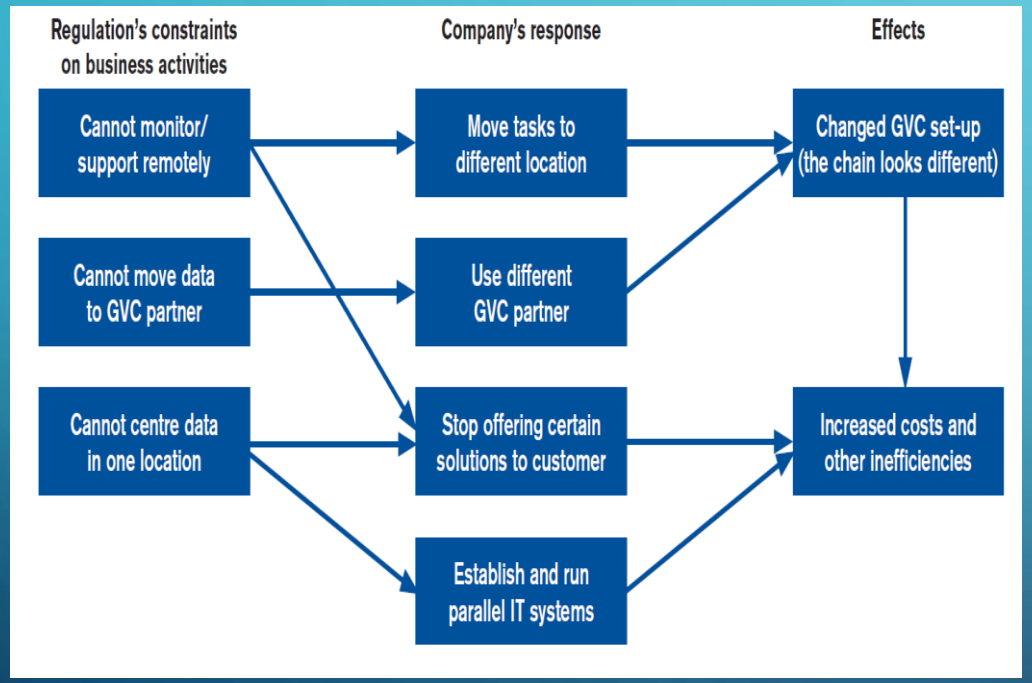
VARIOUS REGULATIONS ON CROSS-BORDER DATA FLOWS



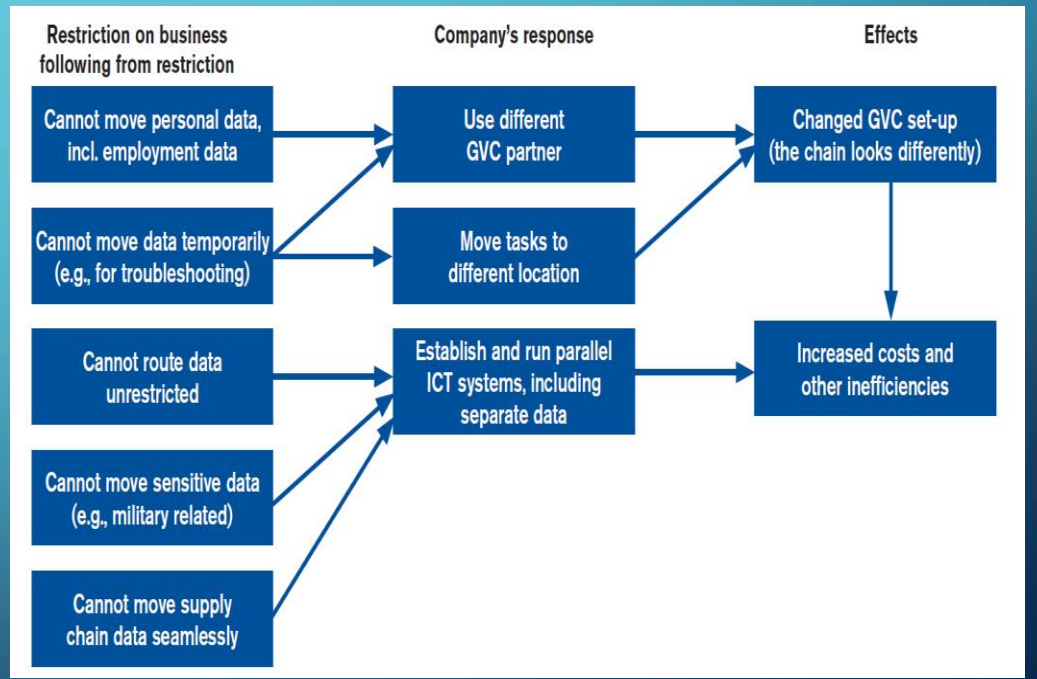
Sources: WDR 2021 team, based on Casalini and López González (2019); Cory (2017).

EFFECTS OF DATA RULES ON GVCS

Effect of forced localization

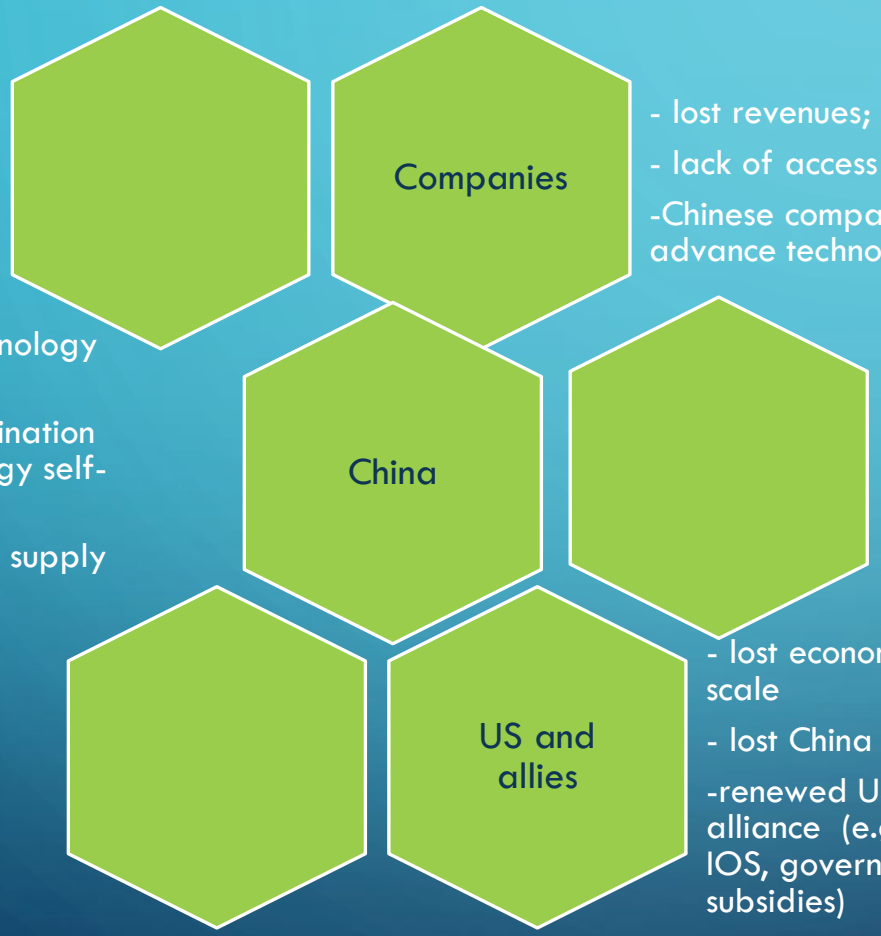


Effect of restrictions on CB data transfers



Source: Kommerskollegium

WHO ARE THE WINNERS AND LOSERS IN THE TECH WAR



- lost revenues; affect future R&D
- lack of access in China market
-Chinese companies also lose access to advance technologies

- set back in technology acquisition
- greater determination towards technology self-sufficiency
- de-Americanize supply chains

- lost economies of scale
- lost China market
-renewed US-EU alliance (e.g. in ITU, IOS, government subsidies)

Example: In 5G

Push for open-source development of software and technology that allow 5G equipment to communicate

O-RAN

Open Radio Access Network standard

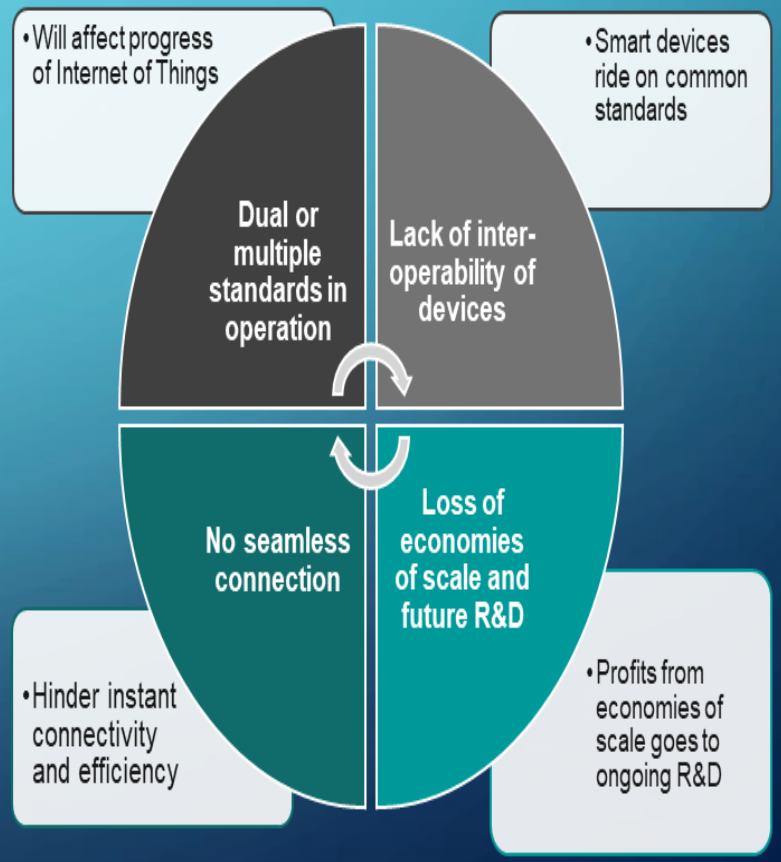
- Huawei not part – has own standard

WILL TECHNOLOGY BIFURCATION RESULT FROM THE TECH TENSIONS?

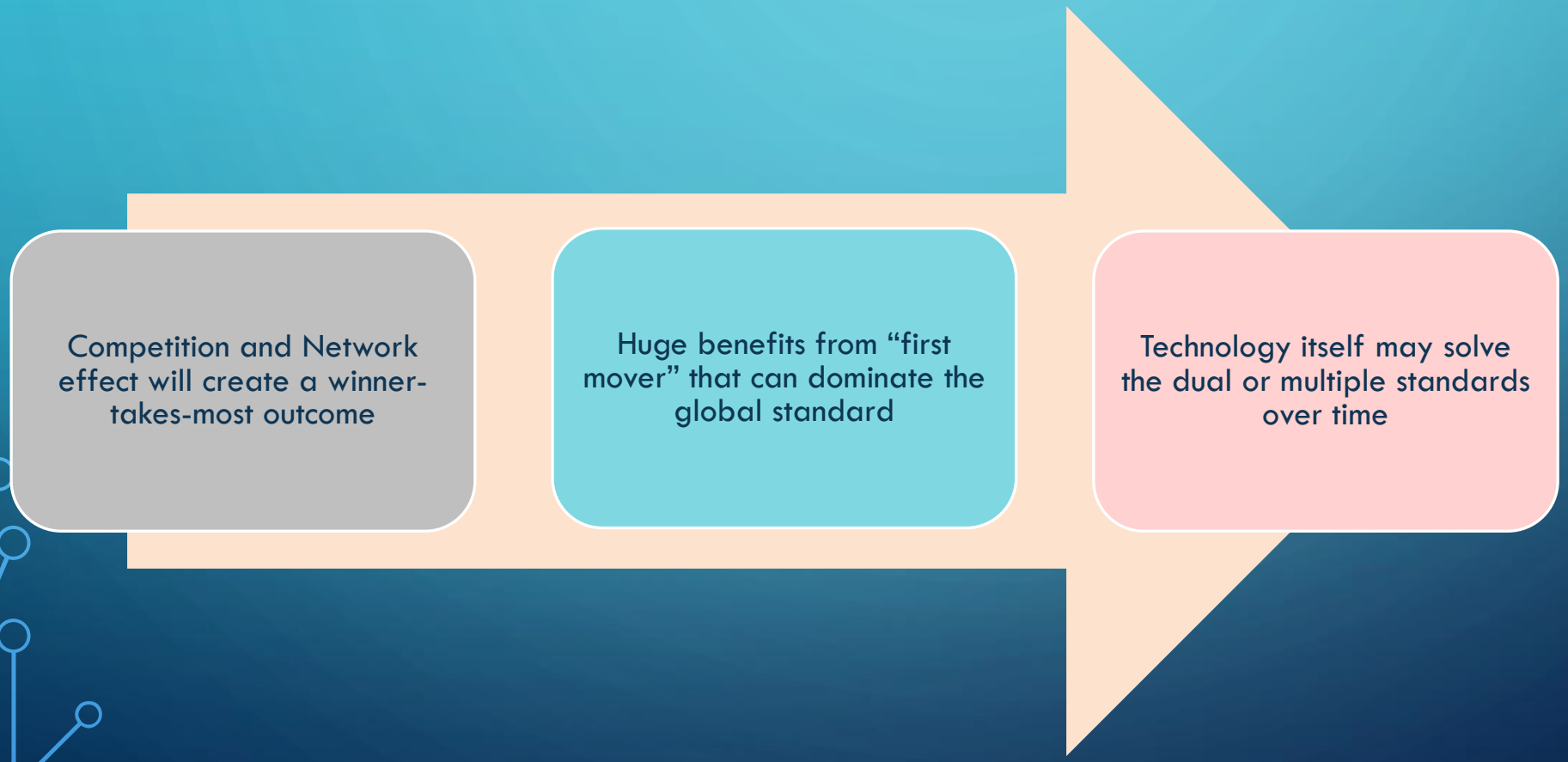
Tech bifurcation => dual or multiple standards in operation; lack of interoperability of devices; no seamless connections

Tech bifurcation can result in the short-run

Effect of bifurcated technology



…BUT TECHNOLOGY BIFURCATION MAY NOT BE THE LONG RUN RESULT



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