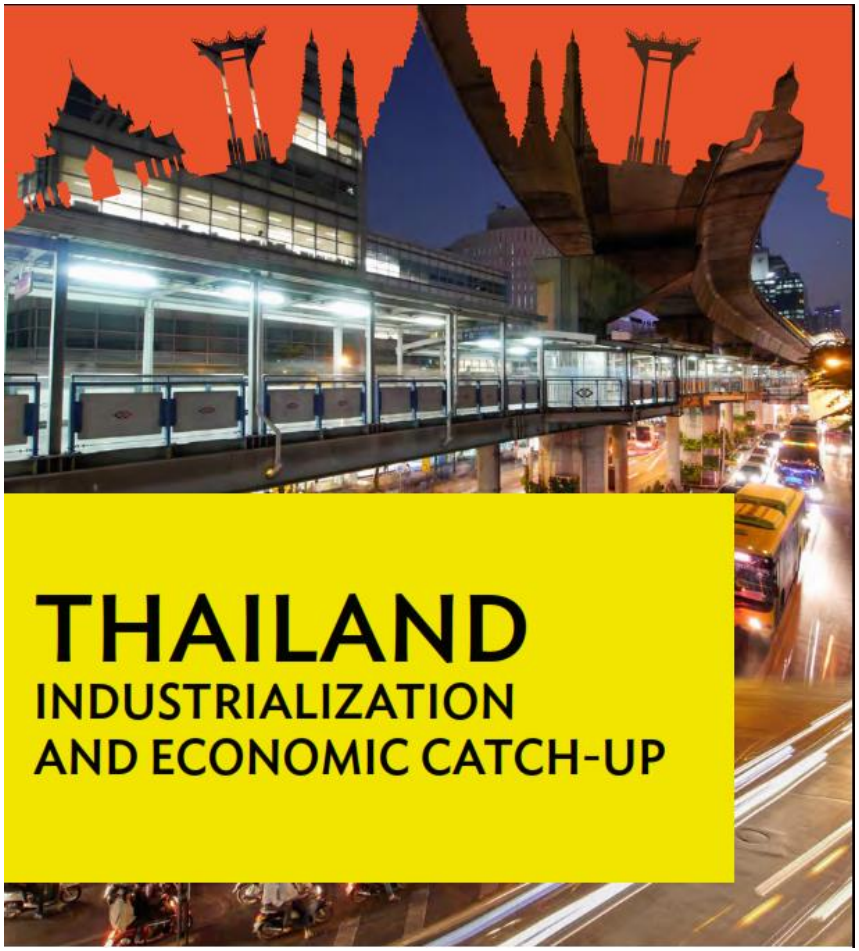
THAILAND: INDUSTRIALIZATION AND ECONOMIC CATCH-UP

ADB's Country Diagnostic Study

EE482 Industrialization: Role of Public and Private Sectors
(Section 046401)
Semester 1 / 2023
Faculty of Economics, Thammasat University



THAILAND
INDUSTRIALIZATION AND ECONOMIC CATCH-UP

COUNTRY DIAGNOSTIC STUDY

ADB ASIAN DEVELOPMENT BANK

1. Overview: Economic Transformation and Industrial upgrade

1. Overview: Economic Transformation and Industrial upgrade

- Thailand has transitioned to an **upper-middle income** country, but **recent economic growth** has **lagged behind** low-and middle-income southeast Asian neighbors.
- Thailand has been a development success story, with sustained growth and impressive poverty reduction, particularly in the **1980s**, when gross domestic product (GDP) **grew 7.8%** a year on average, which was **the second highest** among comparators **after the Republic of Korea**.
- However, this high growth momentum was interrupted by the Asian financial crisis of 1997–1998, followed by the fallout from the global financial crisis of 2008–2009 and the devastating flood in 2011. More recently, during 2011–2014, GDP growth **has slowed to 2.5%** (Table 1.1).

Source: ADB(2015)

Table 1.1: Real GDP Growth Rates, 1971–2014 (%)

Year	Indonesia	Republic of Korea	Malaysia	Philippines	Taipei,China	Thailand	Viet Nam
1971–1980	7.9	9.0	7.8	5.9	7.4	**6.9**	...
1981–1990	6.4	9.7	6.0	1.7	7.6	**7.8**	4.6
1991–2000	4.2	6.5	7.1	2.9	6.2	**4.5**	7.6
2001–2010	5.2	4.4	4.6	4.8	3.9	**4.3**	6.6
2011–2014	5.7	3.0	5.4	5.9	3.0	**2.5**	5.7

Table 1.2: Per Capita Real GDP, 1985–2014 (in 2005 $)

Country	1985	1990	1995	2000	2005	2010	2014
Cambodia	...	...	263	329	471	605	745
Lao PDR	245	262	308	375	472	629	794
Viet Nam	268	301	410	532	699	900	1,078
Indonesia	655	840	1,129	1,086	1,273	1,570	1,866
Philippines	907	1,002	993	1,061	1,201	1,403	1,649
Thailand	**1,047**	**1,572**	**2,280**	**2,206**	**2,690**	**3,164**	**3,451**
Malaysia	2,609	3,147	4,348	4,862	5,554	6,319	7,304
Brunei Darussalam	30,806	26,831	27,294	25,926	25,914	24,589	25,140
Singapore	12,193	16,554	21,651	24,921	29,870	34,758	38,088

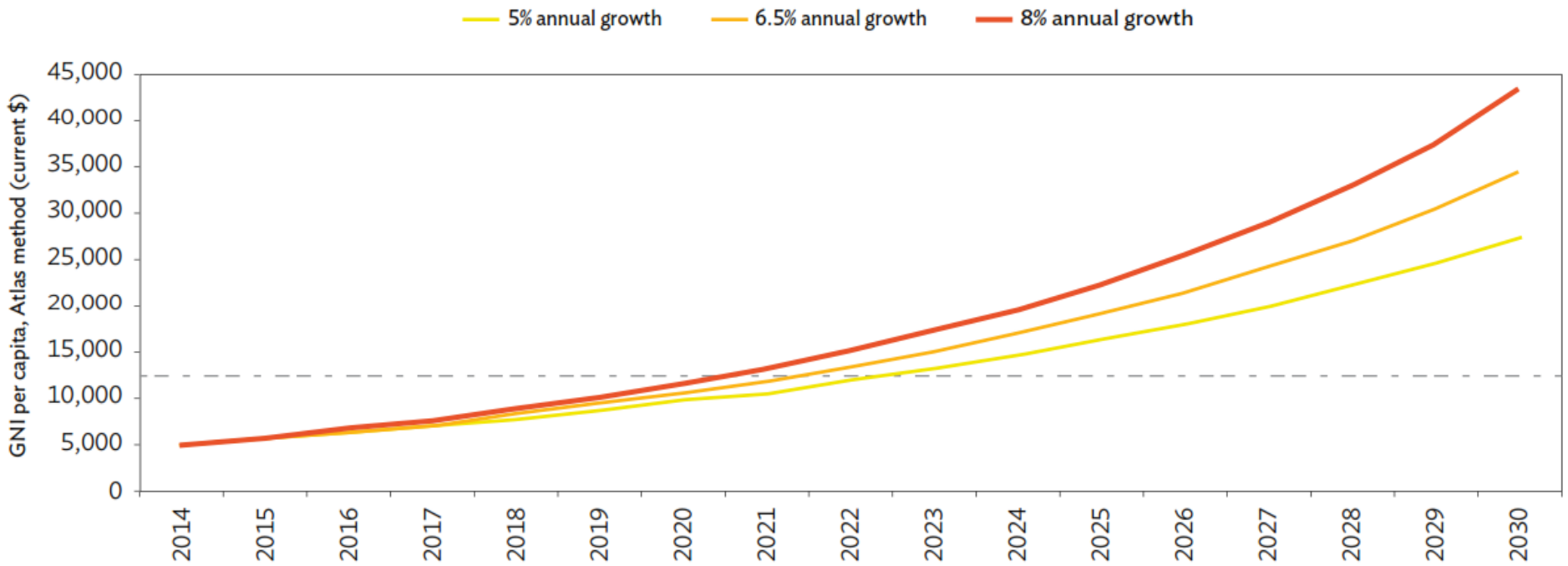
Source: ADB(2015)

1. Overview: Economic Transformation and Industrial upgrade

- Yet, simple projections based on possible growth rates suggest that Thailand has a lot of growing to do.
- Gross national income per capita grew an **average of 2.9%** during 2005–2014. Continuing at that pace, it would **take 11 years, or until 2025**, for **Thailand to become a high-in**come country.
- But with fewer negative shocks, the country could grow faster, at 5% it would take 9 years (by 2023) to reach that income level; at 8%, it would take 7 years (by 2021) (Figure 1.1).

Source: ADB(2015)

Figure 1.1: Thailand's Growth Path at Different Growth Rates, 2014–2030



GNI = gross national income.
Note: Thailand is an upper-middle-income country, with a per capita GNI of $5,340 in 2013 (the threshold for upper middle income is $4,125). The dashed line indicates the threshold for high income (and the upper boundary for upper middle income) at $12,736 per capita GNI. Income thresholds are based on World Bank classifications.

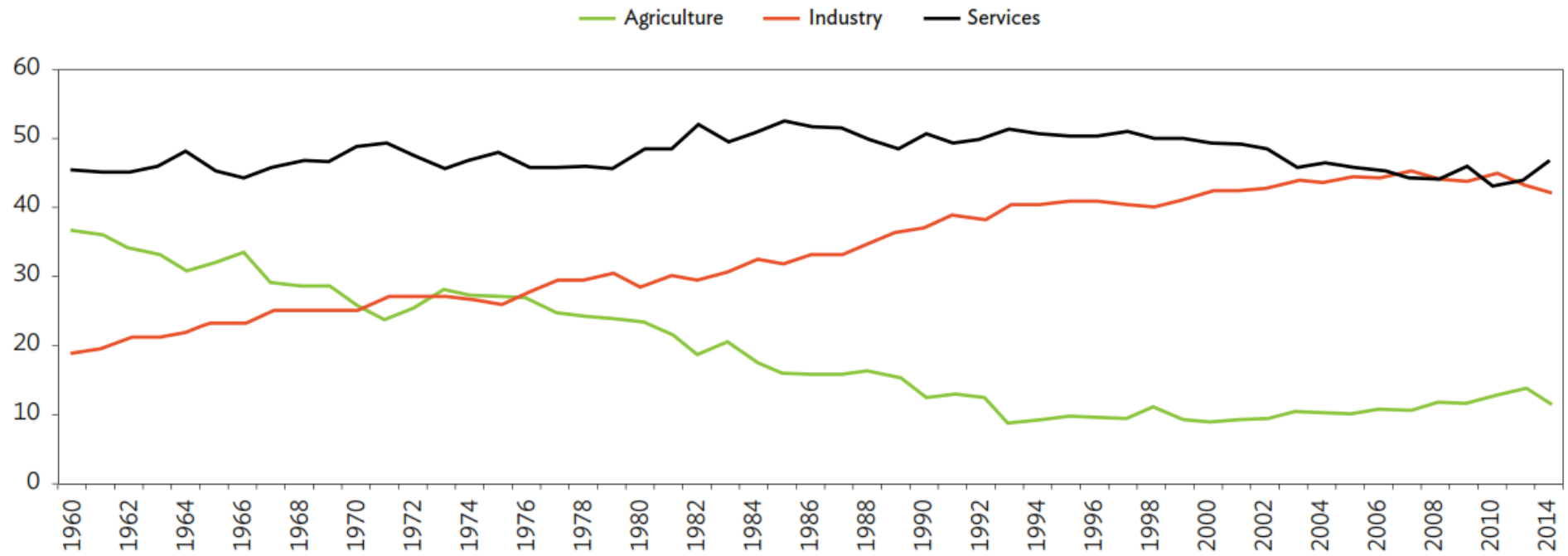
Source: ADB(2015)

1. Overview: Economic Transformation and Industrial upgrade

- The **industry sector** expanded rapidly in the past several decades, accounting for **42% of GDP in 2014**, from 30% in the early 1980s (Figure 1.2).
- Over the same period, **agriculture's share** of output has fallen significantly, from **about 25%** to just over **12%.**
- **Thailand's sectoral shares** are broadly **similar** to those of **other large developing economies** in Southeast Asia, notably Indonesia, Malaysia, the Philippines, and Viet Nam (Figure 1.3).

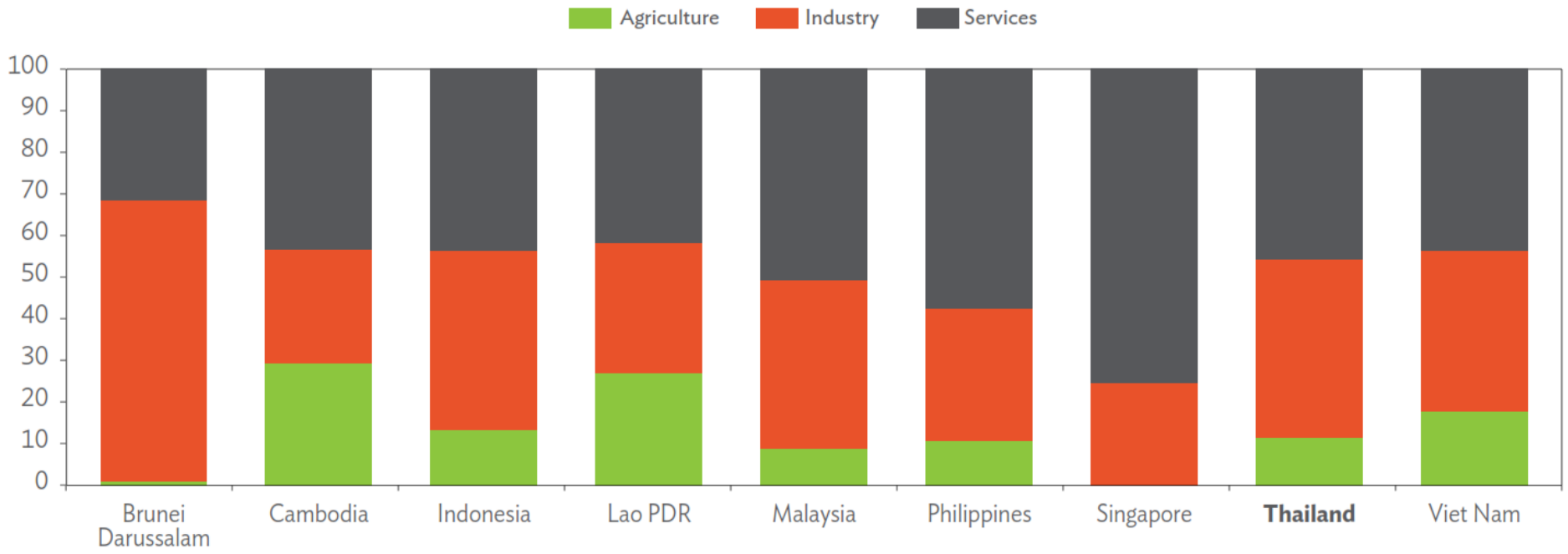
Source: ADB(2015)

Figure 1.2: Sector Shares in GDP, 1960–2014 (%)



Source: ADB(2015)

Figure 1.3: Shares of Major Production Sectors in GDP, 2014 (%)



Source: ADB(2015)

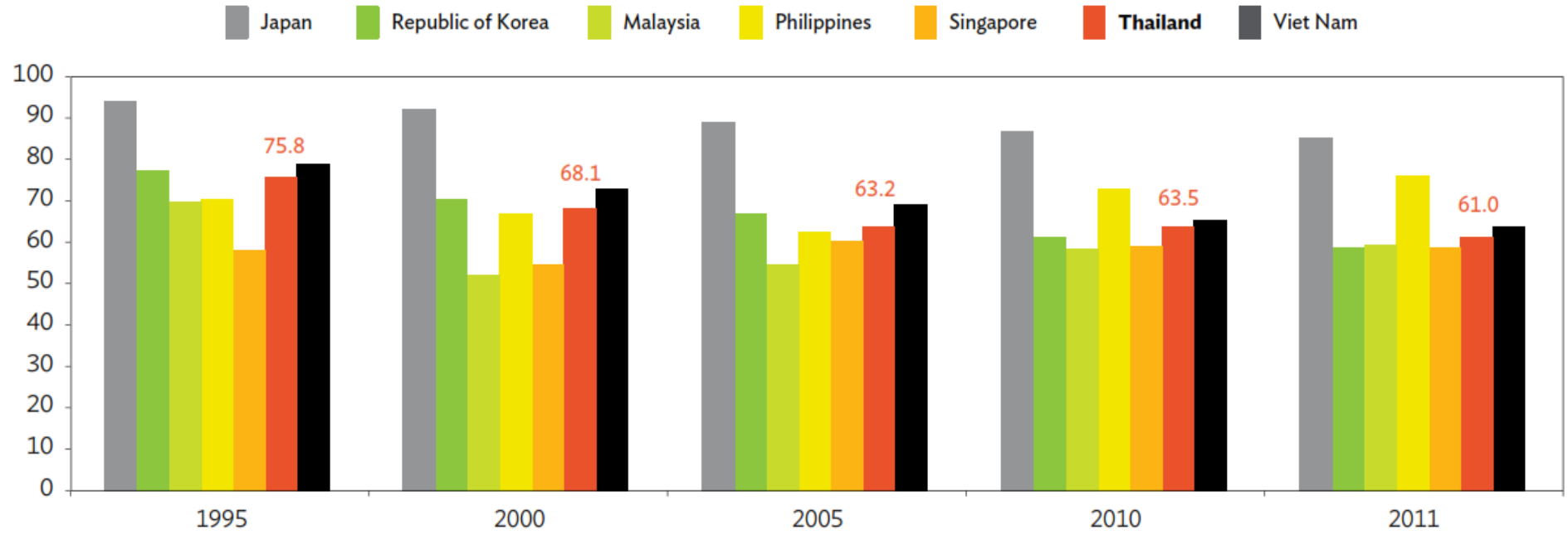
1. Overview: Economic Transformation and Industrial upgrade

- **Enhancing domestic value addition** will have **important implications** for the sustainability of economic growth and employment generation.
- Although until now Thailand has **attracted FDI quite successfully** to **move up the global value chain** and **join the camp of high-income economies**, particularly in export-oriented sectors, it needs to **upgrade industrial sophistication** and **increase domestic value addition** in its exports.
- The domestic-value-added content in total gross exports declined overall during 1995–2011, while the gross exports-to-GDP ratio increased from 33.0% in 1995 to 54.2% by 2011; **domestic value added** in **gross exports** during the same period declined from **75.7%** to **61.0%** (Figure 1.6).

Source: ADB(2015)

Figure 1.6: Domestic Value Added in Gross Exports, Selected Economies, 1995–2011

(% of total exports)



Source: OECD.iLibrary. OECD.Stat. http://www.oecd-ilibrary.org/economics/data/oecd-stat_data-00285-en (accessed August 2015).

Source: ADB(2015)

1. Overview: Economic Transformation and Industrial upgrade

- **Analyzing the disaggregated data gains more insight** into the domestic-value-added content in exports.
- Table 1.7 breaks down the different sectors by domestic value addition, showing that **total manufacturing** and **transport equipment**, along with **basic metals** and **machinery equipment**, are the major sectors **responsible for this decline**.
- This also reflects the **declines in the country's comparative advantage** and competitiveness in these sectors.
- A particular concern associated with this is a **fall in both FDI inflows** and **domestic value addition** after the global financial crisis.

Source: ADB(2015)

Table 1.7: Thailand Domestic Value Added in Exports by Industry, 1995–2011 (%)

Industry	1995	2000	2005	2010	2011
Total	**75.71**	**68.08**	**63.16**	**63.43**	**61.01**
Agriculture, hunting, forestry, and fishing	**90.44**	**86.76**	**83.53**	**83.64**	**81.91**
Mining and quarrying	**89.92**	**89.12**	**84.15**	**84.78**	**82.48**
Total Manufactures	**68.23**	**60.35**	**55.52**	**55.16**	**51.66**
Wood, paper, paper products, printing, and publishing	75.52	75.90	70.28	66.49	61.40
Chemicals and non-metallic mineral products	71.24	64.14	59.32	60.05	55.41
Coke, refined petroleum products, and nuclear fuel	70.44	53.37	38.51	44.02	40.56
Rubber and plastics products	72.76	67.68	64.79	66.05	62.60
Other non-metallic mineral products	74.88	70.69	61.51	65.24	59.90
Basic metals and fabricated metal products	52.94	56.54	43.89	42.46	37.23
Machinery and equipment, nec	51.69	53.28	47.95	51.59	44.38
Electrical and optical equipment	51.40	40.66	39.88	41.68	37.51
Computer, electronic, and optical equipment	51.05	39.09	37.36	39.27	34.75
Electrical machinery and apparatus, nec	52.90	45.87	46.78	50.02	46.58
Transport equipment	51.81	48.75	49.44	50.58	45.12
Electricity, gas, and water supply	**82.54**	**77.39**	**63.23**	**67.21**	**62.49**
Construction	**71.80**	**64.17**	**54.27**	**58.04**	**52.67**
Total Business Sector Services	**88.53**	**84.25**	**80.72**	**82.12**	**80.44**
Transport and storage, post, and telecommunication	83.86	75.18	69.45	71.58	68.96
Community, social, and personal services	**80.15**	**75.72**	**74.74**	**75.00**	**71.30**

...nec = not elsewhere classified.
Source: OECD iLibrary. OECD.Stat. http://www.oecd-ilibrary.org/economics/data/oecd-stat_data-00285-en (accessed August 2015).

Source: ADB(2015)

1. Overview: Economic Transformation and Industrial upgrade

- To strengthen competitiveness, and sustain high and inclusive growth, Thailand needs to develop sectors with **high value-adding activities** and employment generation potential.
- Growth and employment potential therefore depend on how well the country can **diversify into new sectors** and activities and **move up the global value chain into high-value added manufacturing** and, eventually, **high-skill services sectors**.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

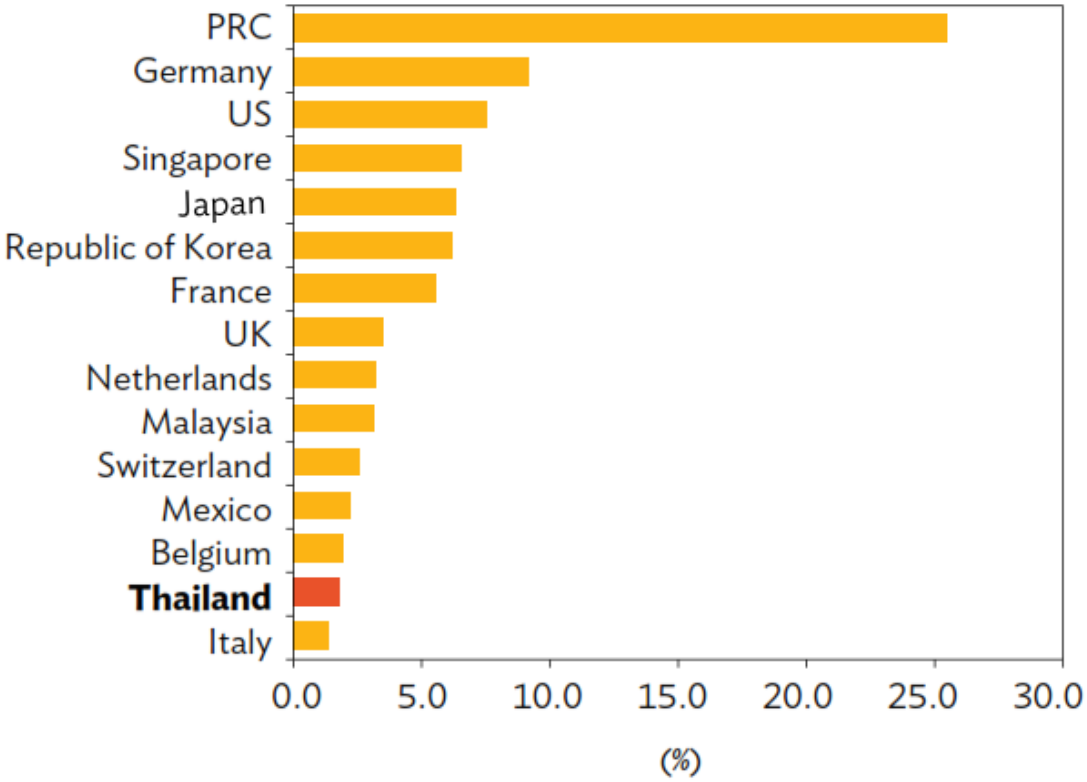
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- **Thailand's reliance on technology lending versus technology transfer**
- Multinational companies, both assemblers and component producers, **have brought leading technologies** into Thailand in the key areas of **electronics and automobiles** (see next section).
- But because it is **acquired through FDI without substantial backward linkages**, this technology **does not constitute technology transfer**—which in the traditional sense means **the acquisition of technology** by **domestic firms**.
- Instead it is **"technological lending"** between the **parent company's headquarters** and its **Thai affiliate.**
- Thailand's technological sophistication is thus related to the extent of technological lending **determined** by those **links of the production network** conducted there.
- In the early years of the auto industry, not only was there **no technology transfer**, but **technological lending** was also **very weak**, as the import of **complete knock-down kits** required only simple assembly activities with low technological requirements.

Source: ADB(2015)

Figure 2.1: Share of Global High-Tech Exports, Top 15 Economies, 2012



PRC = People's Republic of China, UK = United Kingdom, US = United States.
Note: The data indicate a country's total share of world exports in high-tech goods.
Source: World Bank. World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators (accessed on September 2015).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- **Thailand's record in technology acquisition and innovation is complex and uneven.**
- On the one hand, it is a leading producer of **high-tech products**, notably in **automobiles and electronics**.
- It is the **12th largest automobile producer** in the world, specializing in **light trucks**, and is a leading production site for **hard disk drives**.
- The country is thus a **major exporter** of **high-value goods**, **ranking 14th** in the world (Figure 2.1).
- **Multinational firms provide** much of the **technology** for this production, which from the 1980s onward capitalized on Thailand's stable economy, **low-cost workforce**, and **large domestic market** to develop **production clusters**.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Yet, innovation is an area for further improvement; the technology foreign companies provided has **not spilled over to domestic firms**, while the **domestic business** community has **invested** relatively **less in innovation**.
- Research and development (**R&D**) is **weak**, with limited patenting activity.
- The **government has established** a system of innovation through **science parks**, **research grants**, and **public research institutions** covering areas ranging from metallurgy and food processing to nanotechnology and biotechnology, but the **impact of these efforts** is **yet to be seen**.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Gauging the technological level of a country is not easy and is normally done by proxy—by charting the sophistication of goods produced. More advanced technology is needed to make more complex goods.
- While analyzing domestic production is useful, more standardized and detailed production data are provided by exports. Exports data can also provide a measure of competitiveness because goods are competing with those produced by other countries.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- **Export data**, however, may **not clearly represent** the domestic **embeddedness of technology** because

  (i) **technology** to produce exported goods may be **provided by** and **contained** within **foreign-owned firms**; and

  (ii) **sophisticated inputs**, which contribute to export value, may be **imported**.

- Despite these limitations, we first look briefly at **changes in the domestic composition** of production followed by a more **detailed analysis of export data**.

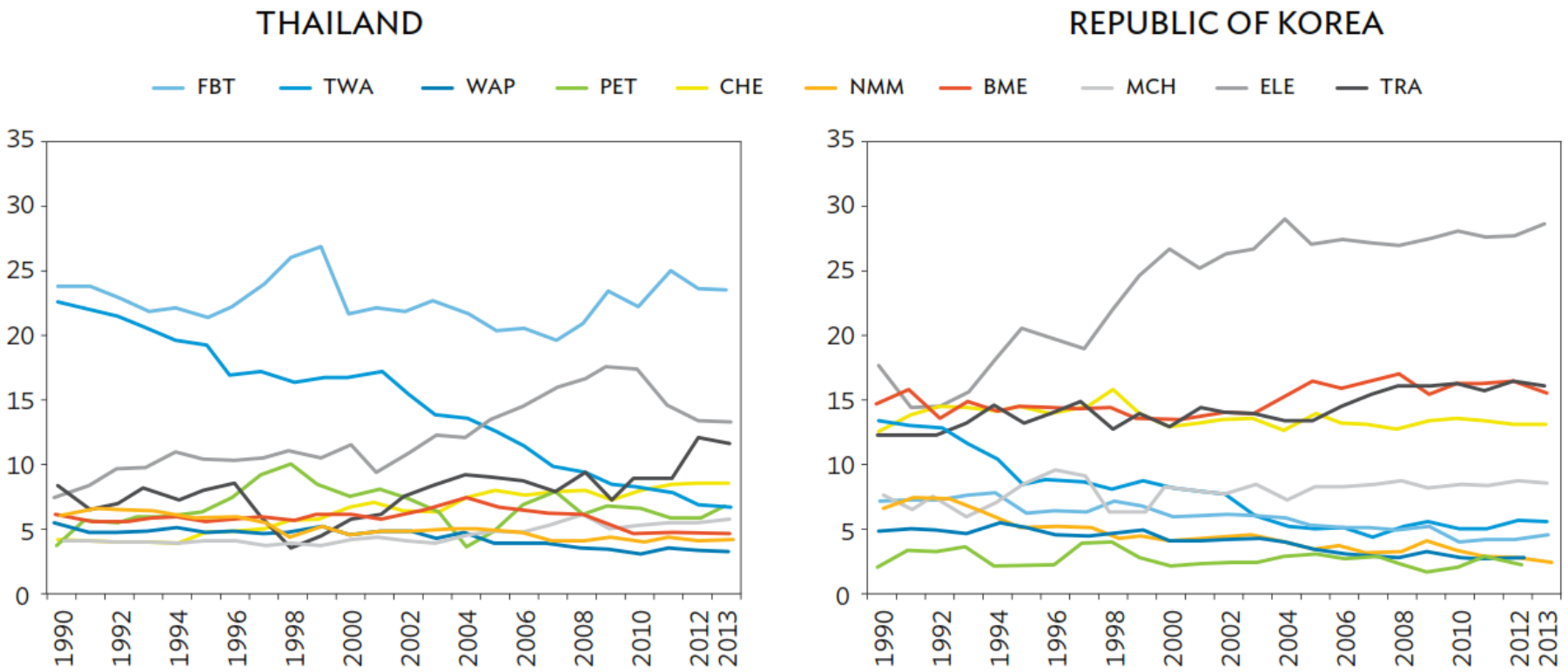
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- **Industrial structure shows a significant shift to more high-value manufactured goods and away from agriculture.**
- The **increased sophistication of production** in Thailand **is confirmed** in the **trend of value-added composition** among manufacturing sectors (Figure 2.2).
- The shares of **labor-intensive sectors** such as **food** and **textiles** have **declined steadily**, while those of more technologically intensive sectors such as electronics and automobiles rose.
- In 2013, food processing accounted for the largest proportion of value added, at about 24% of total manufacturing, followed by electronics (13%), transport (12%), chemical products (9%), and petroleum products (around 7%).

Source: ADB(2015)

Figure 2.2: Value-Added Composition of Manufacturing, Thailand and the Republic of Korea, 1990–2013 (%)



BME = basic metal and metal fabrication; CHE = chemical products; ELE = electrical and electronic products; FBT = food, beverage, and tobacco; MCH = machinery; NMM = non-metallic materials; PET = petroleum and coal products; TRA = transport equipment; TWA = textile and wearing apparel; WAP = wood and paper products.

Sources: For Thailand: National Economic and Social Development Board. Gross Regional and Provincial Product Database. http://eng.nesdb.go.th/Default.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- The share of labor-intensive textile and food industries peaked in the mid-1970s and continued to decline, with less than 5% currently.
- Although this pattern of structural change in manufacturing is not so different from those of other countries, it is worth remarking that the **Republic of Korea** maintained a **high share of textiles until** the **mid-1980s**.
- The share of labor-intensive sectors in the Republic of Korea declined sharply afterward and was replaced by the **rising share of electronics**, **chemical products, and transport equipmen**t.
- Concurrently, Republic of Korea manufacturing in total turned from a **labor-absorbing** to a releasing industry.
- Thus, considering the high share of agricultural labor in Thailand, it may be **premature** for the country to **shed labor-intensive manufacturing**.
- It does appear, however, that the **rise of labor-abundant countries**, such as the **PRC and Viet Nam**, has **squeezed Thailand's manufacturing** into more capital-intensive production.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- The **significant shift** to more **high-value manufactured goods** and away from agriculture and resource based.
- Products is also seen in basic export data, using the Standard International Trade Classification (SITC). The share of agricultural products and raw materials (SITC 1 to 4) declined from 61.4% in 1980 to 18.2% in 2013 (Table 2.1).
- Compared with the **Republic of Korea** and **Taipei,China**, whose exports are already more specialized in manufactured goods and machinery, Thailand is still **active** in **exporting agricultural products**. It is noticeable, however, that the **SITC 7 items** (relatively more sophisticated industrial products) account for **46.8%** in Thailand.
- As the structural change in exports of the **Republic of Korea** and **Taipei,China** shows, export development occurs through **shifting major export items** from **light industries (SITC 6 and 8)** to heavy and more **sophisticated ones (SITC 7)**.
- This could be due to the growth of Thailand's export industries through the **expansion of the global production network** on one hand and **the decli**ne of **textiles** and **consumer nondurables** through competitive **pressure from low wage economies** on the other.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- This conjecture is confirmed if we trace the **share of the garments**, a representative labor-intensive product that usually **accounts for the largest share** in manufactured items at the **initial stage of export development**.
- Garments accounted for about 9.2% and was a top export category in total exports of Thailand in 1990, but its share decreased to 5.9% by 2000 (Table 2.2).
- However, in 10 years it lost its **top place to road vehicles**, **office machines**, and **electronic products** and disappeared from the list of **the top 10 exports** in 2013.
- In comparison, apparel remained the number one export item in 1970–1990 in the **Republic of Korea**, where **labor-intensive light industries** accounted for more than **50% of total exports** until the **mid-1980s.**

Source: ADB(2015)

Table 2.1: Export Shares, 1980 and 2013 (%)

SITC Description	Thailand		Republic of Korea		Taipei,China	
	1980	2013	1980	2013	1980	2013
Food, beverages, and tobacco (0,1)	44.0	11.9	7.1	1.0	9.7	0.8
Crude materials and animal oils (2,4)	17.4	6.3	2.1	1.3	2.0	1.1
Mineral fuels (3)	0.1	1.2	0.5	0.9	0.6	0.2
Chemicals (5)	1.2	10.6	3.4	12.2	3.0	10.6
Manufactured goods and miscellaneous articles (6,8)	31.4	21.3	70.3	22.5	60.4	29.4
Machinery and transport equipment (7)	5.6	46.8	15.8	60.9	23.8	63.6
Unclassified (9)	0.3	1.9	0.7	1.1	0.5	1.2

SITC = Standard International Trade Classification.
Note: The items are aggregated into 1-digit level based from the 4-digit levels of the SITC revision 2.
Source: Estimates using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Table 2.2: Share of the Top 10 Export Items in Total Exports in Thailand, 1990, 2000, and 2013 (%)

1990		2000		2013	
Seafood	10.4	Office machines	15.1	Road vehicles	11.5
Garments	9.2	Electrical machinery	13.8	Office machines	11.4
Other manufactures	7.7	Telecommunications, etc.	6.8	Electrical machinery	10.9
Electrical machinery	7.0	Seafood	6.1	Telecommunications, etc.	5.0
Office machines	6.8	Garments	5.9	General machinery	4.9
Vegetables and fruit	6.7	Other manufactures	4.4	Artificial resins and plastic	4.7
Non-metallic minerals	5.1	Road vehicles	3.3	Crude rubber	4.0
Cereals	4.7	Non-metallic minerals	3.2	Other manufactures	3.9
Telecommunications, etc.	4.4	General machinery	3.2	Rubber products	3.3
Crude rubber	4.3	Artificial resins and plastic	3.1	Seafood	3.0

Source: Estimates using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

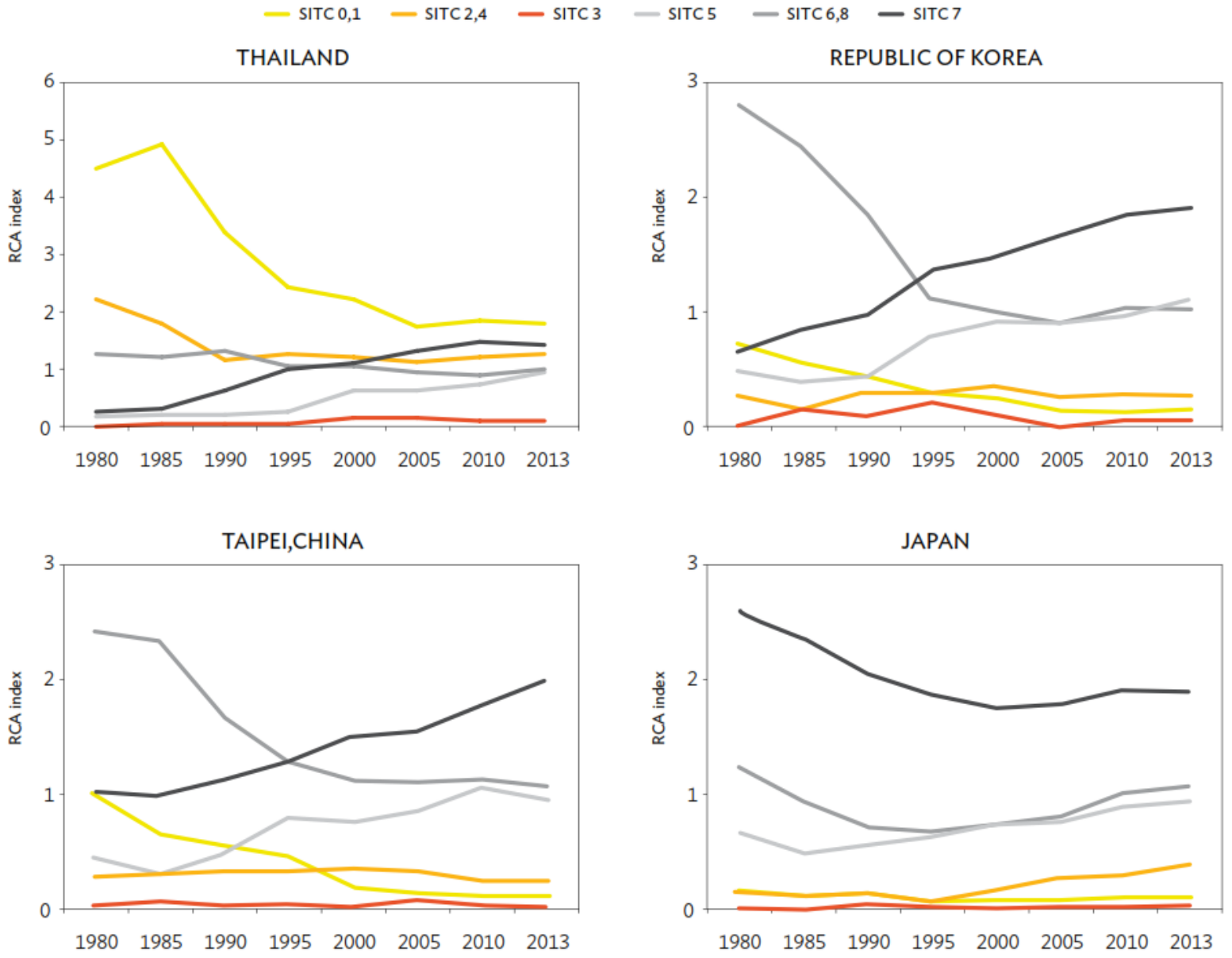
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- The trend of revealed comparative advantage (RCA) tells the same story about Thailand's export structure (Figure 2.3).
- The experience in **East Asia** shows that the **typical pattern of export development** from **labor-intensive light industries** comes with a sharp decline of **agricultural products** or **crude materials**, and then **moves to more sophisticated goods**.
- It might be noted, however, that even **Japan maintained** the comparative advantage in the **SITC 6 and 8 i**tems **until the mid1980s**.
- The **Republic of Korea** and **Taipei,China** had **maintained** the comparative advantage of these items **until the mid-1990s.**
- Compared with these three countries, **Thailand's export** development in terms of RCA started in the 1980s, but **skipped the period of rapid expansion** of exports in **SITC 6 and 8** items that these other countries went through.

Source: ADB(2015)

Figure 2.3: The Trend of Revealed Comparative Advantage, Selected Economies, 1980–2013



Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Another characteristic of Thailand is **the rise of SITC 7** items triggered by **foreign-invested enterprises**.
- The RCA of the 2-digit-level items in **SITC 7** shows that Thailand has **strong comparative advantage** in **office machines** and **road vehicles**.
- **Japan** has **comparative advantage** in most of the items in **SITC 7**, except for office machines and other transport equipment.
- The **Republic of Korea** has strong comparative advantage in **SITC 76 and 77** items due to its competitive **mobile phone** and **household appliances** industries (Table 2.3).

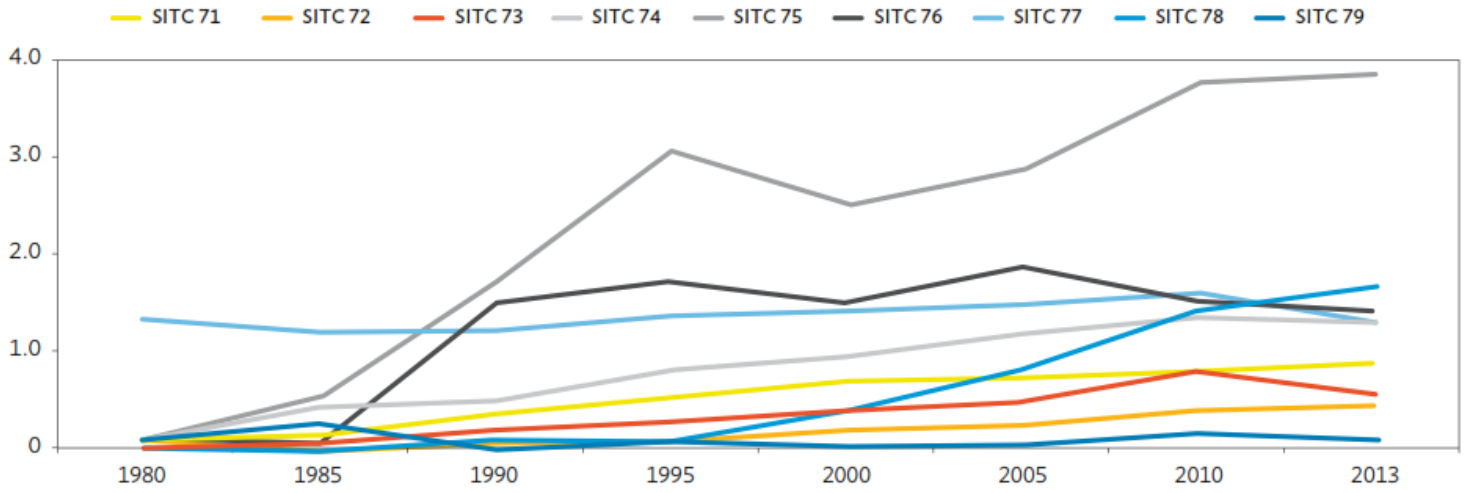
Source: ADB(2015)

Table 2.3: Revealed Comparative Advantage of SITC 7 Exports in 2013

SITC Code	Commodity Classification	Thailand	Republic of Korea	Japan
71	Power-generating machinery and equipment	0.86	0.79	1.97
72	Machinery specialized for particular industries	0.39	1.38	2.85
73	Metalworking machinery	0.58	1.58	4.68
74	General industrial machinery and equipment	1.35	1.14	1.74
75	Office machines and automatic data processing equipment	3.84	0.92	0.54
76	Telecommunications, sound recording, and reproducing equipment	1.35	2.80	0.89
77	Electric machinery, apparatus, and appliances	1.29	2.88	1.74
78	Road vehicles	1.62	1.67	2.99
79	Other transport equipment	0.06	1.15	0.70

SITC = Standard International Trade Classification.
Note: The items are aggregated into 2-digit levels based from 4-digit levels in SITC revision 2.
Source: Estimates using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Figure 2.4: Trend of Thailand's Revealed Comparative Advantage of SITC 7 Exports, 1980–2013



SITC = Standard International Trade Classification.
Note: Commodity classification of SITC 71–79 provided in Table 2.3.
Source: Estimates using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Among items in SITC 7 of Thailand, **office machines** including **hard disks (SITC 75)** and **road vehicles** including **pickup trucks (SITC 78)** rose rapidly in terms of RCA (Figure 2.4).
- It is noticeable that the **RCA** of general industrial machinery and equipment exports is **steadily rising**.
- The trend of export development, along with the rising income level of countries, indicates that the **expansion of export volume** and the **diversification** into new items in **SITC 7** items are a **natural way** for Thailand to increase the role of manufacturing in production and employment.
- The question is **where the potential is** and **how to realize it**.

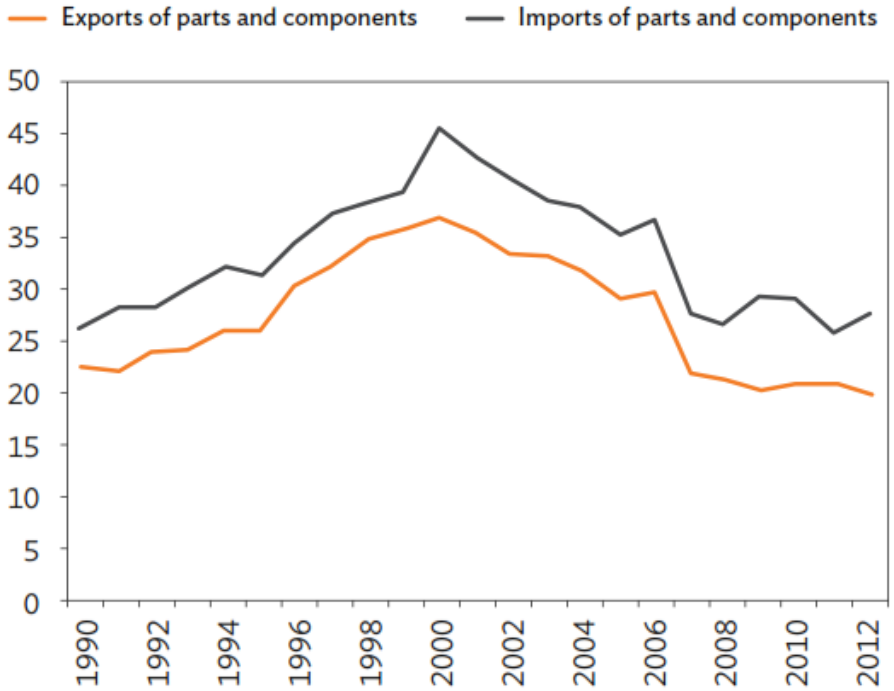
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Within the manufacturing sector, evidence shows that Thailand has **upgraded** from **exporting parts** and **components** to **higher-value final products**.
- Figures 2.5 and 2.6 show the evolution of parts and components vis-à-vis final goods as a share of trade in manufactured goods.
- In the 1990s, as Thailand was setting up its automotive and electronics assembly industries, **parts and components increased** as a share of exports, peaking in the early 2000s.
- However, the share of **parts and components** started to **fall again** in the late 2000s as the country's manufacturing **industry upgraded** to **higher-value final products**.

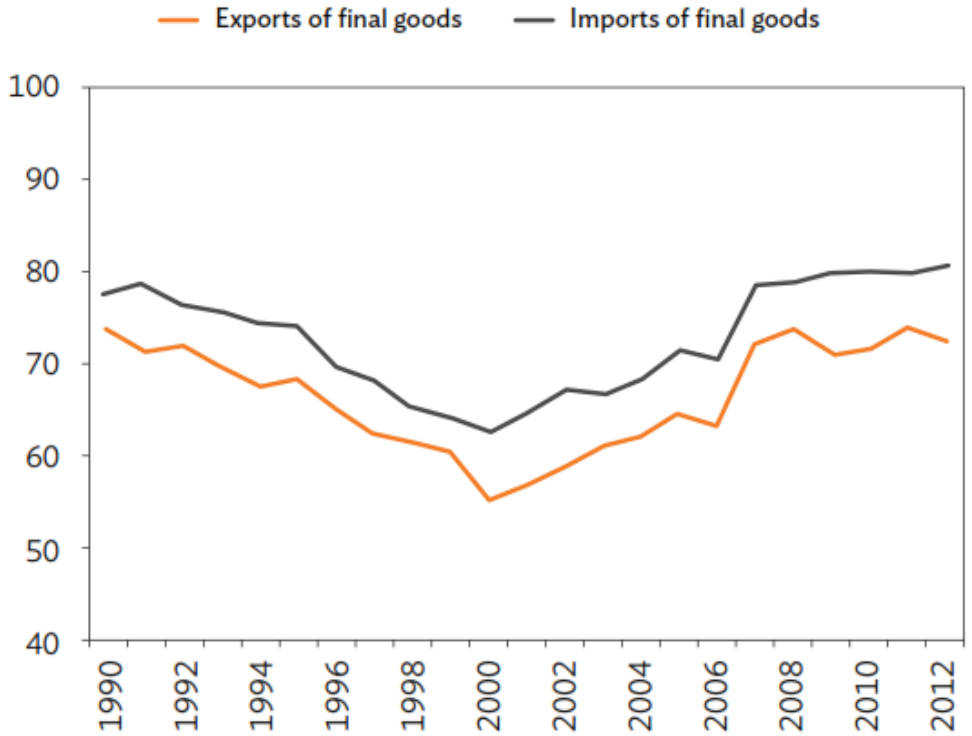
Source: ADB(2015)

Figure 2.5: Share of Parts and Components in Total Manufactured Exports and Imports in Thailand, 1990-2012 (%)



Note: Parts and components using SITC Revision 3 are defined by P. Athukorala and A. Kohpaiboon. 2009. Intra-Regional Trade in East Asia: The Decoupling Fallacy, Crisis, and Policy Challenges. *ADBI Working Paper Series No. 177.* Tokyo: Asian Development Bank Institute.
Source: Estimates using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Figure 2.6: Share of Final Manufactured in Total Manufactured Exports and Imports in Thailand, 1990-2012 (%)



Note: Final manufactured goods are computed as total manufactured goods less parts and components.
Source: Estimates using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- The overall **sophistication of an economy** is **not easy to measure**. But recently **some researchers developed techniques** based on detailed export data to create **aggregate indicators** that **proxy** for a particular country's productive capabilities.
- Briefly speaking, these indicators **measure** the **sophistication** of individual products based on the income level of countries that are successful in exporting them. The underlying assumption is that **higher-income countries export more technically advanced and sophisticated goods**.
- First, one can estimate a product's sophistication. The **sophistication level of products (PRODY) index** is the **average exporting countries' gross domestic product per capita weighted by each country's revealed comparative advantage** for the exported commodity.
- Second, one can estimate an **aggregate PRODY index** for the **export basket** of a particular country. This is the **weighted sum of the PRODY values** of all the products that a country exports, with the weights being the share of each commodity in the country's total exports.
- This **aggregate sophistication score** can offer **insights** into the country's productive capabilities. A **higher score** indicates that the country has **acquired complex capabilities** that make it easier to **export sophisticated products**.

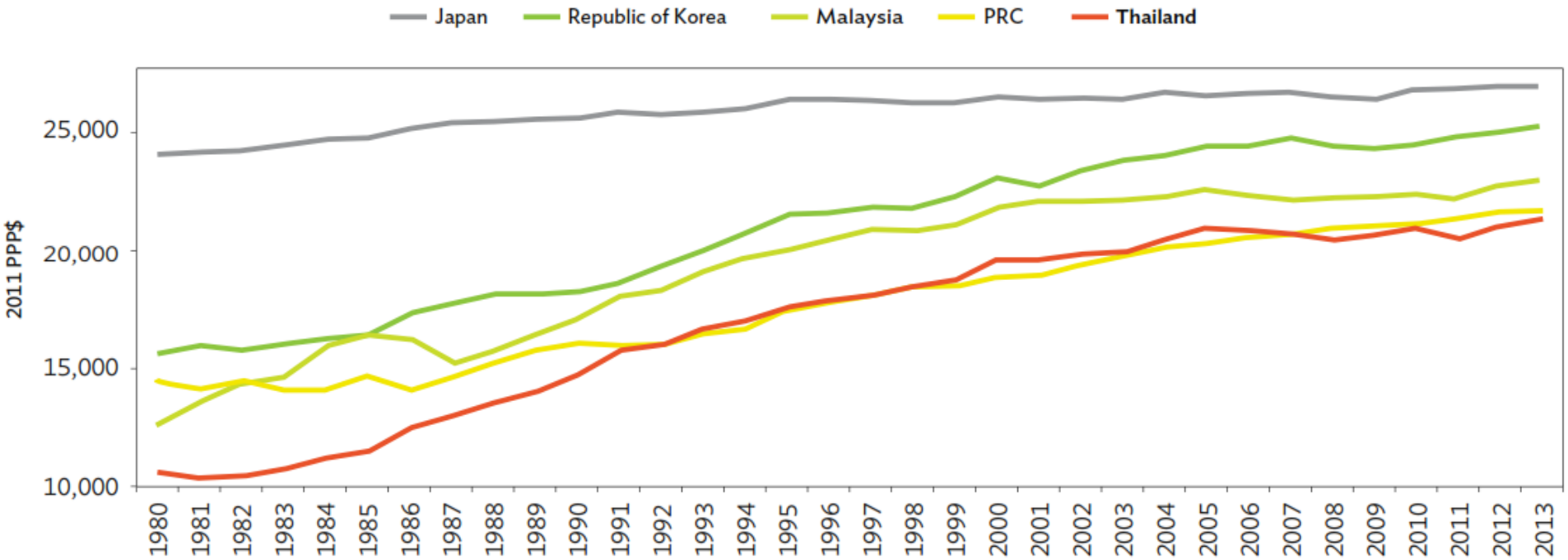
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Thailand's **export sophistication** has been **steadily increasing** since the 1980s; however, in the mid-2000s, this increase **started to taper off**, likely due to **stiffer competition** from **the PRC** combined with a glut in demand from advanced economies due to the global financial crisis (Figure 2.7).
- In fact, Thailand's **export sophistication** started **declining from 2008 onward**, though from 2013 it has been very slowly catching up with the PRC's again.
- The **PRC's sophistication** nonetheless also **continued to increase** in the same period, indicating that Thailand **may have lost some ground** to that country's **lower costs of production** and **scale economies** during this period.
- The majority of Thailand's exports **remain** technically **less sophisticated** than other **middle- and high-income Asian economies**.

Source: ADB(2015)

Figure 2.7: Sophistication of Export Baskets in Selected Countries, 1980–2013



PPP = purchasing power parity, PRC = People's Republic of China.
Note: Figures represent trends in the (PRODY) index.
Source: Estimates using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Despite an increase in overall export sophistication, its exports are still **focused on** relatively **less sophisticated manufactured goods**.
- More than **60%** of Thailand's exports are **in groups 3, 4,** and **5** of the PRODY index, similar to the PRC, but **less sophisticated than Malaysia** (Figure 2.8).
- In the case of Malaysia, **57%** of its exports belong to **highly sophisticated categories** and fall under groups 1 and 2.
- Since 1980, however, Thailand's share of exports of more sophisticated goods (groups 1 and 2) has more than quadrupled (Figure 2.9).
- Likewise, the trade deficit in sophisticated goods has narrowed significantly (Figure 2.10).
- Overall, these findings suggest Thailand **has gone a long way** in **increasing its technological sophistication**, as indicated by its exports.
- In fact, its pace of **structural transformation** in **technological sophistication** seems even **faster** than that of the **Republic of Korea**.

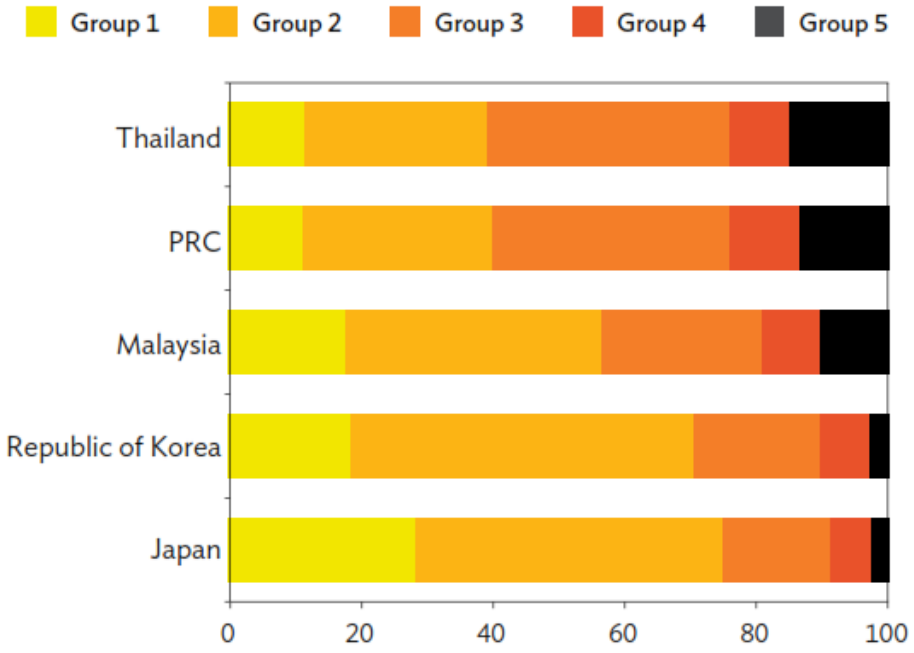
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- However, the data also indicate that Thailand is **struggling to compete** with its large northern neighbor**, the PRC,** which still has **the advantage of scale**.
- Thailand has been **diversifying exports since 1980**, but **plenty more opportunities to do so** exist when **compared with** other East Asian countries, especially **Japan** and the **Republic of Korea**.
- **Japan** is the **most diversified** among five countries in Figure 2.11.
- **Export diversification** is **an indicator** of **technological competitiveness**—a country that **utilizes technology efficiently** will be able to **maintain its competitiveness** in international trade.
- One measure of export diversification and competitiveness is the **number of commodities** with **1% of world market share**, which has about **tripled for Thailand** since 1980, particularly rapidly between **1985 and 1995**.

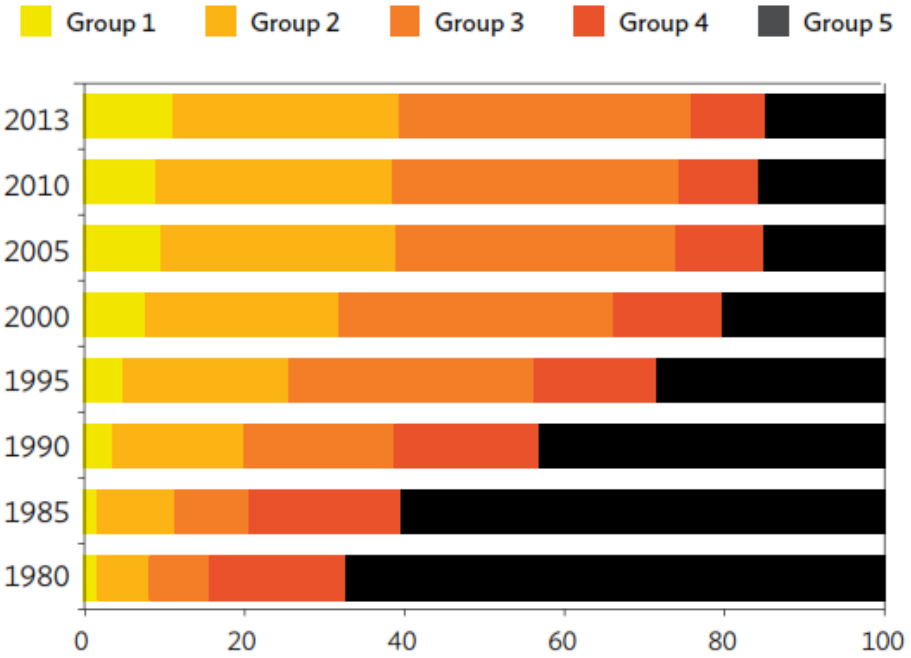
Source: ADB(2015)

Figure 2.8: Disaggregation of Exports by Technological Sophistication Group, Selected Economies, 2013 (% of total)



PRC = People's Republic of China.
Note: Groups are based on quintiles of sophistication level of products (PRODY). Group 1 = PRODY ≥ 28,900; Group 2 = 28,900 > PRODY ≥ 23,100; Group 3 = 23,100 > PRODY ≥ 17,600; Group 4 = 17,600 > PRODY ≥ 10,730; and Group 5 = PRODY < 10,730.
Source: Calculations using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

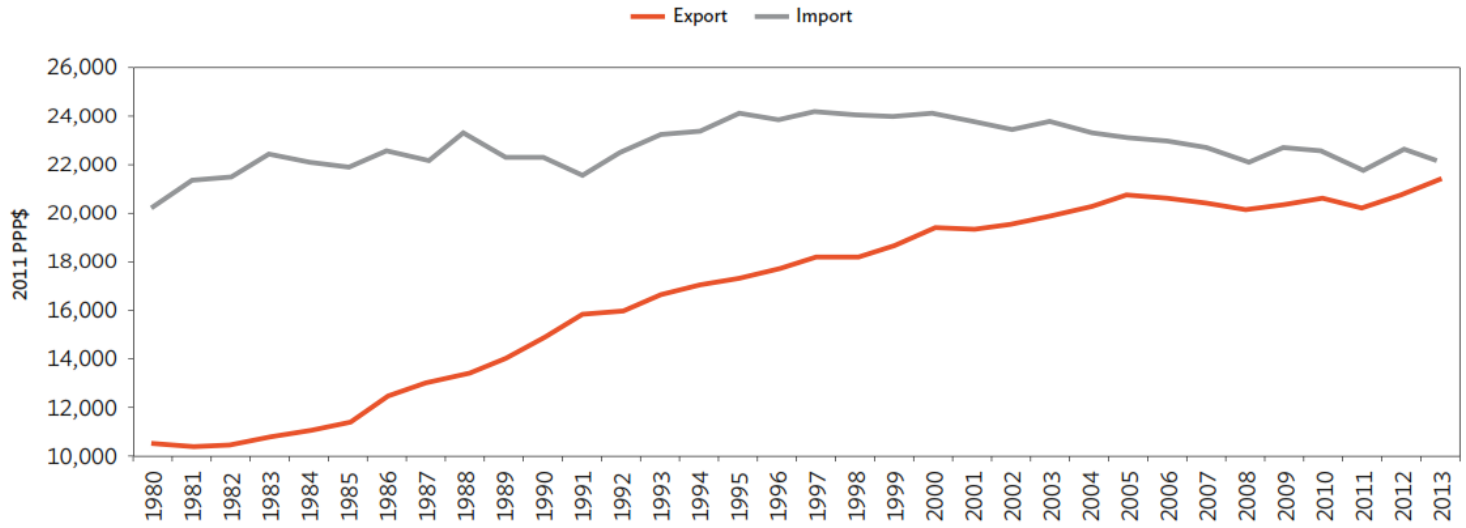
Figure 2.9: Disaggregation of Exports by Technological Sophistication Group, Thailand, 1980–2013 (% of total)



Note: Groups are based on quintiles of sophistication level of products (PRODY). Group 1 = PRODY ≥ 28,900; Group 2 = 28,900 > PRODY ≥ 23,100; Group 3 = 23,100 > PRODY ≥ 17,600; Group 4 = 17,600 > PRODY ≥ 10,730; and Group 5 = PRODY < 10,730.
Source: Calculations using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

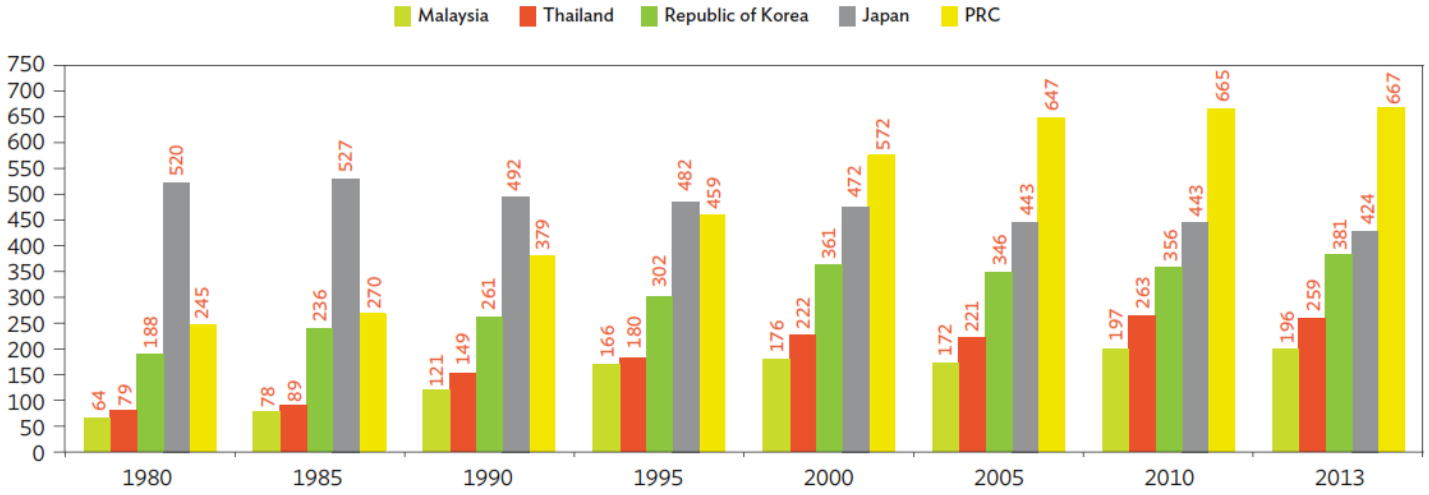
Source: ADB(2015)

Figure 2.10: Technical Sophistication of Export and Import Baskets in Thailand, 1980–2013



PPP = purchasing power parity.
Source: Calculations using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Figure 2.11: Number of Commodities with More Than 1% World Market Share, Selected Economies , 1980-2013



PRC = People's Republic of China.
Source: Calculations using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- In the degree of export diversification by commodity group (Table 2.4), Thailand is most **diversified in food and animals** (SITC 0).
- But there are **significant gaps** between Thailand and the other two countries in the levels of **diversification for manufactured materials** (SITC 6) and **machinery and transport equipment** (SITC 7), which suggest **room for Thailand to expand** into newer export areas.
- In SITC 5 and 8 (which include commodities such as consumer goods of light industries) the country is relatively diversified, although the number of commodities in this area is still significantly **smaller than for Japan** and the **Republic of Korea**.
- **Japan** holds many export products in **SITC 8** that maintain a **competitive edge** in the world market.
- In this respect, **finding niches in traditional industries**, such as chemicals (SITC 5) and the light industries (SITC 6 and 8), is **another important part** of **export diversification**, in addition to entering the capital intensive and high-technology industries in SITC.

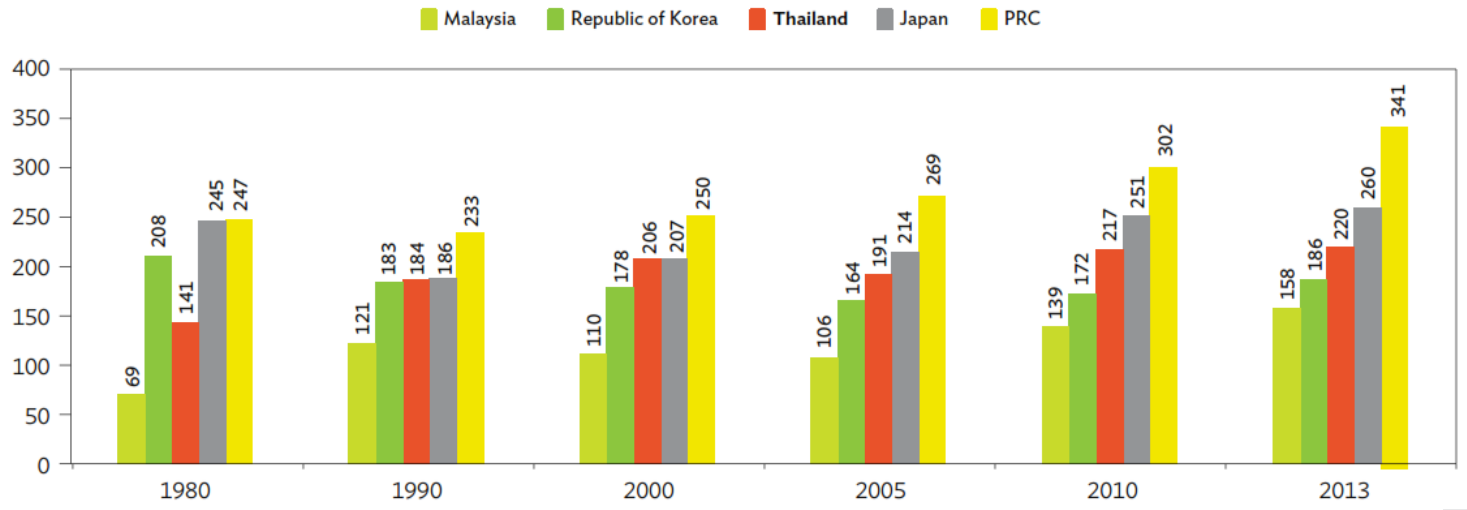
Source: ADB(2015)

Table 2.4: Diversification of Exports by Commodity Group, Selected Economies, 2013

SITC Code	SITC Description	Number of Goods with 1% Global Market Share		
		Japan	Republic of Korea	Thailand
0	Food and animals	8	12	31
1	Beverage and tobacco	1	3	2
2	Crude materials	22	20	23
3	Mineral fuels	9	7	7
4	Animal oils and fats	3	0	5
5	Chemicals	80	63	31
6	Manufactured materials	128	126	78
7	Machinery and transport equipment	126	112	55
8	Miscellaneous manufactured articles	45	36	26
9	Unclassified	2	2	1
	Total	424	381	259

SITC = Standard International Trade Classification.
Note: Commodities are classified at the 4-digit SITC.
Source: Calculations using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Figure 2.12: Product Diversification: Number of Commodities with Comparative Advantage (RCA ≥ 1), Selected Economies, 1980-2013



PRC = People's Republic of China, RCA = revealed comparative advantage.

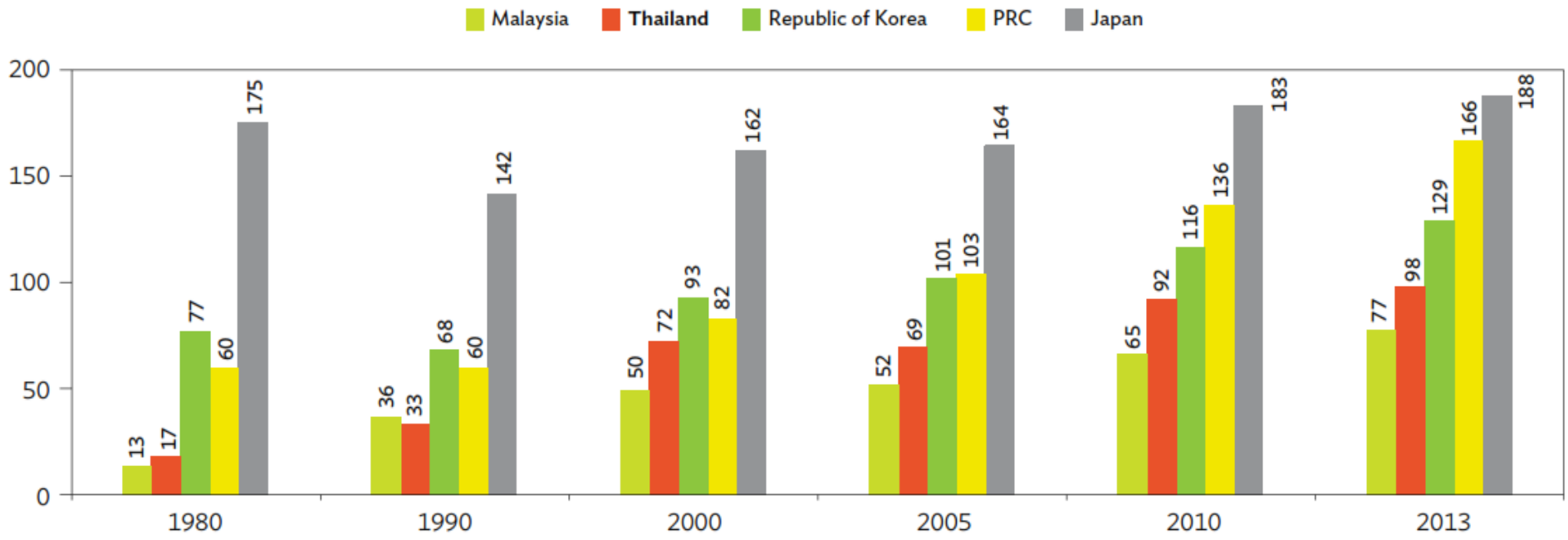
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- A **more precise measure** of diversification and competitiveness is the **number of commodities with RCA**; between 1980 and 2013, Thailand was able to increase the number of these commodities from 141 to 220 (Figure 2.12).
- This lags considerably **behind the PRC** and **Japan**, but is **ahead of Malaysia** and the **Republic of Korea**.
- **Thailand's RCA** in **core products** (machinery, chemical and metallurgy) increased almost **sixfold** between 1980 and 2013, but **remains below** the **PRC**, **Japan**, and the **Republic of Kore**a (Figure 2.13).

Source: ADB(2015)

Figure 2.13: Number of Core Products with Comparative Advantage (RCA ≥ 1), Selected Economies, 1980-2013



PRC = People's Republic of China, RCA = revealed comparative advantage.
Notes: Core products include machinery, chemicals, and metallurgy. Most of these products have high technological sophistication.
Source: Calculations using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2015).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Since that early assembly stage, nonetheless, the country has made **considerable progress**.
- There is little doubt that such technological lending has helped Thailand to industrialize and become a leading exporter of high-tech goods.
- But **technological lending** has its **limitations**.
  - First is whether it creates a type of **enclave industrialization** in which the **country possesses a few high-tech sectors**, but not a high-tech economy.
  - The second is whether the technology will **be "un-lent" or "retracted"** if firms decide to **move to lower-cost destinations**.
  - The third, **Thailand may fail** to engage in many of **the higher-value research** and **design stages** of product development.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- The **first** and **third** concerns are **very real now**.
- The **second** is **starting to be realized**, but probably only for the lower-value segments for the time being, as the Greater Mekong Subregion and ASEAN liberalization and integration processes have gathered pace recently.

Source: ADB(2015)

The Automobile Sector

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- **The automobile sector in Thailand has several characteristics.**
- Thailand has **18 automobile assemblers**, all foreign owned, and **no national car company** (Thailand Board of Investment 2015).
- The **Japanese automobile manufacturers** account for **about half** of the approximately **1.5 million** vehicles produced annually, and about **half** of production is **exported**, with the rest serving the **large domestic market** (Thailand Automotive Institute and Ministry of Industry 2012).
- The **main niche** (about 54% of units produced) is in **pickup trucks** (Tractus Thailand 2014).

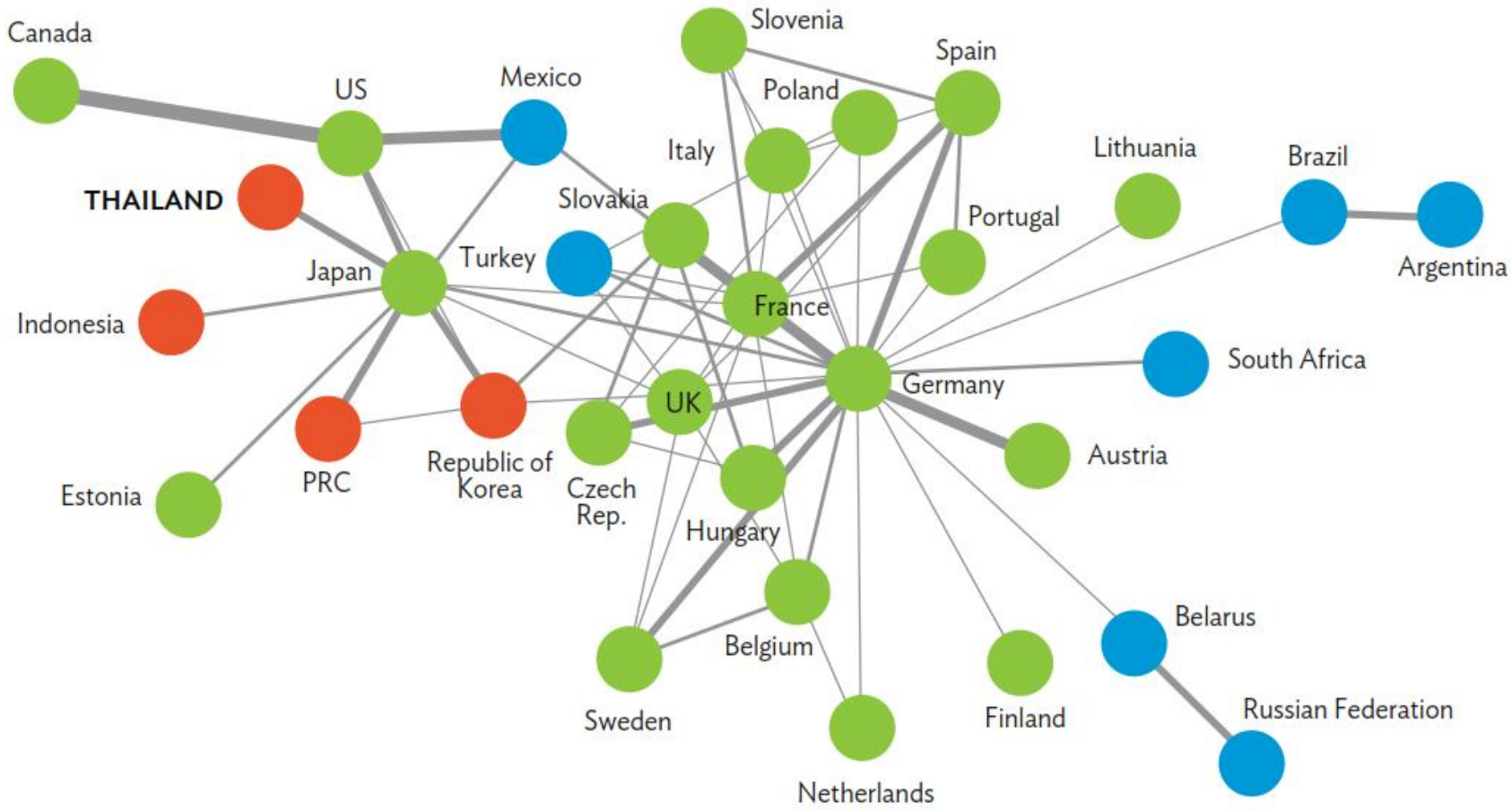
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- The country has also emerged as an **assembling hub** for the multinational global automobile companies, supported by government efforts to promote export industries and FDI.
- The automobile industry uses parts procured outside as well as manufactured within the country.
- This **differs from the electrical/electronics industry**, in which Thailand is both a supplier and **producer** of **parts and components** and **less** of an **assembler of final goods**.
- Figure 2.14, based on Ferrarini (2011), shows the **country's place** in **global and regional production networks** for the automotive industries.
- The **thickness** of the lines represents **the strength** and extent of the **relationships**, with the **connection to Japan**.

Source: ADB(2015)

Figure 2.14: Global Network Trade Index—Automotive Industries



PRC = People's Republic of China, UK = United Kingdom, US = United States.
Source: B. Ferrarini. 2011. Mapping Vertical Trade. *ADB Economics Working Paper Series* No. 263. Manila: Asian Development Bank.

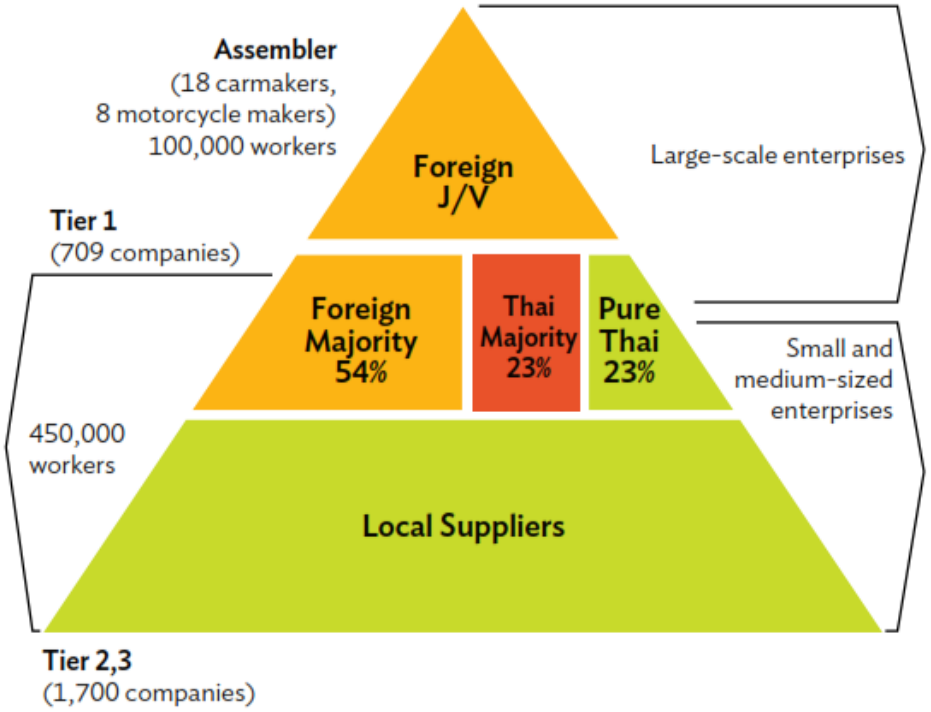
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- As **vehicles** are complex, **multicomponent goods**, the quality and reliability of **suppliers are critical** for the complete product.
- In Thailand, the **Tier 1** auto parts suppliers are **predominantly foreign controlled** or foreign directed (Figure 2.15).
- About **54%** of the almost **709 supplier**s are **foreign-majority joint ventures**, while another 23% are Thai-majority joint ventures, although in these companies the foreign partners still tend to be the **source of technology**, which is **channeled from the parent company**.

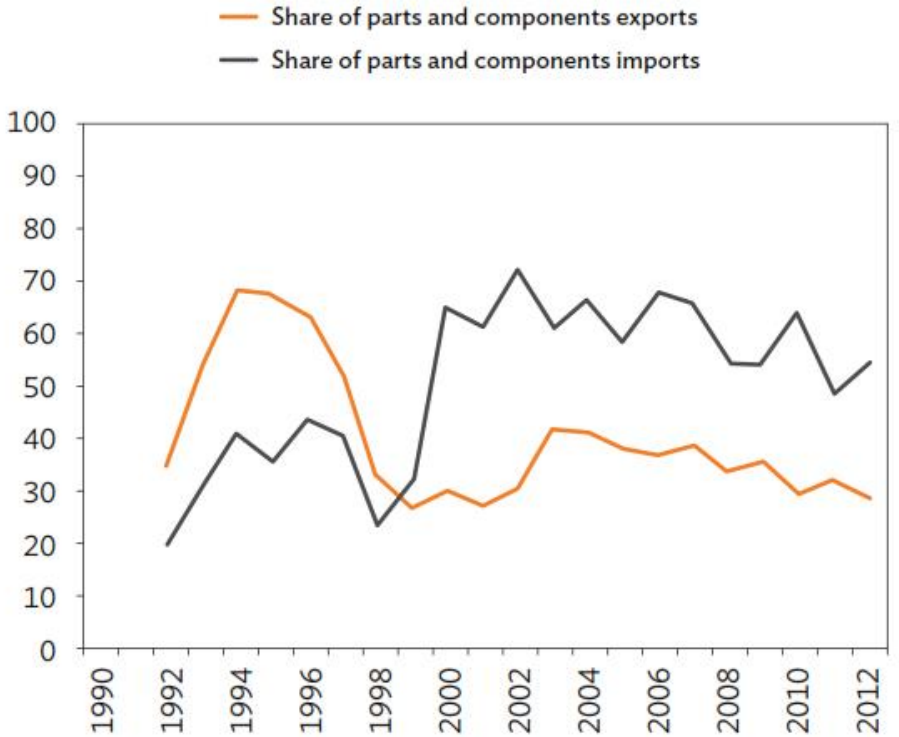
Source: ADB(2015)

Figure 2.15: Structure of Thailand's Automobile Industry in 2014



J/V= joint venture.
Source: Thailand Board of Investment. 2015. Thailand: Global Green Automotive Production Base. http://www.boi.go.th/upload/content/BOI-brochure%202015-automotive-20150325_70298.pdf

Figure 2.16: Share of Parts and Components in Motor Vehicle Exports and Imports



Note: Parts and components for each manufactured product type follow P. Athukorala and A. Kohpaiboon. 2009. Intra-Regional Trade in East Asia: The Decoupling Fallacy, Crisis, and Policy Challenges. *ADBI Working Paper Series* No. 177. Tokyo: ADB Institute.
Source: Estimates using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2013).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- The remaining **23%** are **fully owned Thai firms**, some of which have been able to break through and become **respected Tier-1 suppliers**, such as **AAPICO Hitech** and the **Summit Group**, and have exported to other countries.
- The technologically **less sophisticated Tier-2 companies** that supply basic rough components to Tier-1 firms for further processing are all Thai-owned.
- The nature of Thailand's auto industry is that assemblers prefer to **link with a limited number** of high-quality suppliers **located in the same or near their industrial parks**.
- Product development tends to be a **top-down system** in which suppliers seek to satisfy the requests for the assembler or a higher-tier supplier, resulting in relatively **little joint development** or **within-firm innovation**.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- As a result, **research and development** in the sector **is very limited** and assemblers or **higher-tier foreign firms** make **little attempt** to **share or develop** the **technological capacity of local firms**.
- There is **technological lending**, but **little technological transfer**.
- This **lack of indigenous technological capacity** is well recognized and **various supplier-linkage programs** have been promoted to **integrate domestic firms with foreign-controlled producers**.
- These programs were begun in the early 1990s and applied to the automobile sector, but they have generally been **unsuccessful.**
- They include the Industrial Linkages Development Program (1991), National Suppliers Development Program (1994), and 1995 Master Plan for the Development of Supporting Industries (with the Japan International Cooperation Agency).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- More recently, partnerships between the sector and the Ministry of Industry established the **Thailand Automotive Institute** supporting **human resources development** and the **transfer of technology** to develop Thai-owned suppliers.
- The institute had a major role in formulating the Thailand Automotive Sector Master Plan (2007–2011), which also focused on human resources and technology transfer to domestic firms.
- Under its framework, the Thailand Automotive Human Resources Development Program (2006–2010) was initiated with a lead role by Japanese producers Denso, Honda, Nissan, and Toyota.
- It aimed to improve the quality, cost, and delivery performance of Thai-owned component suppliers through human resources development, although **the impacts** of this program are **not yet clear**.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Over time, the Thai automotive industry seems to have **upgraded from exporting parts and components** to **exporting finished goods**.
- In the 1990s, the country was mainly exporting parts and components, suggesting a place on the relatively lower rungs of the automotive industry value chain (Figure 2.16).
- But in the 2000s, the share of parts and components in motor vehicle exports decreased and the share of completely built- up auto mobile exports increased.
- Likewise, the share of **imports** of **motor vehicle parts and components increased** during this period.
- These findings indicate that, since starting in the 2000s, Thailand has been **importing motor vehicle parts** and **assembling them** into built-up automobiles for **export**.

Source: ADB(2015)

The Electronics Sector

Source: ADB(2015)

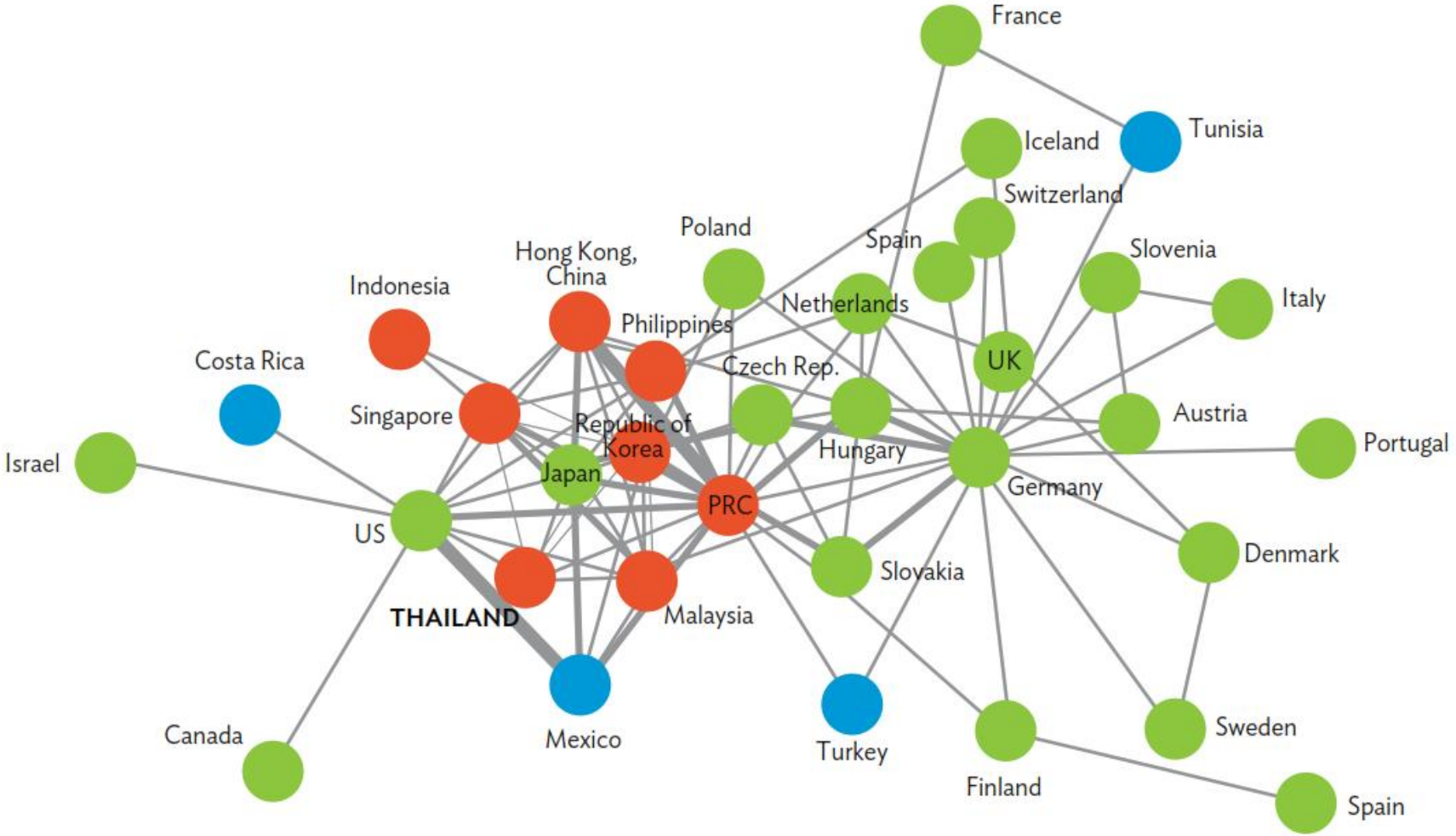
2. Technological Progress: Limited International Technology Transfer

- **Thailand's electronics sector has similarities to the automobile sector**

  - **Foreign dominance** in the development of the electronics industry is **similar to the auto industry**, in that they **have provided the technology** for advanced production in Thailand.
  - Electronic products are also **complex, multicomponent goods** that provide considerable opportunity for structuring along **regional and global production networks** (Figure 2.17), as well as the inclusion of **domestic component suppliers**.
  - In electronics, similar to the automotive industries, **Thailand is integrated with regional production processes**. This time, the linkages are clear, with **the PRC** and **Japan**, and to a lesser extent with the Republic of Korea, Malaysia, Singapore, and the United States.
  - Thailand has been able to **increase the complexity** of the tasks for electronics over the past 3 decades as **more technology has been "lent"** through **intra-firm channels**.

Source: ADB(2015)

Figure 2.17: Global Network Trade Index—Electric/Electronics Industries



PRC = People's Republic of China, UK = United Kingdom, US = United States.
Source: B. Ferrarini 2011. Mapping Vertical Trade. *ADB Economics Working Paper Series*. No. 263. Manila: Asian Development Bank.

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- The higher-value components of the chain are produced elsewhere and imported, however.
- Furthermore, like the auto sector, domestic firms **are located in the low-tech tiers**.
- The main electronics subsector is the manufacture of **hard disk drives**, for which Thailand is known as a **leading global production site**, hosting **the world's major players**.
- The hard disk drive industry in Thailand was effectively founded when **Seagate Technologies** moved its labor-intensive head stack assembly operations from **Singapore to Thailand in 1983** to take **advantage of lower wages**.
- With other multinational companies following suit, the number of operations **grew from 5** in the mid-1980s to **74** by the mid-2000s (Kohpaiboon and Poapongsakorn 2011).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- **Unlike the automobile sector**, the government **did not attempt to apply local content requirements** to the electronics sector, and **gradual tariff reductions** have allowed for a **relatively free flow of parts and components** into and out of the country.
- **High-value components** are **produced elsewhere**, notably in areas near Singapore (such as Johor, **Malaysia**), and then **imported to create the completed drives**, which are **then exported** for placement in computers and other finished products.
- While accurate figures are hard to come by, the value of **local content** is **about 30%–40%.**
- Thai producers inhabit the **lower technological levels** of the value chain and **contribute little** to **innovation** and **design** (ADB 2013).

Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Concern is emerging about **the minor role of Thai owned firms**, and that increased participation would be beneficial, with efforts made in this regard through private sector collaboration.
- The **Hard Disk Drive Institute** was established in 2005 and counts among its members the leading industry players.
- The institute works to **support skill development** among small- and medium-sized Thai enterprises to reach the quality standards needed for supplying large foreign firms.
- Yet, while there is recognized interest in fostering innovation so that Thai firms can participate fully in the hard disk drive value chain, **little evidence yet shows that it is bearing fruit**.

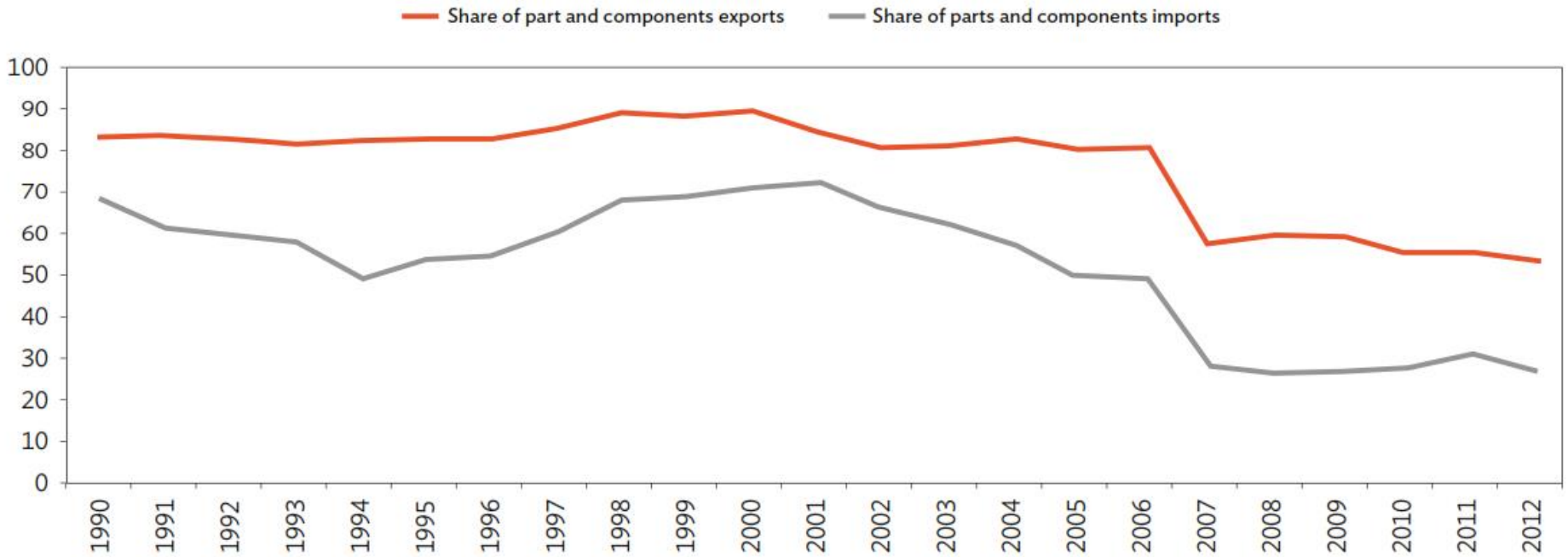
Source: ADB(2015)

2. Technological Progress: Limited International Technology Transfer

- Also similar to the auto industry, the **share of parts and components** in information and communication technology exports **has been going down** since the 1990s, indicating a **higher concentration on exporting finished information and technology products**.
- Imports of related parts and components have also been declining (Figure 2.18).

Source: ADB(2015)

Figure 2.18: Share of Parts and Components in Information and Communication Technology Exports and Imports (%)



Note: Parts and components for each manufactured product type follow P. Athukorala and A. Kohpaiboon. 2009. Intra-Regional Trade in East Asia: The Decoupling Fallacy, Crisis, and Policy Challenges. *ADBI Working Paper Series* No. 177. Tokyo: ADB Institute.
Source: Estimates using data from UN Comtrade Database. http://comtrade.un.org/ (accessed June 2013).

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- Thailand's **progression into high-income status** will depend on **two key factors**:

  (i) the ability to **move up the global value chain** and support investment in the **innovation**, design, and production of **more sophisticated goods** and services

  (ii) the ability to **expand investment and development** more broadly **throughout the country**. As it stands, large areas, notably the North and Northeast, and to a lesser extent the South, have not gained the full benefits of Thailand's development.

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- The **ability to innovate**, **adopt**, and **use technology** is a **critical aspect of growth**, driving improvements in productivity and enabling the production of **more sophisticated** and **higher-value goods** and **services**.
- Technologies are embedded in and utilized by firms and the ability to **develop technologically advanced** and innovative firms is a **central aspect** of the **development process** for **middle-income countries**.

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- The high-income East Asian economies of **Hong Kong**, China; **Japan**; **Republic of Korea**; **Singapore**; and **Taipei**,China **successfully adopted** increasingly **complex technology** through imports, adaptation, and subsequent innovation.
- Governments recognized the importance of technology and utilized whatever means possible to entice firms to improve their capabilities.
- The **PRC,** now in the **process of its own "East Asian miracle**," is also working hard not only to attract advanced technologies brought by foreign firms, but also to leverage strategic partnerships with these firms and to **develop technology and innovation** by **domestic firms**, in collaboration with research institutes and other public bodies.

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- Thailand is growing in a **different environment** from the **earlier** crop of **high-growth economies**.
- Asia is a **more integrated economy** with **production chains** on a regional scale driven by **large multinational firms** from within and outside of the region.
- These firms have moved production—and with its technology—to countries in Southeast Asia to **take advantage of low wages** and other production cost advantages, as well as to be **closer to growing consumer markets**.
- From the late 1980s, parts of Thailand's economy have become firmly embedded in and benefited from the rise of **"Factory Asia."**
- To maintain its place and draw the benefits from an integrating Asia, Thailand needs to **keep pace** with **advancing technology** and **innovation**.

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- While foreign investment will remain important to provide advanced technology and innovation, this needs to be supplemented with domestic efforts to **ensure** that **technology infuses** the **sectors of the economy** and is not isolated in a few specific, albeit key, subsectors.
- Thailand's **research and innovation capacity** remains **weak,** however, stemming from the **lack of interest and investment** and the **reliance on foreign inve**stment for its key technological inputs.
- Thailand ranks **55th** out of 141 countries in **the Global Innovation Index 2015** (Cornell University, INSEAD, and WIPO 2015) put out by the World Intellectual Property Organization.
- **Adequate research infrastructure** and **activity needs to emerge** to provide new breakthrough and improvements on products and production processes.

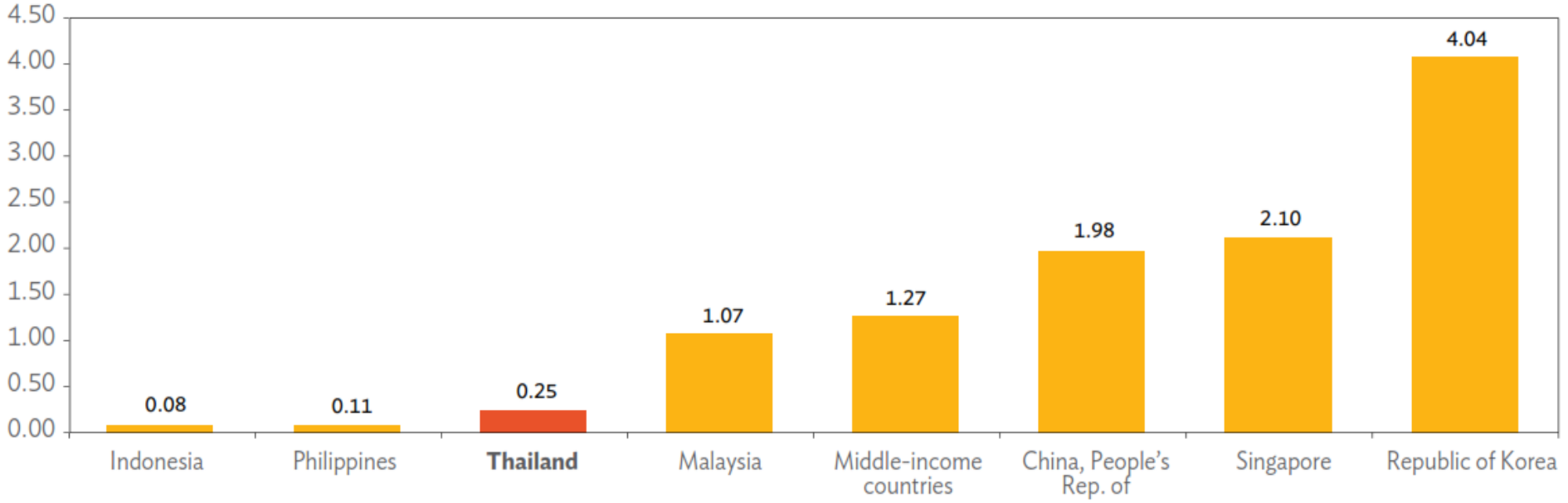
Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- Evidence of **insufficient innovation capa**city is seen in the standard measures.
- In terms of **R&D expenditure**, Thailand **lags behind** a number of **middle-income countries** and behind the now high-income countries.
- While its R&D is higher than Indonesia's and the Philippines', it falls **considerably below Malaysia's**, the **average level of middle-income countries**, and the **PRC's**, which was at the same per capita income level in 2014, when both countries graduated to upper middle-income Status (Figure 3.1).

Source: ADB(2015)

Figure 3.1: Research and Development Expenditure, Selected Economies, 2014 (% of GDP)



GDP = gross domestic product.
Note: Data for the Republic of Korea and middle-income countries are for 2011; data for the People's Republic of China and Singapore are for 2012.
Source: World Bank. World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators (accessed September 2015).

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- Thailand spends a **quarter of 1%** of **GDP on R&D**, even lower than India, which also spend less than 1% of GDP on research (Table 3.1).
- In comparison, the **Republic of Korea** spends **more than 4%**; **Japan**, about **3.4%**; and the **PRC** almost **2%**.
- **Private sector spending on research** in Thailand is the **second lowest** in the sample group **after India**.
- Deliberate R&D is **an important driver** of technological change.
- The phenomenon of science and technology takeoff is one characterized by abrupt increases in national R&D intensity, as it approaches 1% of GDP, and accelerates abruptly to the vicinity of 2%, before leveling off in the range of 2% to 3% of GDP, based on historical data during 1987–1997 in the PRC (Jefferson and Su 2006).

Source: ADB(2015)

Table 3.1: Expenditure on Research and Development by Source (% of GDP)

Economy	Total Research and Development Expenditure	By Business Enterprises	By Government	By Higher Education	By Private Nonprofit Organizations
PRC	1.980	1.509	0.323	0.150	...
India	0.810	0.288	0.490	0.033	...
Republic of Korea	4.040	3.091	0.473	0.408	0.065
Malaysia	1.070	0.607	0.154	0.309	...
Thailand	**0.250**	**0.103**	**0.082**	**0.062**	**0.003**
Germany	2.920	1.953	0.432	0.534	...
Japan	3.390	2.610	0.285	0.447	0.051
United States	2.790	1.947	0.343	0.385	0.112

... = data not available, PRC = People's Republic of China, GDP = gross domestic product.
Note: Data for Thailand are for 2009; India, the Republic of Korea, Malaysia, and Japan are for 2011; and the PRC, Germany, and the United States are for 2012. Some numbers do not add up because of rounding.
Source: UNESCO Institute for Statistics. Data Centre. http://www.uis.unesco.org/datacentre/pages/default.aspx (accessed September 2015).

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- The average ratio for **23** Organisation for Economic Co-operation and Development **(OECD) countries** stood at **2.0%**, while that for **non-OECD countries** was a very low **0.7%**.
- The **seven largest OECD countries** in the sample have average R&D intensity equivalent to **2.4%**, while the average for **16 small OECD countrie**s is **1.8%**.
- R&D spending has been **low and stable** over the past decade in Thailand.
- Thailand's 11th National Economic and Social Development Plan **targets R&D spending of 1% of GDP** by 2016, suggesting that the government recognizes that technology and innovation are too low to support a higher growth process.

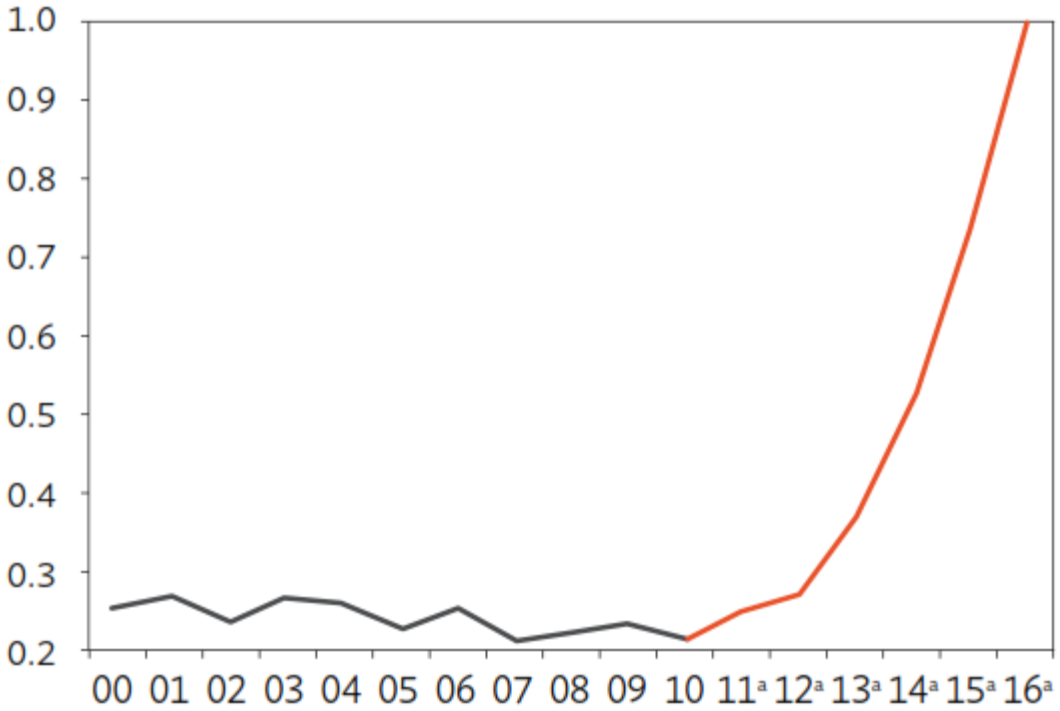
Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- Whether it can be achieved remains in question, given that spending has hovered near **0.25%** for **more than a decade** (Figure 3.2).
- It should be noted that even the **PRC**, which has recognized the importance of technology and innovation as vital to moving beyond the middle-income stage, tried to **raise R&D spending to 2%** by the end of the 10th Five-Year Plan, but failed to do so.
- The **PRC** raised the target further in its 12th Plan to **2.2%**.
- R&D targets are difficult to achieve because they represent a **combination of public and private sector** activity.
- Governments can allocate more funds to research, but **private firms need to play their part**.
- The Thailand government hopes that the **share of private sector R&D** will rise to **70%** by 2016, a considerable increase from its **current level** of about **40%–45%**.

Source: ADB(2015)

Figure 3.2: Research and Development Expenditure in Thailand, 2000–2016
(% of GDP)



[a] Ministry of Science and Technology targets.
Source: Oxford Business Group (OBG). 2011. *The Report: Thailand 2014*. London: OBG.

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- The National Research Council of Thailand's 2010 Science, Technology and Innovation Survey estimates that only **24.9% of firms actually had a budget for innovation activities**, of which 15.8% see no change in budget in the next 5 years, 8.9% see an increase, and 0.2% see a decrease (NRCT 2011).
- Among companies with a budget for innovation, the majority of it is spent on R&D done by the company itself, while about a fifth of the budget is spent on the acquisition of equipment (Table 3.2).
- However, spending on innovative activities is estimated to total B9.8 billion in 2010, **just 0.10% of GDP**.
- This figure is down from the estimated B13.2 billion spent on innovation in 2009, or **0.15% of GDP**.
- Thailand also has a **lot of catching up** to do in **recruiting and training more researcher**s.
- Currently, only **0.57 researchers** are available **for each 1,000 members** of the labor force (Table 3.3).
- In comparison, there are **1.75** researchers per 1,000 workers in the **PRC**, more than **10** in the **Republic of Korea**, and **3.8** in **Malaysia**.

Source: ADB(2015)

Table 3.2: Allocation of Budget for Innovation Activities (%)

Innovation Activities	2009	2010
Intramural research and development	57.5	51.6
Extramural research and development	5.0	9.8
Acquisition of machinery and equipment (including computer hardware) for product or process innovation	20.2	18.1
Acquisition of other external knowledge such as licenses to use intellectual property or specialized services (such as consultants)	0.6	0.5
Training	5.4	6.0
Marketing of innovations	3.5	3.7
Design and other preparations	2.5	3.0
Marketing of improved services (market research and launch advertising)	4.9	3.7
Others	0.5	0.4

Source: National Research Council of Thailand (NRCT). 2011a. Innovation Survey: Business Sector (Summary). Presentation at the UNESCO Institute of Statistics Statistical Capacity Building Workshop 2011. http://www.uis.unesco.org/StatisticalCapacityBuilding/Workshop Documents/ST Workshop dox/Vietnam 2011/Thailand Innovation Survey (2).pptx.

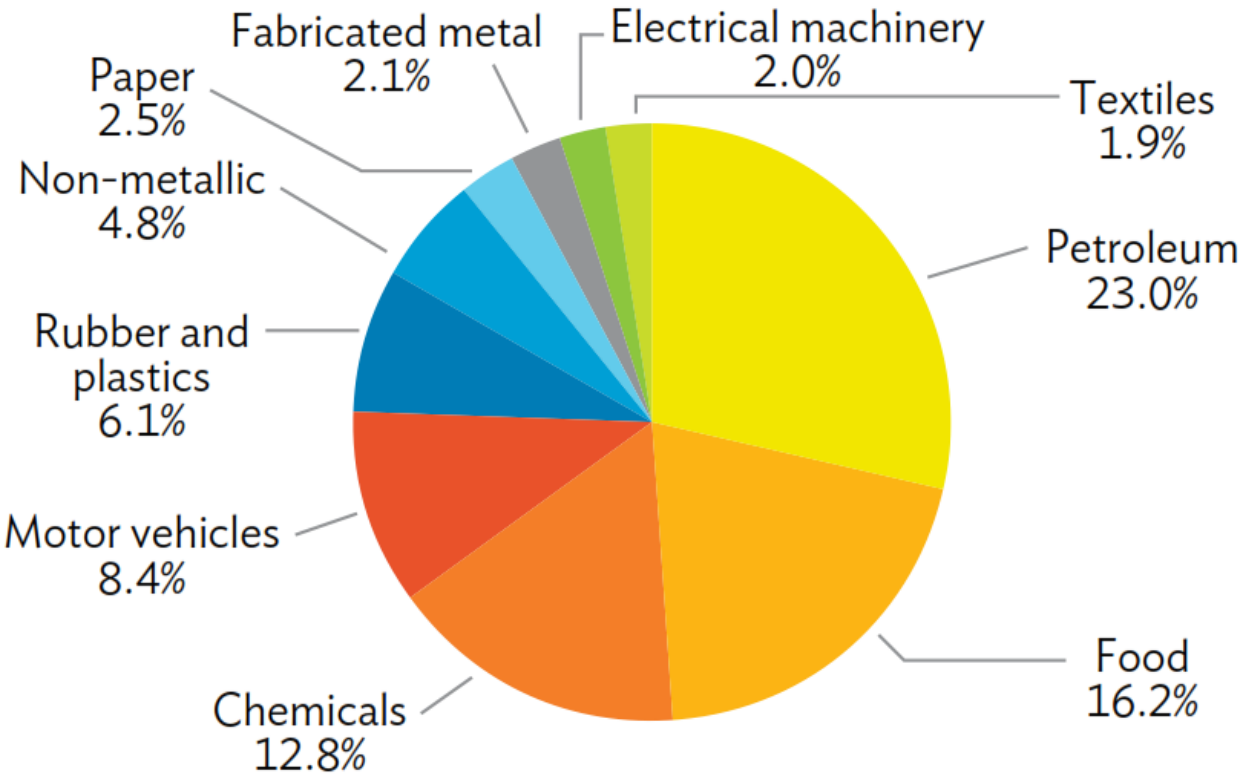
Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- Allocation of R&D is also highly interesting, in that there is relatively **little private R&D** in the prominent manufacturing sectors of **automobiles** and **electronics**, which account for **8.4%** and **2.0%**, respectively, of total private sector R&D.
- Indeed, R&D in electronics is only slightly ahead of **textiles**, at **1.9%** (Figure 3.3).
- This may reflect the **heavy influence** of **foreign producers** in these sectors, for which research work is done in the home country.
- In Thailand, the **three sectors** that account for **just over half (52%)** of all private research are **petroleum**, **food**, and **chemicals**, which are also areas that government has encouraged.

Source: ADB(2015)

Figure 3.3: Private Investment in Research and Development, Thailand, 2009



Source: Oxford Business Group (OBG). 2011. *The Report: Thailand 2014*. London: OBG.

Source: ADB(2015)

3. Challenges in the Transition to High-Income Status

- Strategic **collaboration between institutions of higher education** and the **manufacturing sector** are **not enough** to foster indigenous innovation.
- Few joint, integrated research projects are found for innovative product and process development.
- Universities seldom engage in basic research, which is not always of good quality, and offer **few ideas** for business to **turn into commercially viable innovation**.

Source: ADB(2015)