Changing Thai Agriculture

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Lecture 10

Course Syllabus
Lecture 10

- The three stylized facts about economic development are confirmed by Thailand's changing economic structure: output, employment, and exports.
- The focus is on the comparison between Thailand and other advanced and developing countries.
- The pessimistic view on Thai agriculture is examined in light of agricultural productivity development.

Main themes

1. Stylized facts on economic development
2. A dismal view on Thai agriculture
3. Agricultural productivity
4. The wealth of nations and agriculture
5. The important role of irrigation

1. Stylized facts of Economic Development

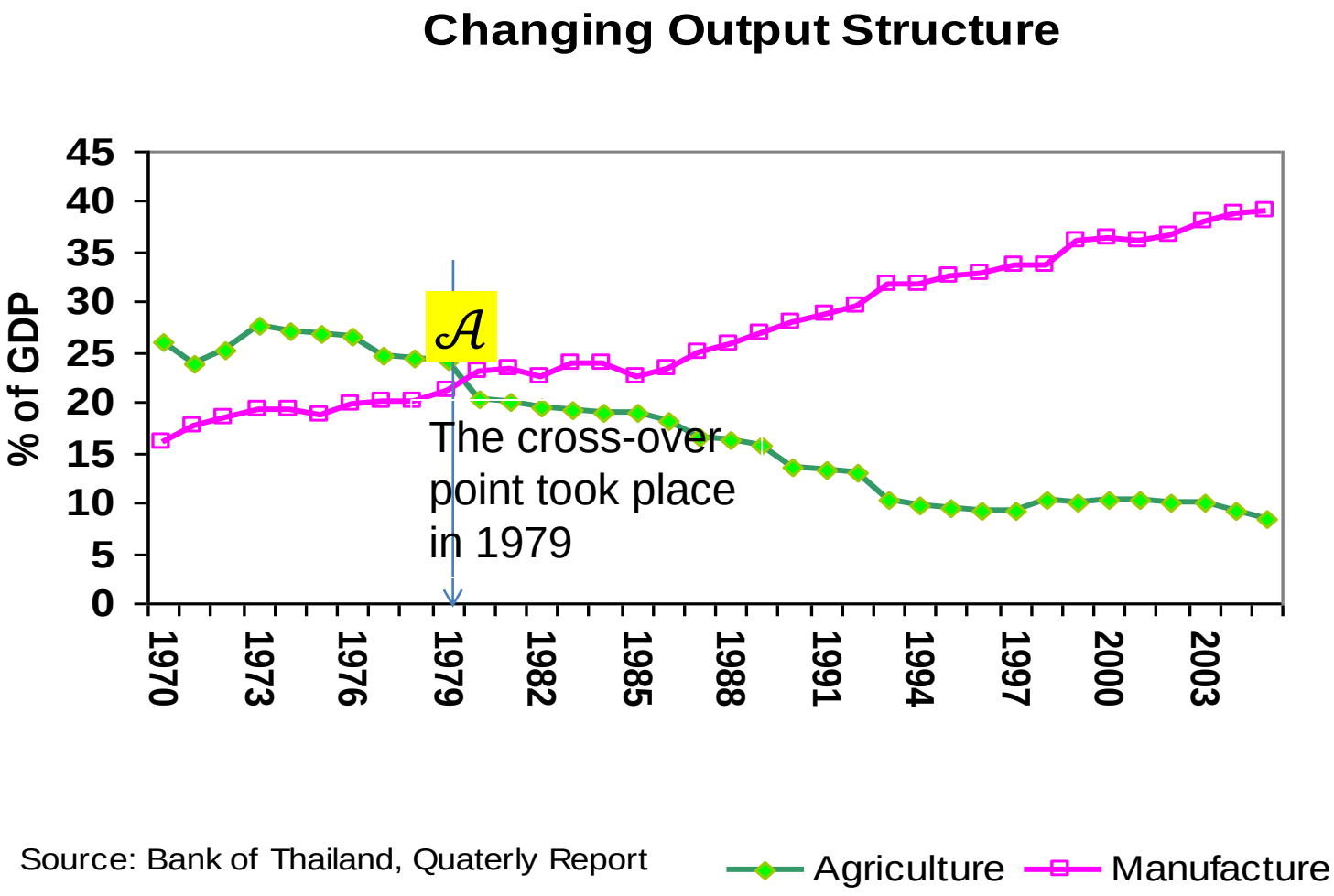
Three declining trends:

A. Shares of agriculture output

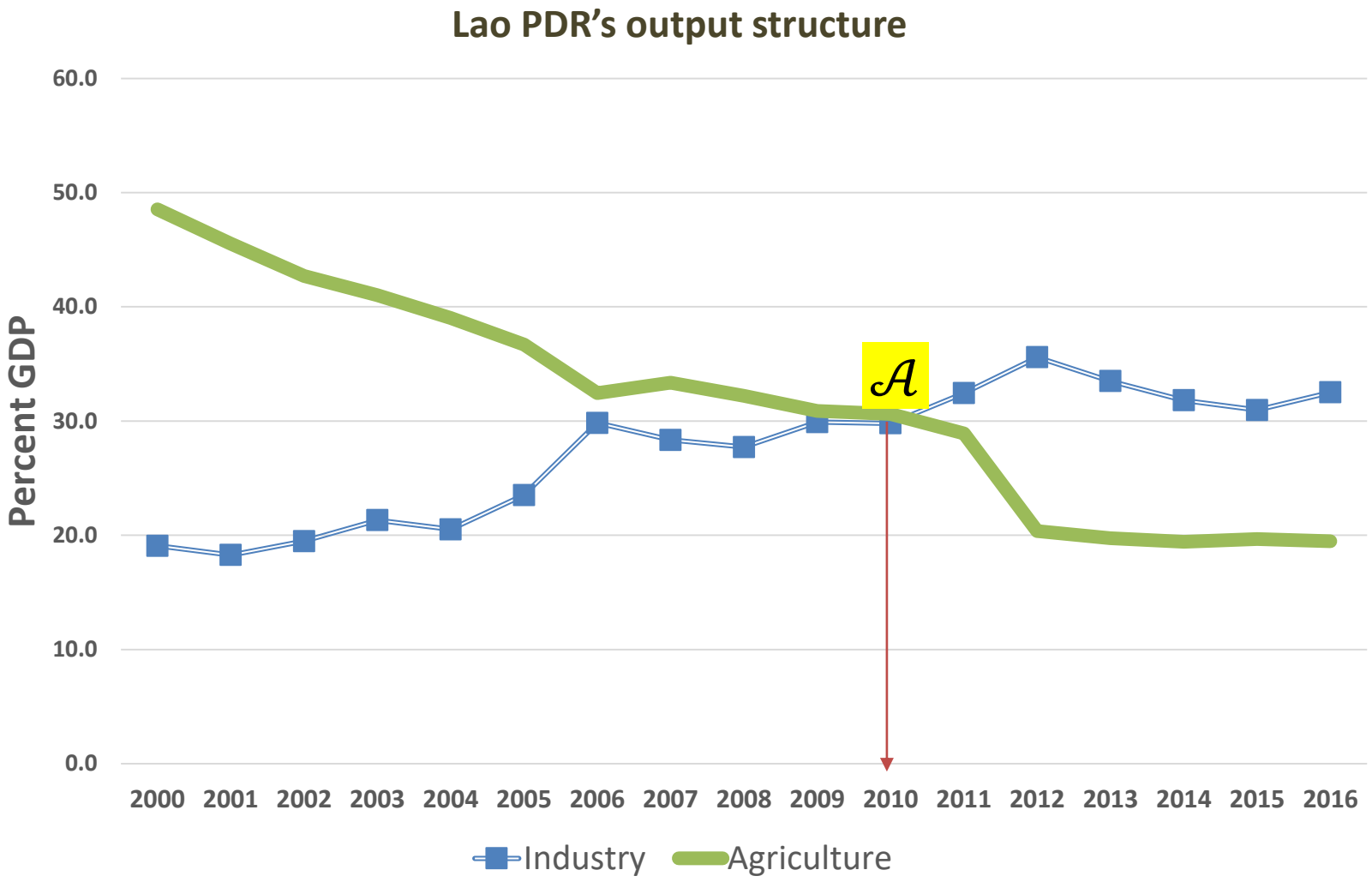
B. Share of agricultural exports

C. Share of agricultural employment

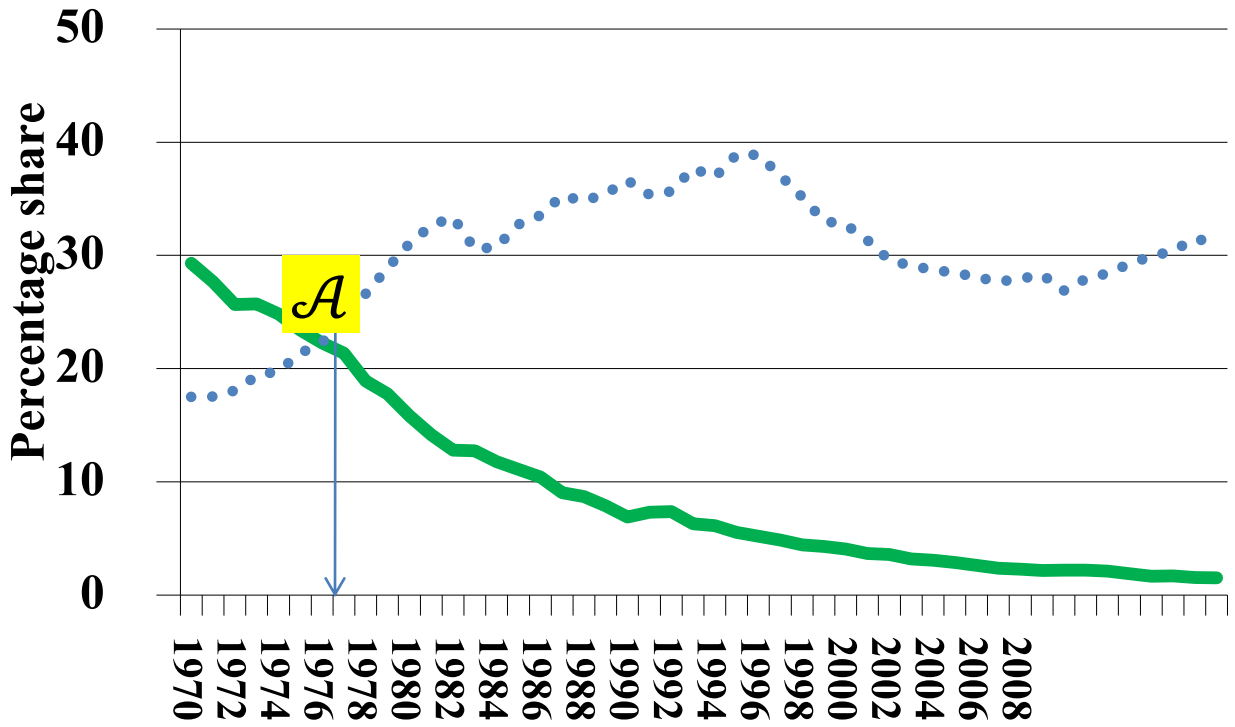
A. Thailand's output structure



Source: Bank of Thailand, Quaterly Report

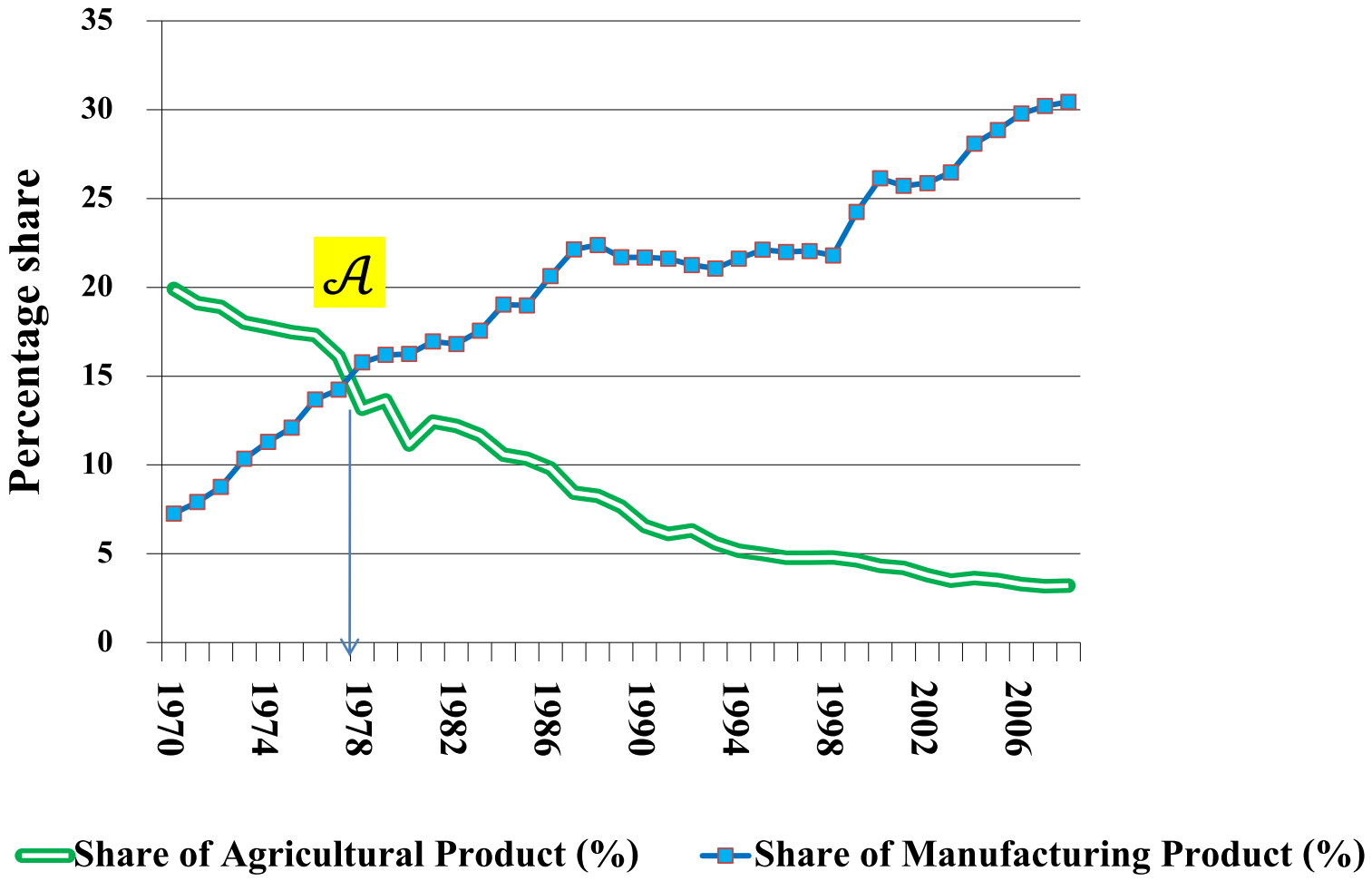

Lao PDR's output structure
Percent GDP
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
A
Industry
Agriculture

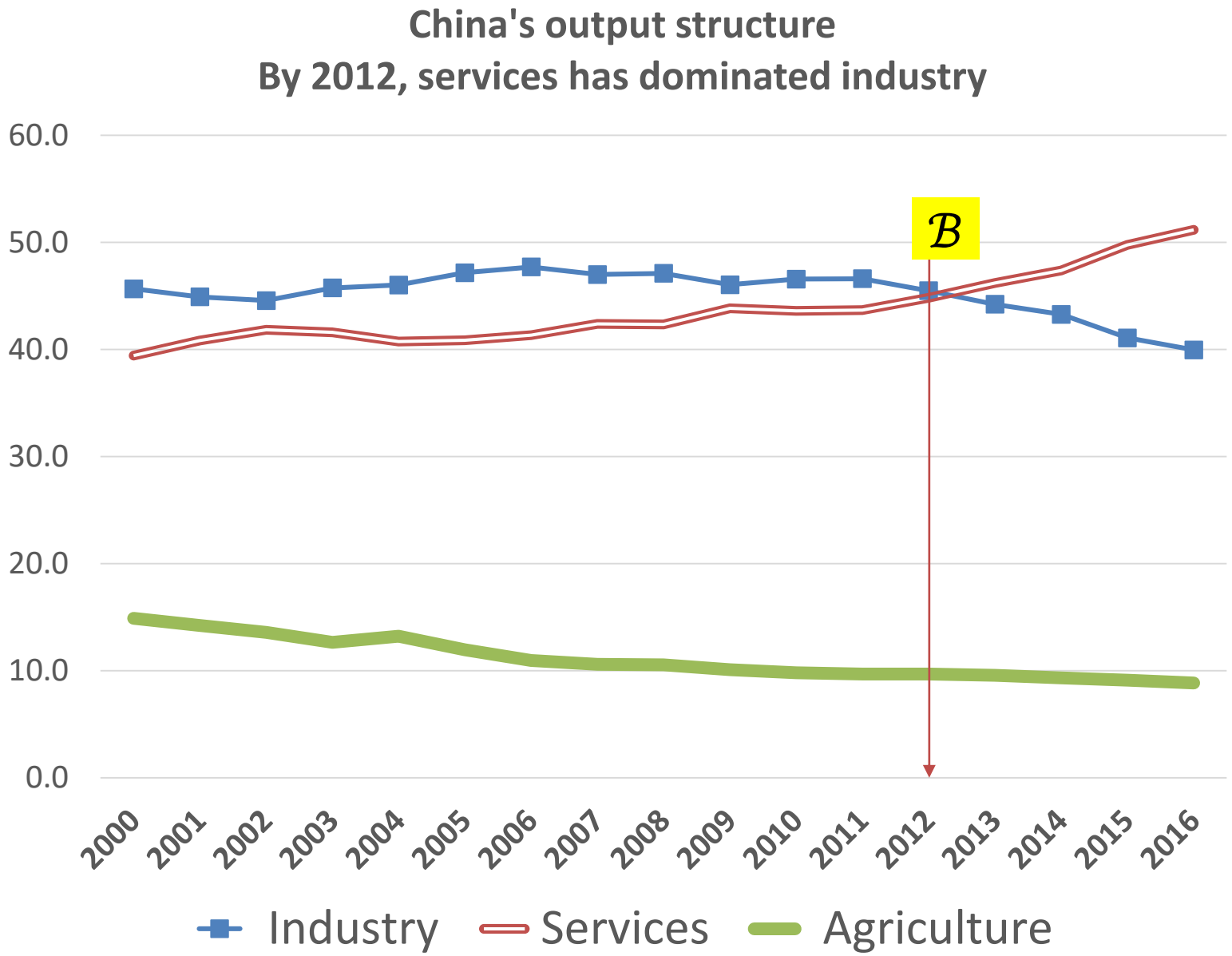
Taiwan



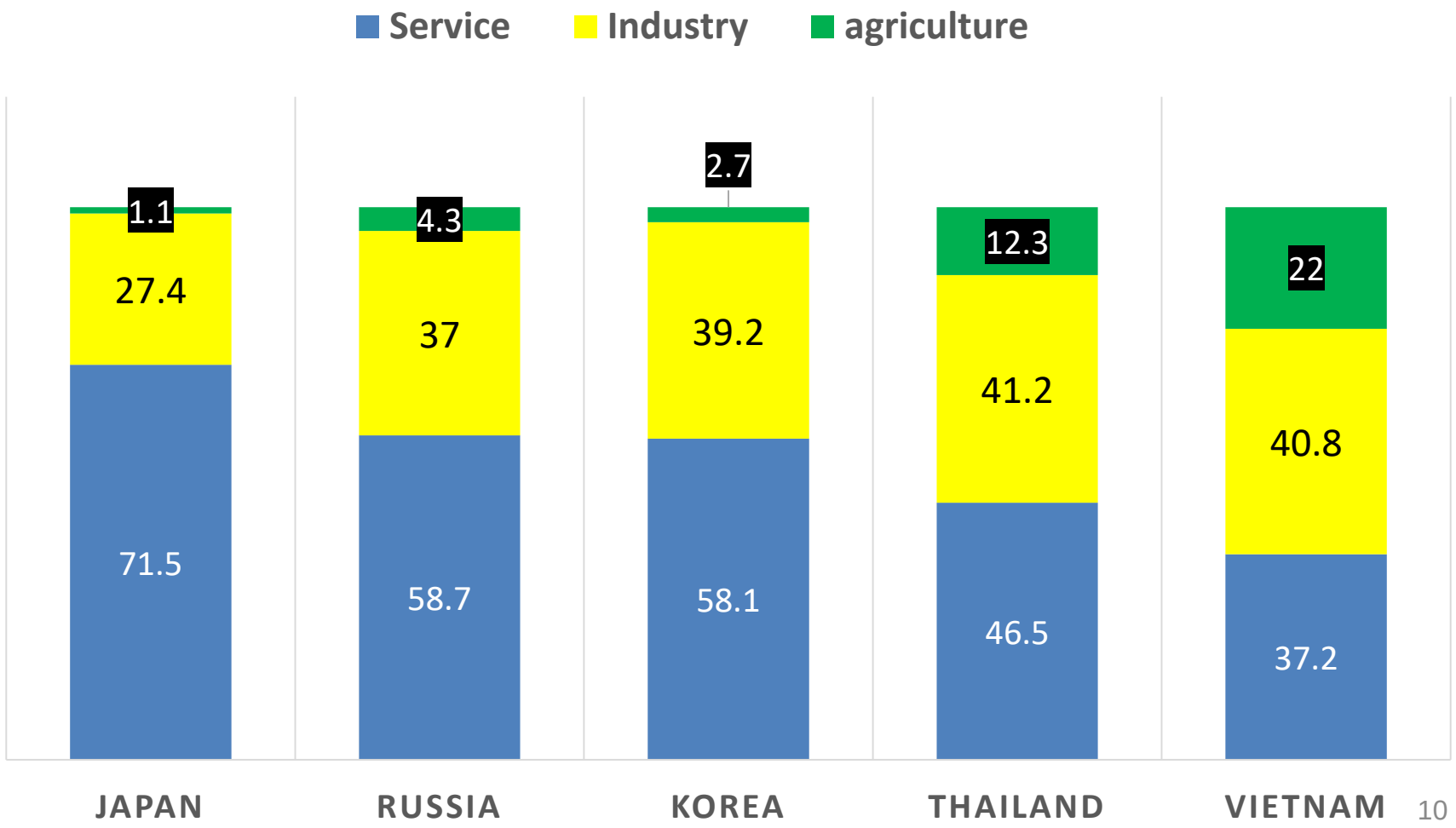
The cross-over point was experienced earlier in the four Asian Tigers

South Korea

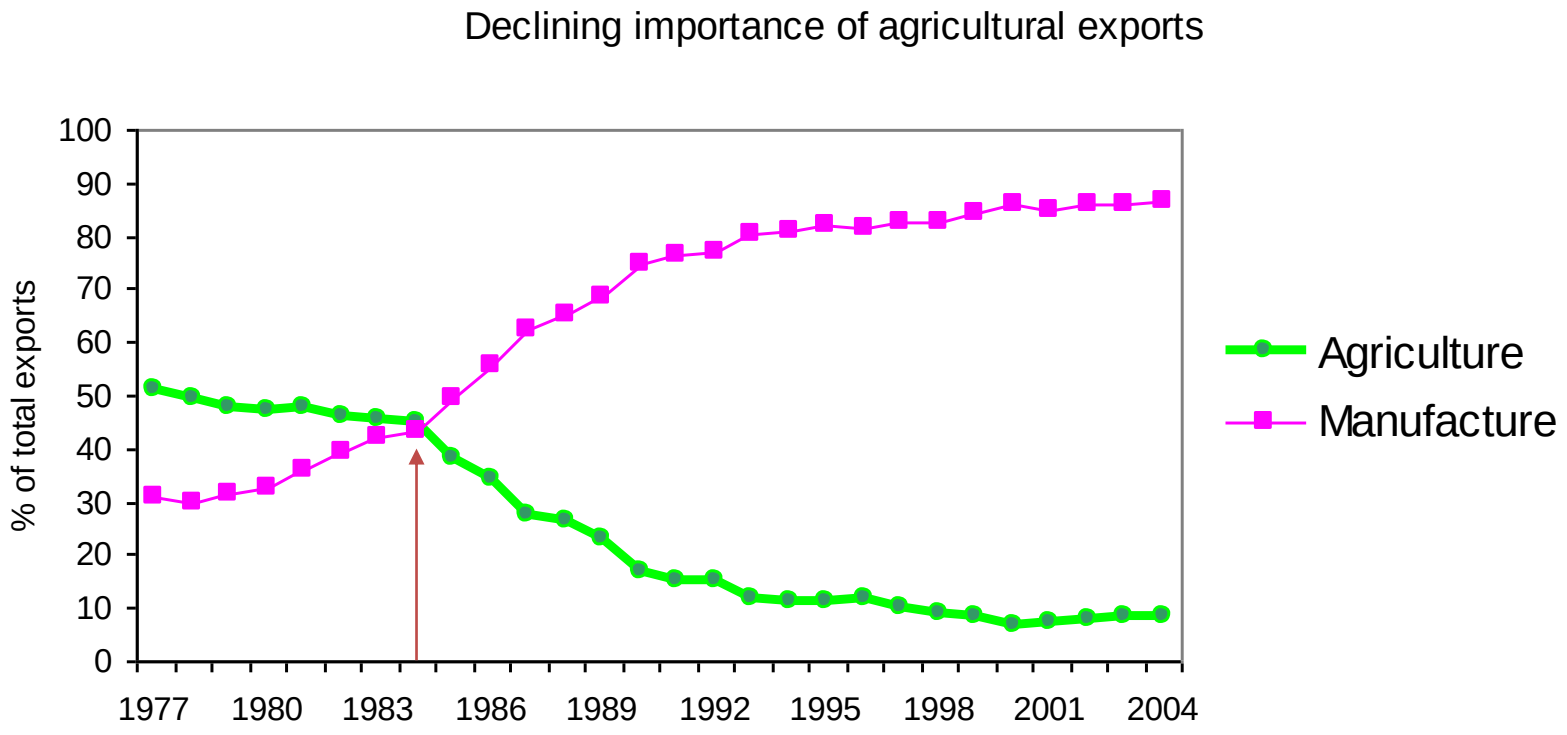

Percentage share
35
30
25
20
15
10
5
0
1970
1974
1978
1982
1986
1990
1994
1998
2002
2006
A
Share of Agricultural Product (%)
Share of Manufacturing Product (%)


China's output structure
By 2012, services has dominated industry
60.0
50.0
40.0
30.0
20.0
10.0
0.0
B
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Industry
Services
Agriculture

OUTPUT STRUCTURE (% GDP)
IN SEARCH OF *CREATIVE* ECONOMY

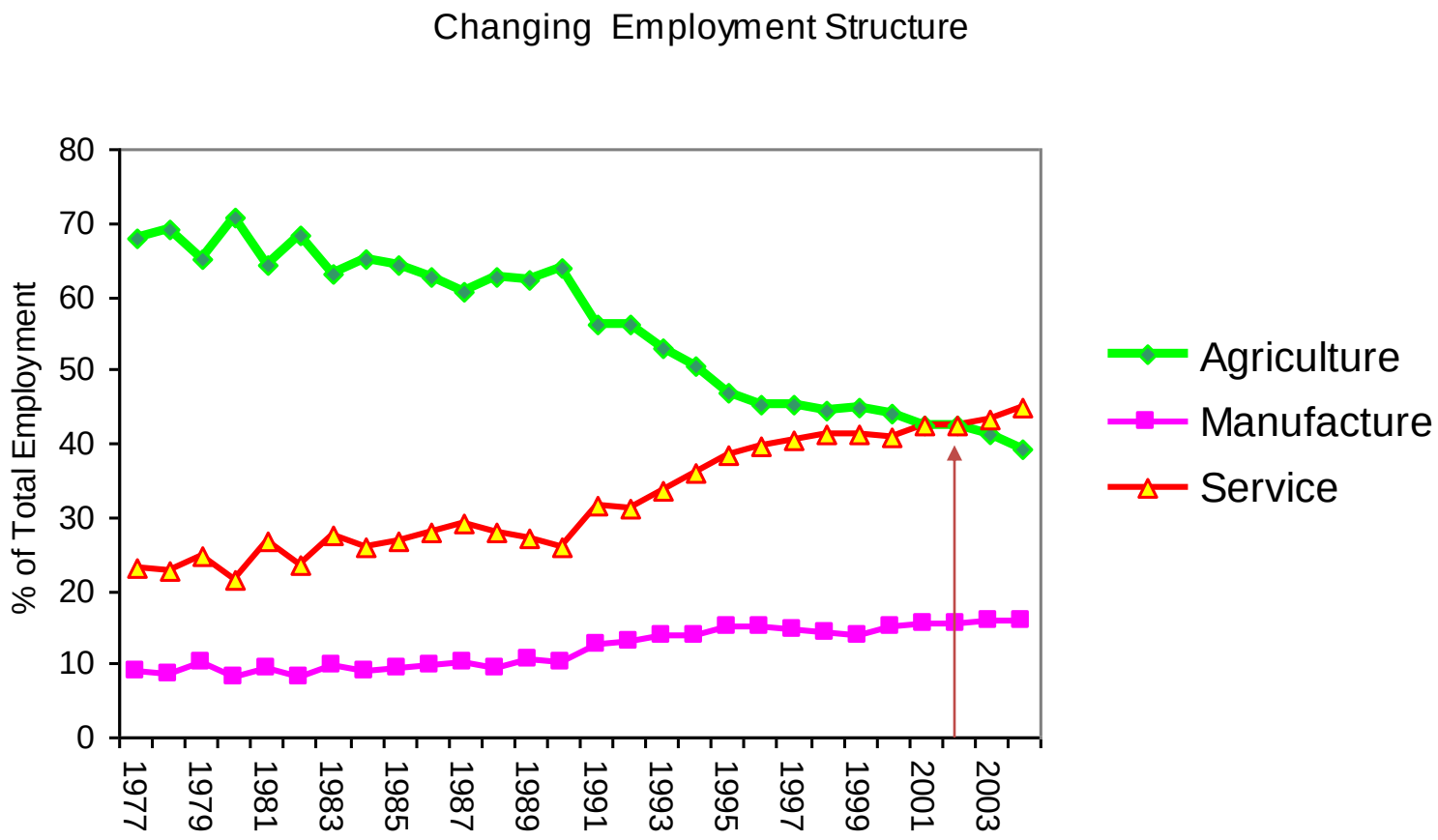


B. Thailand's exports structure



Source: Bank of Thailand

C. Declining share of agricultural labor



Source: Bank of Thailand

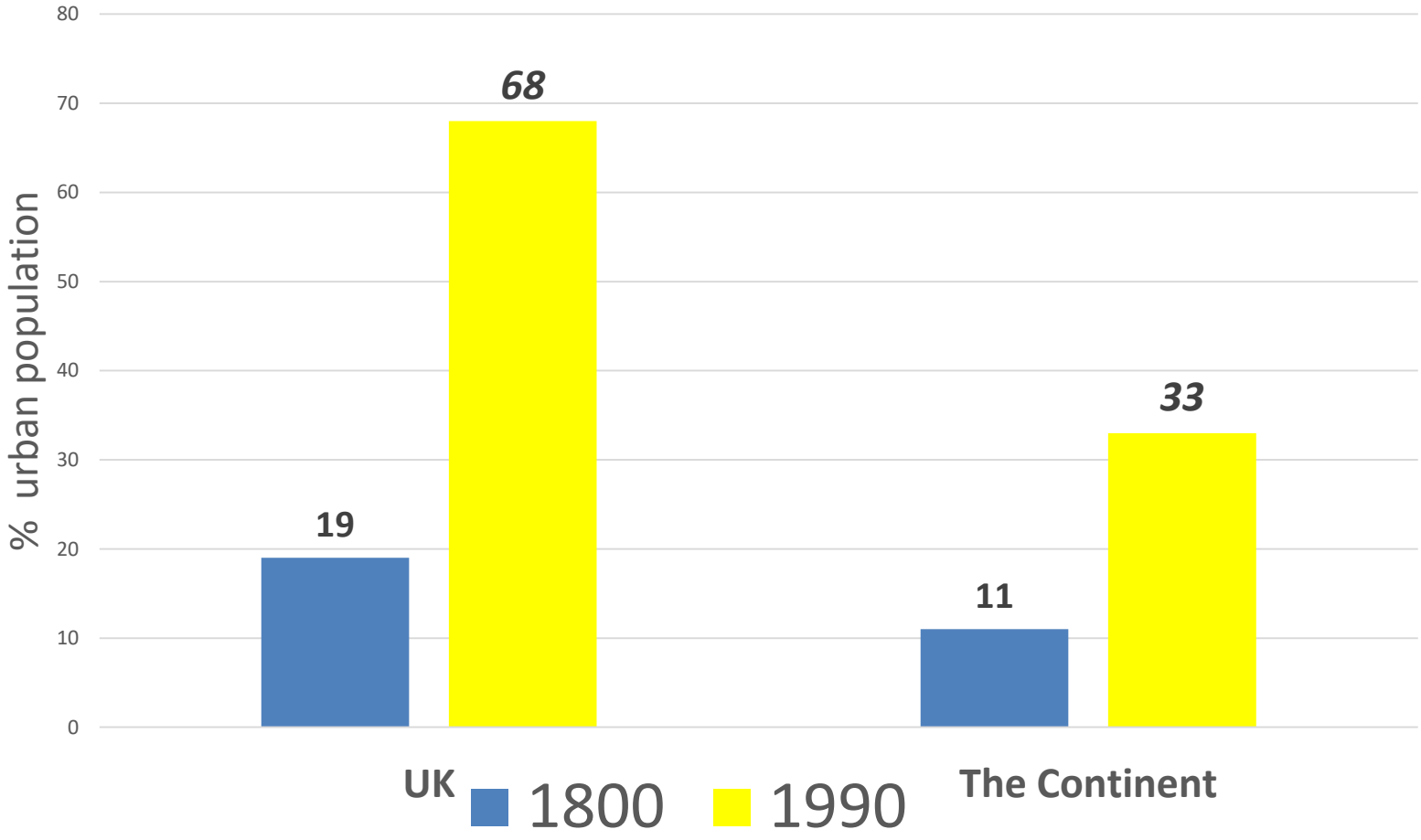
Urbanization is propelled by improved agricultural productivity

- The rapid urbanization and growth of the total population of the developed countries which occurred in the 19th century was made possible by great improvements in agricultural labor productivity.
- The increase in labor productivity in the UK was greater, since agriculture labor's share of total employment declined from **36** percent in 1800 to *8.5 percent during 1900-1910.*
- By the beginning of 1900, the ***UK was importing approximately half of its food***, but during the same period its ***population nearly tripled***.
- In France the amount of wheat produced ***by a man-day of labor*** more than ***doubled between 1800 and 1892***

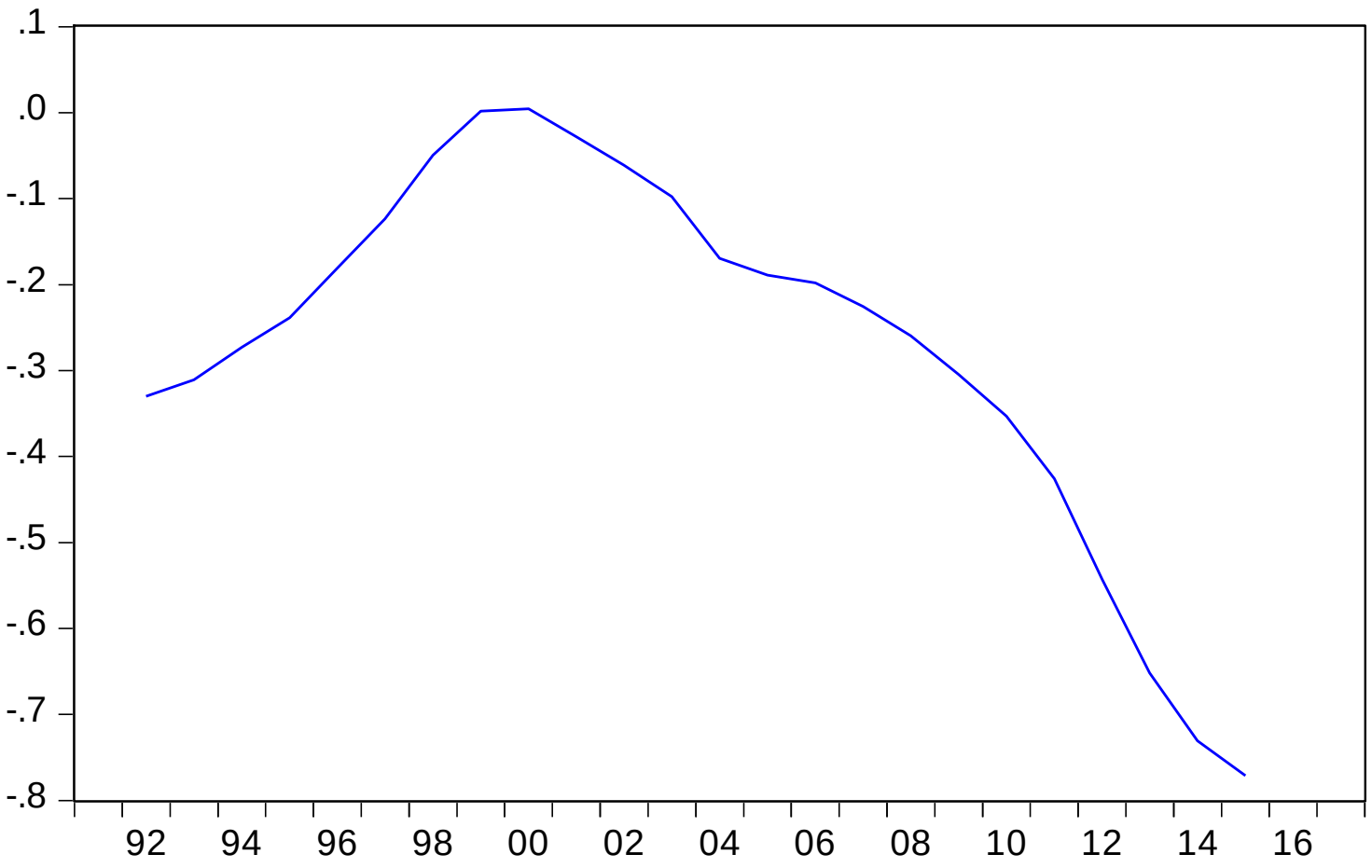
Rapid urbanization is permitted by enhanced farm productivity

Rising farm productivity accelerates urbanization

Rapid Urbanization in Europe



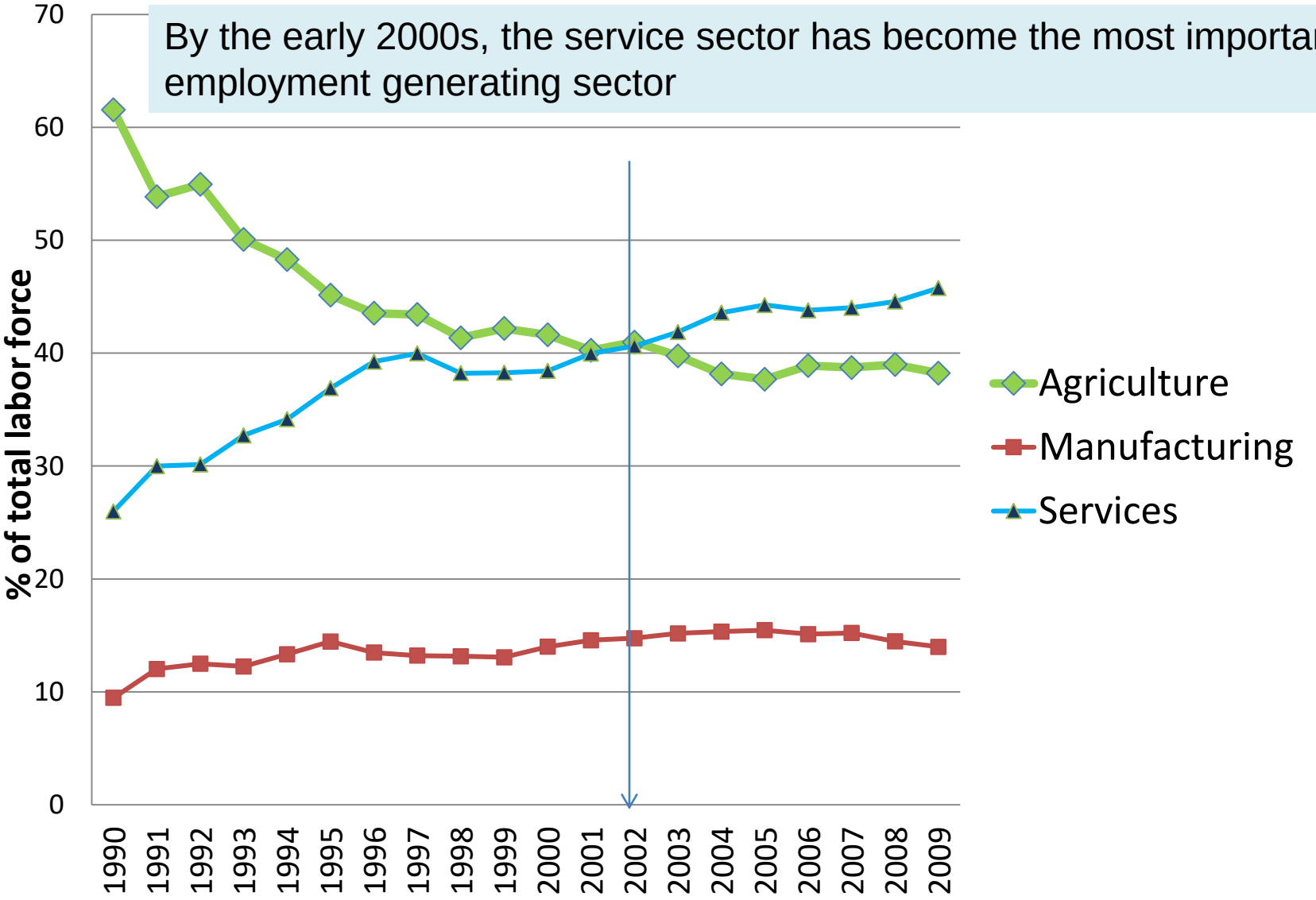
Changes in trend growth rate of Thailand's agricultural output



Slow agricultural productivity growth implies less rapid rate of urbanization

Thailand's Employment structure: 1990-2009

By the early 2000s, the service sector has become the most important employment generating sector



2. A dismal view

- **“Thailand would lose comparative advantage in agriculture as manufacturing has increasingly become more important than agriculture”.**
- **“Due to the shortage of labor and water during the dry season, with the disappearance of land in the 1980s, the future of Thai agriculture would look bleak”.**
- **Ammar Siamwalla (1996) “*Thai Agriculture*: From engine of growth to sunset status”**

  Source: TDRI Quarterly Review Vol. 11, no.4

- *Really? Does land matter that much?*

Cracks in a rice field show the effects of severe drought in Ayutthaya's Nakhon Luang district.
Feb 8th 2020

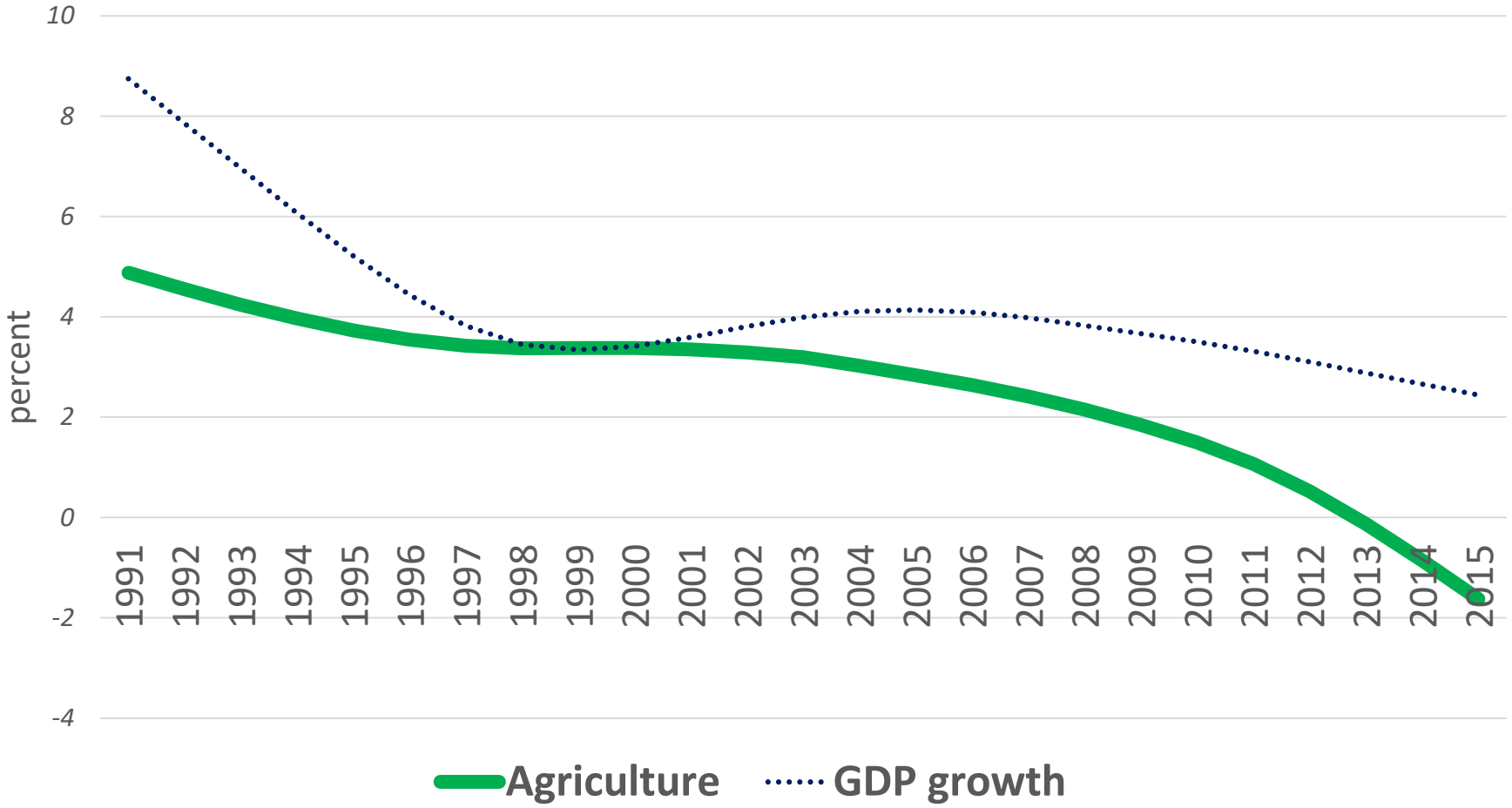
The 2020 drought is the worst in 40 years

- Sugar output may tumble about 30% to 9 million-10 million tones, while cane output may fall below 90 million tones from about 130 million in the previous season because of the dry weather.
- It may also further raise global sugar prices that have surged about 35% in the last five months on concerns that adverse weather is threatening crops from India to Mexico.
- The effects of the drought will be felt not just within the *agriculture industry* but also in the industrial sector."

Dismal view on agriculture: Wage pressure from non-agricultural sector

- The boom in the non-agricultural sector led to higher wage rates in urban areas.
- Because of labor migration, the lack of labor speeds up farm mechanization,
- *But the future still looks bleak*
- Wage pressure and declining agricultural prices squeezed farm profits, discouraging investment and further reducing agricultural growth since the turn of the 21st century.

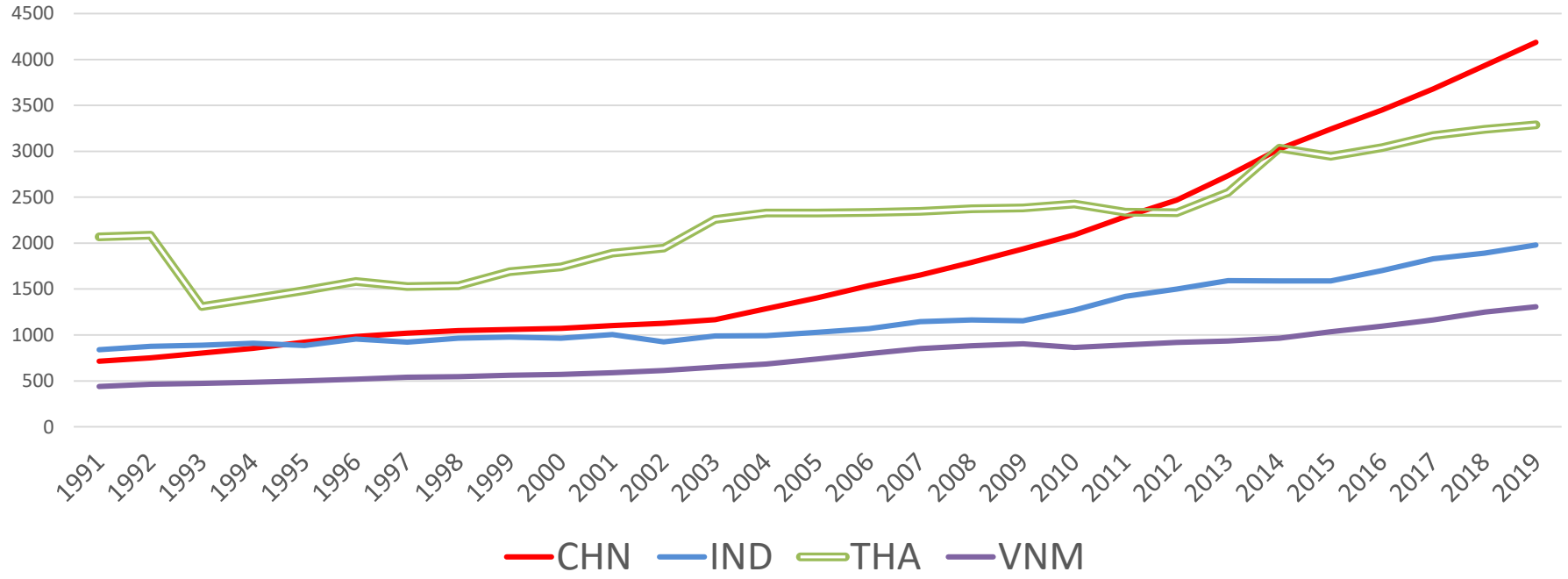
Trend growth path
(excluding cyclical movements)



3. Agricultural productivity

Agriculture, forest, and fishing value added per worker

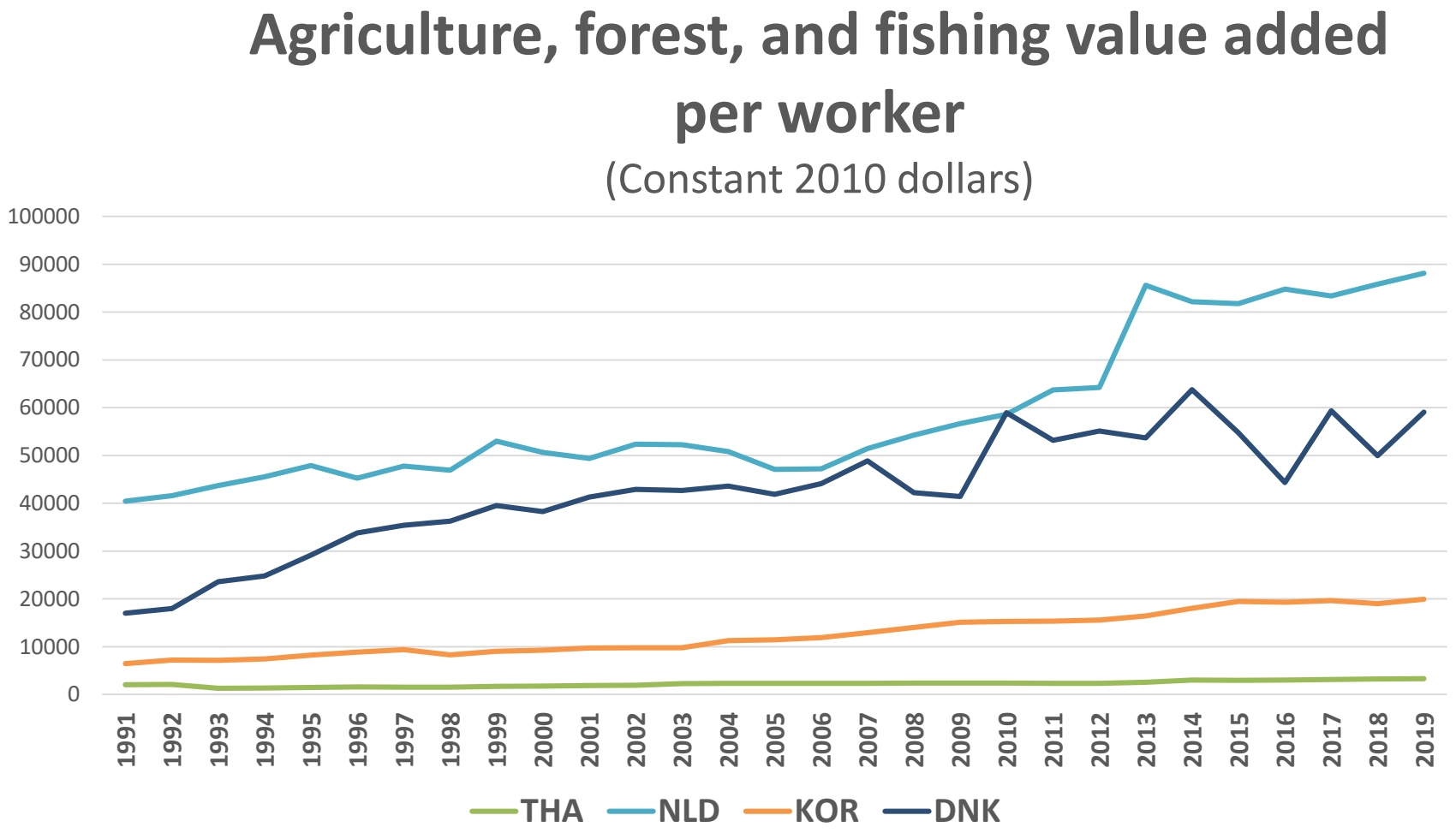
source: WB



Thai agriculture over the last 50 years

- Per capita agricultural output in Thailand increased ***faster*** than the world average and industrialized countries.
- *The rapid **improvement** has become more pronounced since the 2000s*.
- But Thailand still lags behind other countries in Asia, due to the explosive growth of Chinese agriculture since 1970.
- Given limited land for cultivation, the focus is on improving land productivity, which can be measured by average product of land (output in kg over hectare(ha).

There are still very large **productivity gaps** between Thailand and developed countries.



Farm productivity improvement

- Farm mechanization, fertilizer, and irrigation are responsible for the improvement.
- Large declines in imported agricultural machinery can be attributed to huge currency depreciations and ***expansion of domestic production of farm machinery***.
- *Does the strong baht help or hurt Thai farmers?*

Factor Intensities in farming

- Increasing factor intensities of farm inputs, which are complement to improvement in irrigation (e.g., water pumps, threshing machine, two-wheeled and four-wheeled tractors).
- The **irrigated area** as a percentage of arable land increased from 15 percent in 1960 to *30* percent in 2000.
- Improved High-Yielding Varieties (**HYV**) of rice also resulted in yield improvement.
- Irrigation made it possible to employ these input factors because of their complementarity.

Will Martin and Devashish Mitra.
"Productivity growth and convergence in agriculture vs manufacturing."
Economic Development and Cultural Change 49.2 (2001): 403-422.

- Employing panel data from 50 countries over the period 1967-92, Martin and Mitra found that:
- **productivity growth has been *higher for agriculture* than manufacturing sector in both industrial and developing countries.**
- **The shift *away* from agriculture in developing countries has been driven by higher productivity growth in agriculture.**
- Rapid accumulation of human capital contributed to a strong shift out of agricultural activities and into export-oriented manufacturing industry in East Asian economies."

We neglected agriculture at our peril

- **Human and physical capital accumulation increased at a much faster pace in manufacture and urban areas than in Thailand's agricultural rural areas.**
- **Foreign direct investment and capital inflows concentrated in the manufacturing and services sectors; thereby substantially raising capital-labor ratios in non-farm sectors.**
- **Alas, FDI in agricultural sector has been relatively small**
- ***Kubota smart and precision farming***

Thus productivity increase in manufacture was *higher* than the increase in the agricultural sector--in particular prior to the financial crisis.

In general for both LDCs and developed countries

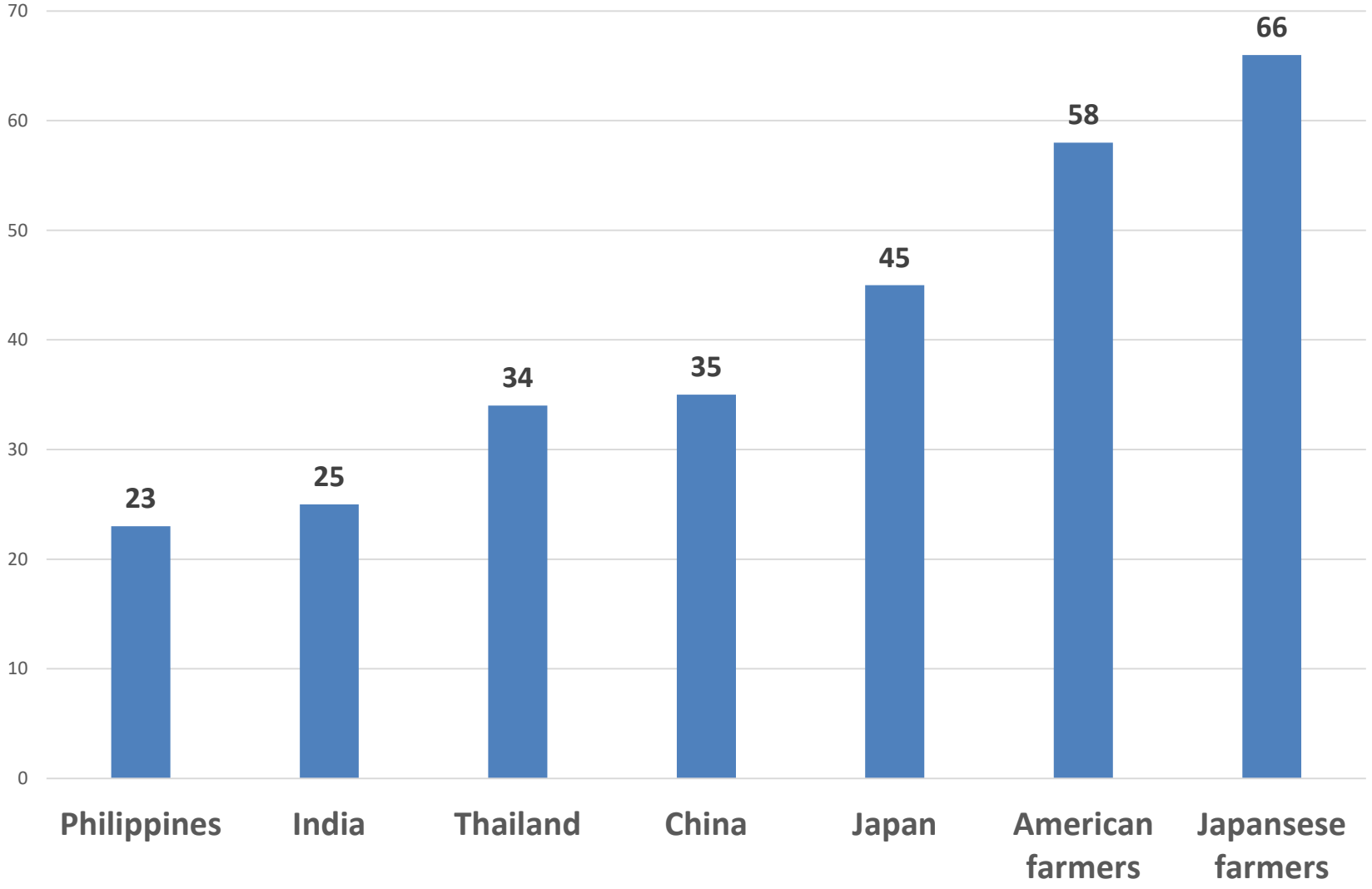
$$\left(MP_L\right)^a > \left(MP_L\right)^m$$

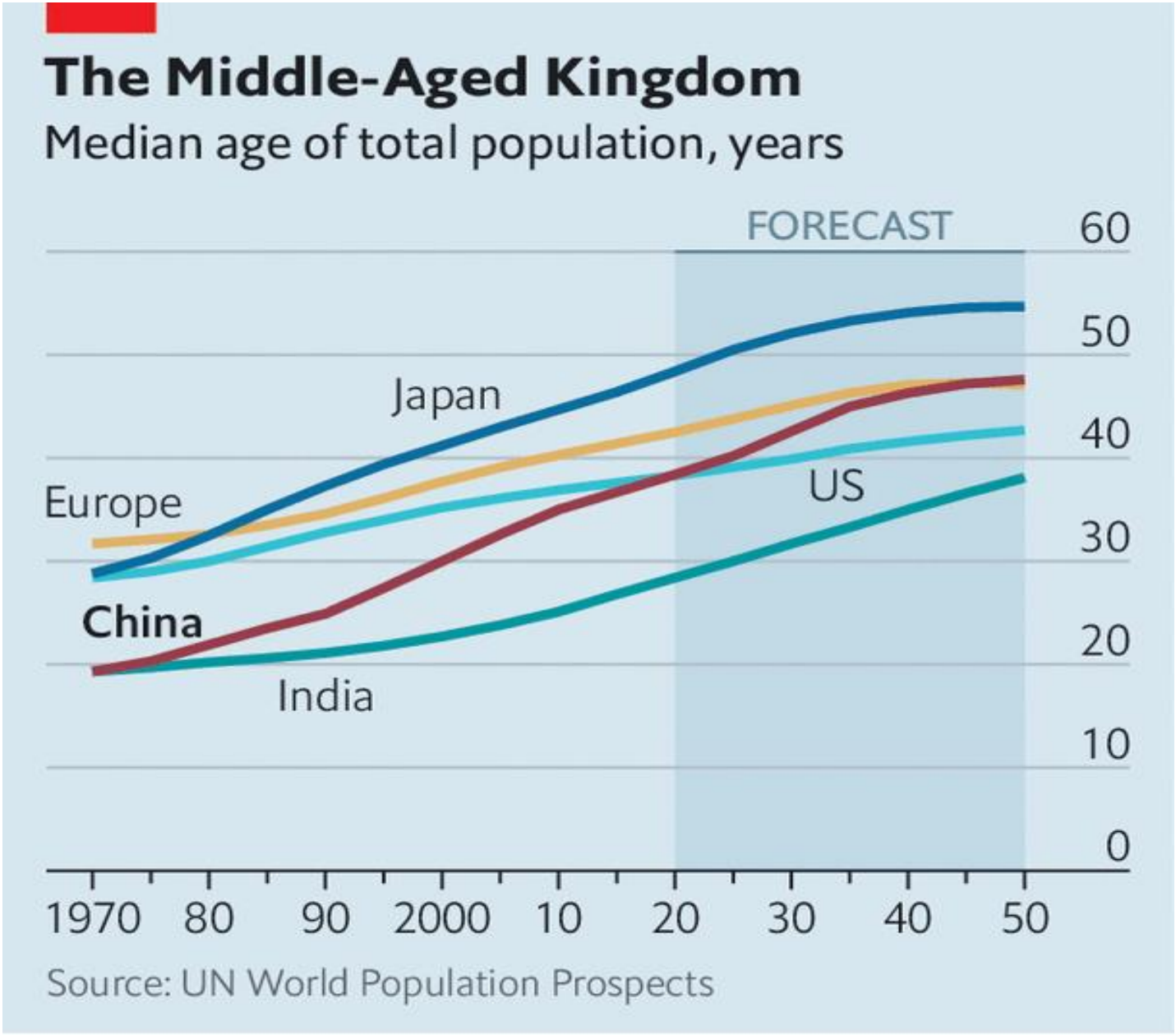
But in the case of Thailand

$$\left(MP_L\right)^a < \left(MP_L\right)^m$$

Aging society encourages farm mechanization

Comparative Median Age of Population
Farm mechanization is crucial for ageing farmers





The Economist

Why has the majority of Thais remained in farm sector?

- The productivity growth of labor in manufacture rose faster than farm labor productivity, thanks to higher capital-labor ratio, limiting employment generation and the ability to absorb farm labor.
- Productivity gap between the two sectors has been widening.
- Speed is important in farming.

Harvesting time: Economies of speed

- Harvesting was the critical labor period for small grains such as wheat, barley, and rice.
- For centuries it was **extremely labor-intensive** and needed to be done in a relatively brief period of time in order to *save the crop from weather damage.*
- Labor-saving techniques for harvesting came very late in history.
- There seems to have been ***no decrease in labor*** use during harvesting from at least the 14th century until early in the last century

The sickle and the scythe

Harvesting tools: labor intensive

- The reason for extreme labor intensive was that the sickle remained the tool used to harvest grain.
- It was used in the United States well into the past century.
- The sickle coexisted with the scythe for some time, then was rapidly replaced by various forms of reapers, then by the binder, and in the current century by the combine.

Modern harvesting tools: The binder

- Prior to the binder, which became common only after the mid-19th century, the stalks of grain were collected into bundles by *a time-consuming hand operation*.
- The binder performed this function mechanically with a great saving in time.
- With the *sickle*, one man could harvest *0.5 acre* per day;
- The binder permitted a man with 2-4 horses to harvest 8-18 acres per day, ***a reduction in labor requirements of 90 percent.***

A reaper-binder was invented in 1872 (Wisconsin)

Thailand's Capital-Labor Ratio farm vs. manufacture

$$\left(\frac{K}{L}\right)^{a} < \left(\frac{K}{L}\right)^{m}$$

A farmer in Mae Hong Son threshes paddy. (Photo by Pattarapong Chatpattarasill)

In rich countries, capital-Labor ratio in agriculture is higher than manufacture

$$\left(\frac{K}{L}\right)^{a} > \left(\frac{K}{L}\right)^{m}$$

But the farm labor shortage problem can be mitigated by farm machinery

Rice farmers harvest in Surin province (2019)

Gale Johnson (1991) ***World Agriculture in Disarray***, 2nd Ed. London: Macmillan,

- According to Johnson (1991), American agriculture has a capital-labor ratio that is six times the ratio in manufacturing.

$$\left(\frac{K}{L}\right)^{a} > \left(\frac{K}{L}\right)^{m}$$

- Agriculture in developed countries are *more* capital intensive than developing countries.
- Thai agricultural labors are deprived of vital inputs: water, fertilizer, machinery, and irrigation
- Output per land and output per farmer is very low.
- Productivity also differs due to high yielding varieties (HYV) of rice strains.

4. Agriculture and Wealth

- Evidence of agriculture's role in contributing to the wealth of nations is found in data on productivity change.
- ***Labor productivity growth in agriculture has been greater than in the other sectors of the economies in the industrial countries***.

Johnson, D. Gale. "Agriculture and the Wealth of Nations." *The American economic review* 87.2 (1997): 1-12

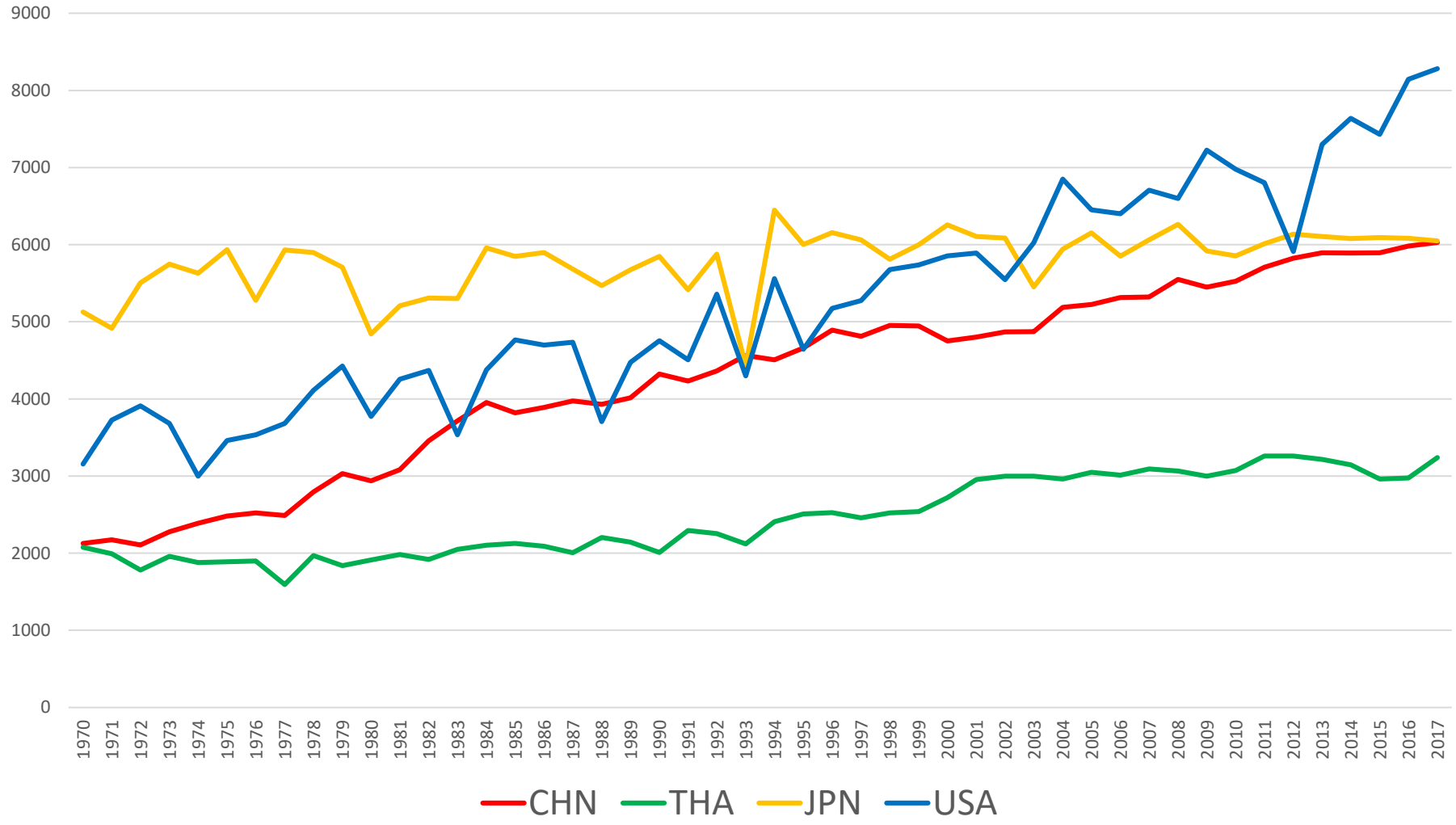
- This was especially true during the postwar period up to 1980.
- From 1967-1968 to 1983-1984, for 17 of 18 industrial countries for which there were data on changes in GDP in constant prices, labor productivity growth in agriculture exceeded that in other sectors.

The real obstacle to farming is not limited farm land

- Much of the concern over future world food supplies is based on the assumption that land is the limiting resource (See Siamwalla), which is putting the emphasis in the wrong place.
- But Johnson argues that major factors that limit the growth of food production in developing countries are:
- **(1) Knowledge and research, (2) the availability of nonfarm inputs at reasonable prices, and (3) the governmental policies that affect incentives**.
- If policies provide for the first two and do not discriminate against agriculture in trade and macroeconomic policies, farmers will do the rest, according to Johnson.

Comparison of crop yield: 1970-2017

(Kg per hectare)



China's super rice vs กข 83:

- *China's super rice breed yields 2,000 kg per rai.*

- Thai farmers harvest only 400kg per rai.
- "*Pathum Thani* 1" one of the best cross-breeds yields only 500kg per rai.

A new HYV In 2019*: *Kor Kho 83 has an average yield of 542 per rai

กข 83 black jasmine rice has **maximum yield** of ***864 kg.,*** plant *disease resistance*, *non-sensitive to light*, can be grown in wet and dry planting seasons, gestation period 130 days.

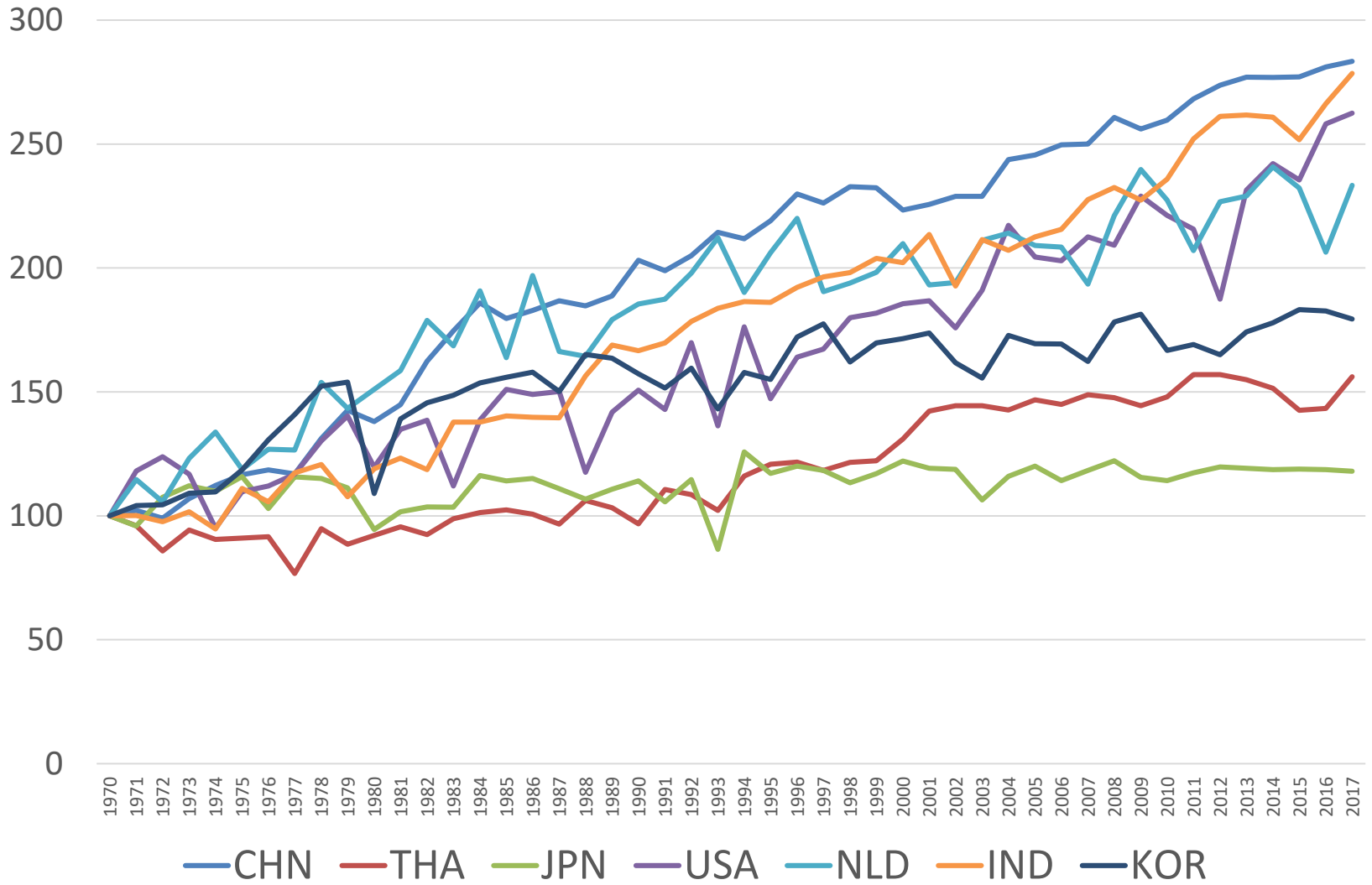
Nong Kai's black Jasmin rice

Average yield: 542 kg/rai

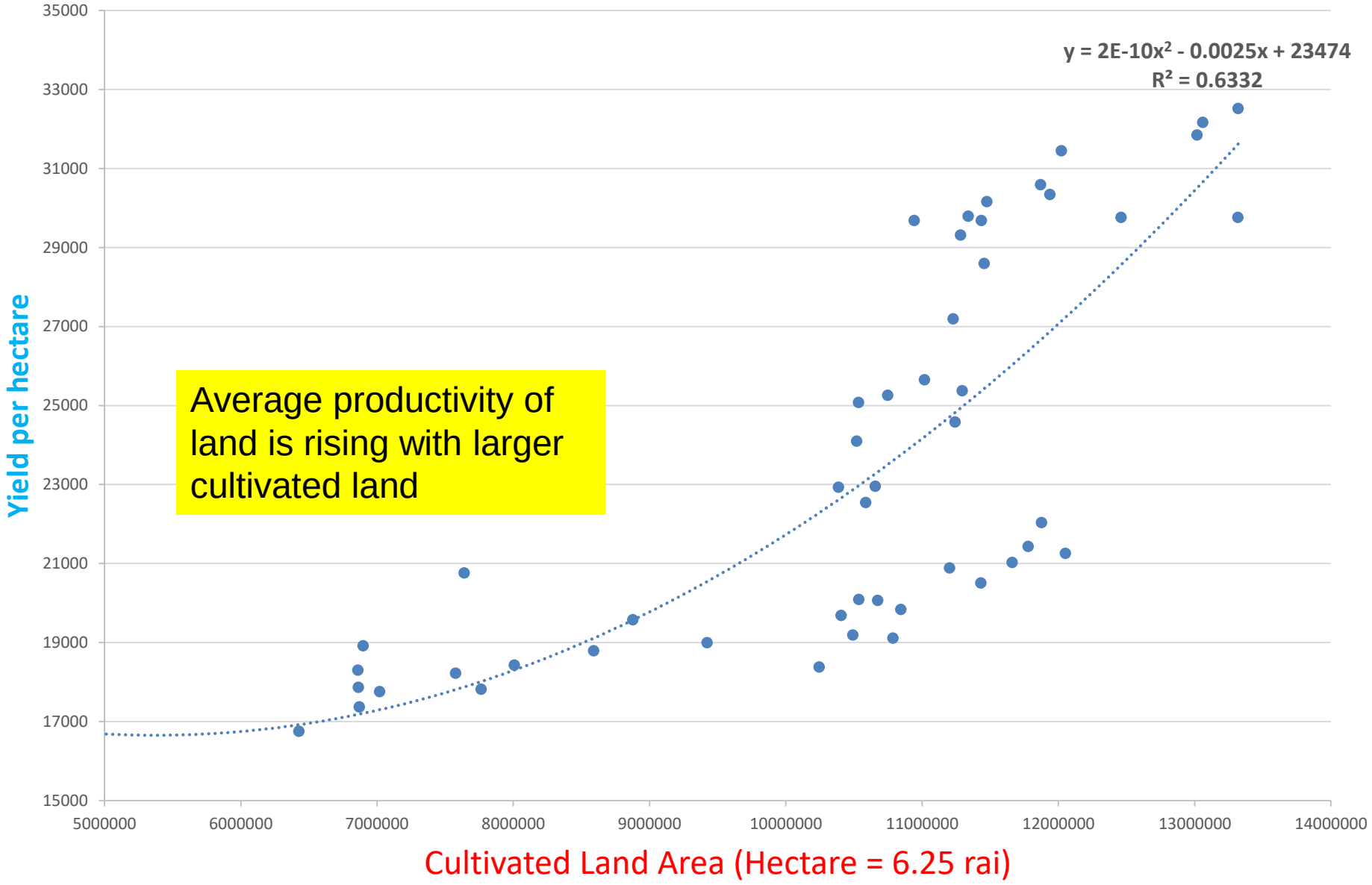
"ข้าวพันธุ์นี้ มีสารต้านอนุมูลอิสระสูง กรดเฟอรูลิค แกมมาออไรซานอล วิตามินอี ฟีนอลิค และฟลาโวนอยด์ เมื่อหุงสุกข้าวสวยเหนียว นุ่ม มีกลิ่นหอม ต้านทานต่อโรคใบไหม้ในระยะกล้าในภาคตะวันออกเฉียงเหนือ ภาคเหนือ และภาคกลาง ต้านทานโรคถอดฝักดาบในภาคตะวันออกเฉียงเหนือ เหมาะสำหรับปลูกในพื้นที่นาชลประทานและนาน้ำฝนภาคตะวันออกเฉียงเหนือ โดยเฉพาะพื้นที่ที่มีโรคไหม้ระบาดหรือพื้นที่ที่ต้องการข้าวคุณภาพพิเศษ ซึ่งมีตลาดเฉพาะสำหรับกลุ่มผู้บริโภคข้าวเพื่อสุขภาพ โดยในขณะนี้ กรมการข้าวกำลังดำเนินการวิจัยต่อยอดการใช้ประโยชน์ข้าวพันธุ์นี้ ร่วมกับ

Crop yield index (land productivity)

1970=100



Thailand's Productivity of Cereals (1961-2016)



5. Irrigation
Distribution vs. controlled irrigation

- By the mid-1800s, a number of canals had been constructed in the central plain to carry floodwaters from the Chao Phraya, and in the latter half of the century other canals were dug.
- The canals did not form a controlled irrigation system, however, but simply a ***distribution network***, and *whether additional water could be made available depended on the level of the rivers.*

Distribution canal 2: Klong 2 district Prathum Thani province

Rice growers try to seek ground water from the dry irrigation canal in Nakhon Sawan
December 2019

Don’t delay irrigation development

- Records covering almost a hundred years to 1930 showed that in about ***one-third of the years water from the rivers was insufficient***, resulting in considerable crop losses.
- In 1902 the government contracted with a ***Dutch expert*** to develop a controlled irrigation plan for the entire country but ***failed to take further action***.

Zeewolde: Controlled irrigation in Netherlands

Crisis-led development

- Droughts in 1910 and 1911 led to renewed interest and the hiring of a British irrigation specialist.
- Nevertheless, the first irrigation project was not completed until 1922.
- *What lessons can we learn from the history?*

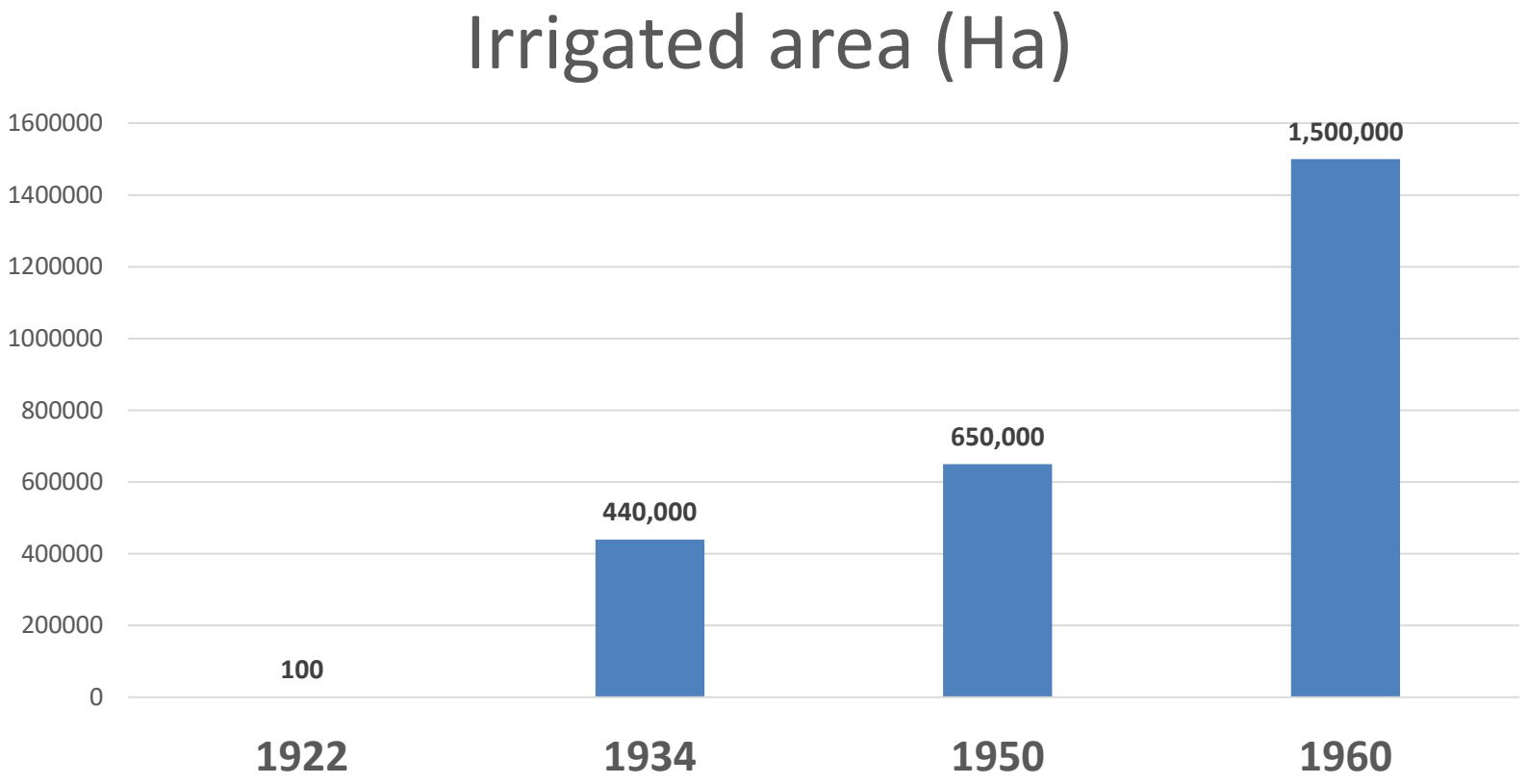
Thanks to the 1950 WB loans

- By 1938 about 440,000 hectares had been irrigated. Supply problems held up projects during World War II, but work resumed with renewed vigor in the late 1940s.
- By 1950 the irrigated area totaled nearly 650,000 hectares.

The big push theory of development

- In 1950 Thailand secured the first of *a series of loans from the World Bank* for the construction of the vital ***Chainard Diversion Dam*** on the Chao Phraya and a number of major canals.
- *By 1960 over 1.5 million hectares had been irrigated, almost entirely in* ***the Center and the north.***

The big push on irrigation development prior to the 1st development plan

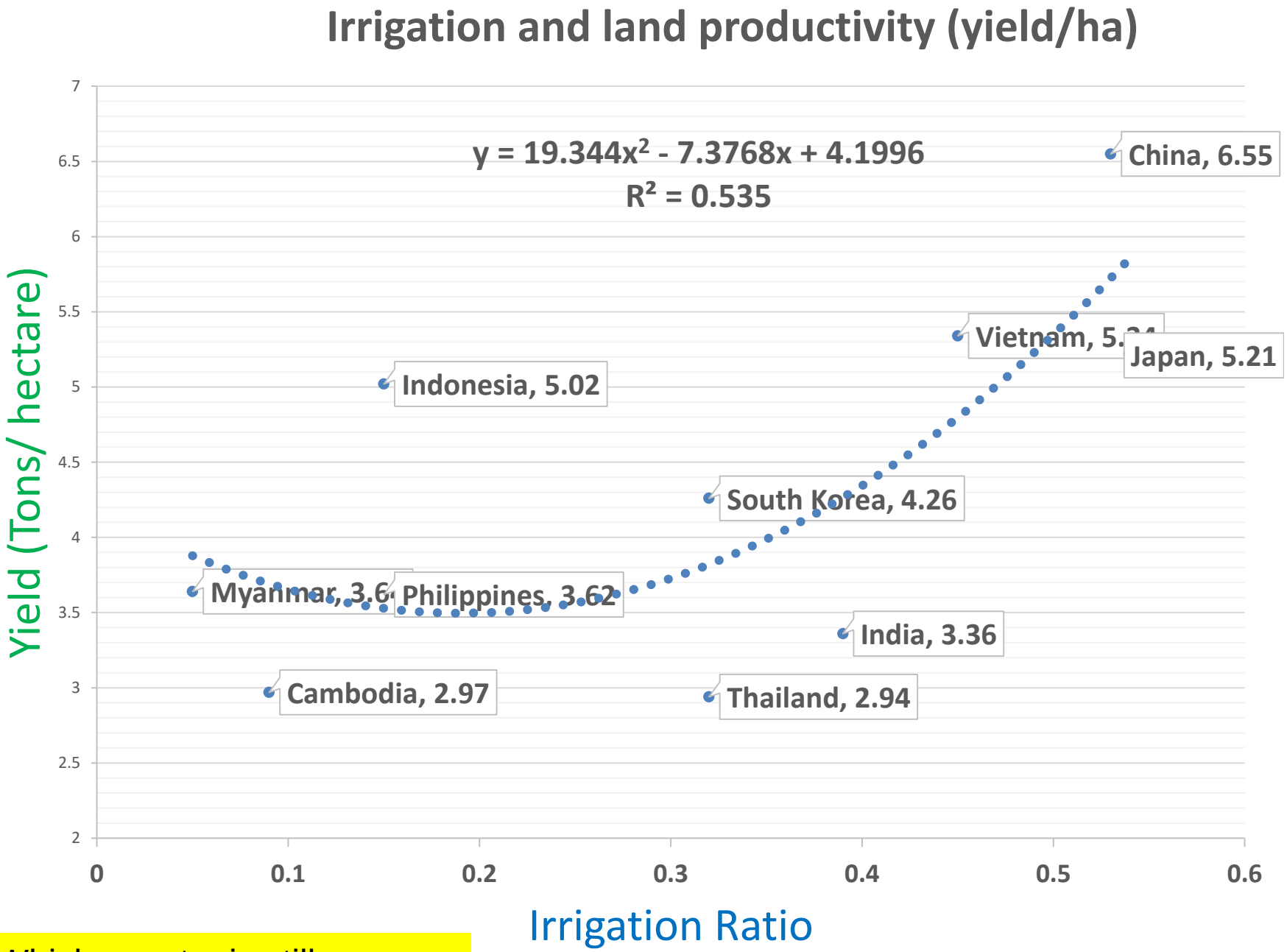


The first economic development plan (1961-66) further investment in multipurposed dams

- Systematic development of the irrigation system began with the First Economic Development Plan (1961-66) and was continued in later plans.
- New assistance from the ***World Bank*** included financing of the important multipurpose Bhumibol Dam (completed in 1964) on the Mae Nam Ping and the Sirikit Dam (completed in 1973) on the Mae Nam Nan.

Hydroelectric power-generating dams Private and public benefits

- These dams, both of which have associated hydroelectric power-generating facilities, impound water at two large reservoir locations in the Chao Phraya Basin.
- Other World Bank-financed projects were also carried out in this basin during the 1970s, and by the end of the decade nearly 1.3 million hectares had controlled water flow in the rainy season, and about 450,000 hectares had it in the dry season.
- Note the different source of financing mega dams along **the upper Mae Kong river** in China and Laos. Those projects are mainly financed by Thai and Chinese investors.



Which country is still importing rice?

Heterogenous Production Functions

- Public investment in irrigation is required to reduce the number of *rain-fed farming*.
- Productivity of irrigated farm is higher by water supply which is required by high yielding varieties (HYV).
- Different rice farming technology implies different production function and capital-labor ratio, due to ageing farmers and labor shortages.

Conclusion: Changing crop patterns

- Agricultural output changes in ***response to price incentives***, which can be affected by government subsidies and external factors.
- The force of competition ensures that only cost competitive commodities can survive.
- Rising cost of production and changing demand pattern can be detrimental to export commodities.
- ***Market intervention*** by the government is costly, inefficient, and disruptive due to distorted incentives.

Concluding remarks: Transforming Traditional Agriculture

- Governments throughout the developing world continue to ***exploit agriculture*** through export taxes, price controls, and protection of the agricultural input sectors.
- Schultz warned numerous governments that the accepted conventional wisdom that there was surplus agriculture labor that could be withdrawn at little cost to provide labor for industry development.
- **Industry** was arguably ***claimed*** to be the real engine of economic growth, while in fact it was the agriculture that is the source of the wealth of nations.

Goodbye to agricultural exploitation, say hello to agricultural subsidies

- The agrarian exploitation generally persisted well into the 1980's. (Thailand abolished the rice premium export tax in the 1970s).
- The history of that exploitation *vindicates* the view of Schultz that agriculture should not be discriminated against.
- However, Thailand's agriculture subsidies have been employed for political purposes.

Review Questions

- How does China's new normal growth affect Thailand's agricultural sector?
- "The future of Thailand's agriculture is rather bleak" Discuss.
- How does the productivity growth of agricultural sector contribute to the wealth of Thailand.