

Resilience and Dynamism of Thai Agriculture

Bhanupong
Lecture 11

Diversification and dynamism
Learning by doing

Course Syllabus

Lecture 11: Resilience of Agriculture

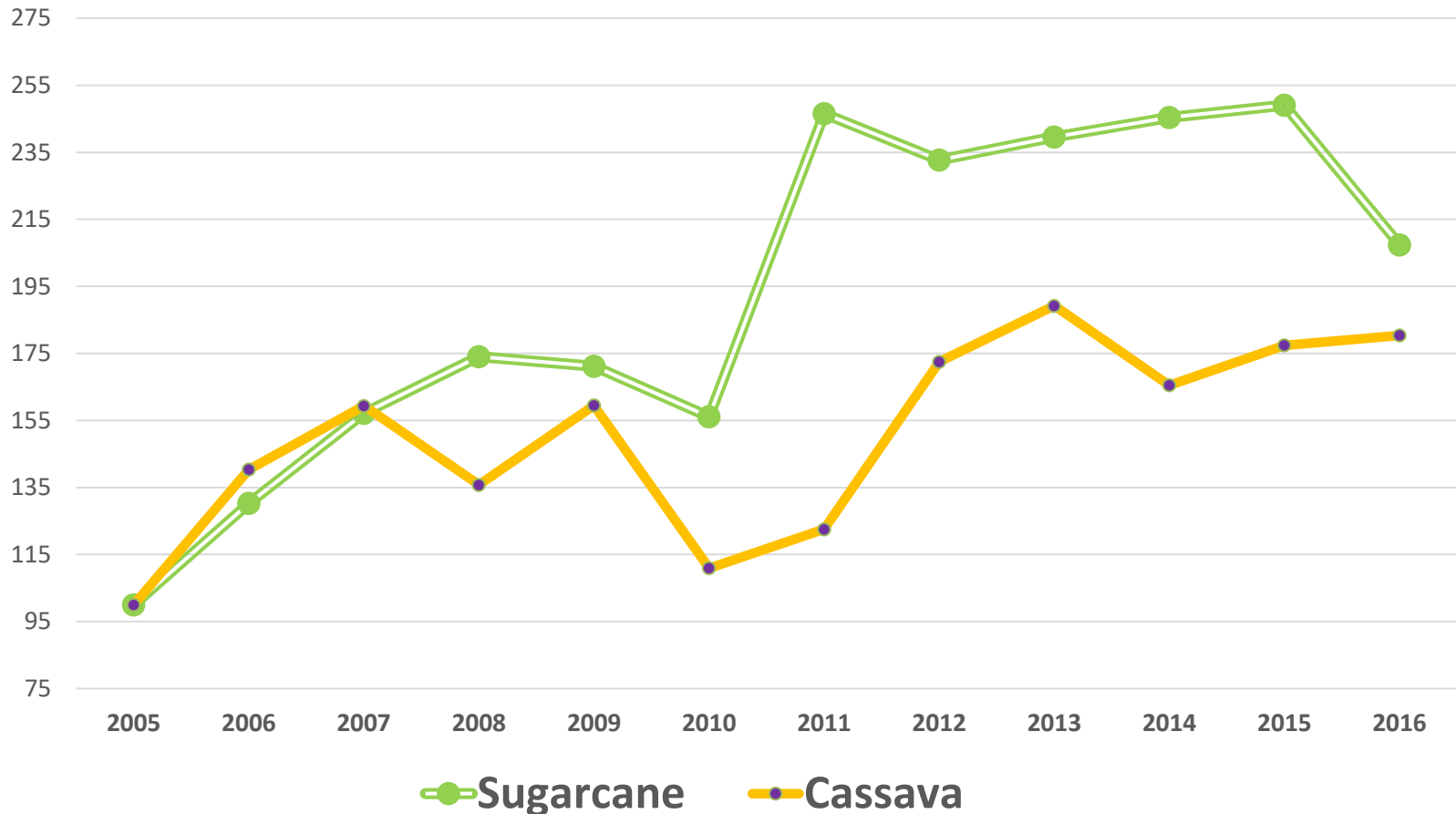
- The trend of Thailand's agricultural exports and Baumal-Bowen Hypothesis.
- Comparative advantage of Thai agriculture
- Learning curve effect and agricultural export diversification.
- “Dynamism of the Thai Agriculture” *East Asian Economic Perspectives*, 12(2), August 2005

Key Words

- The importance of crop prices to Thai agriculture
- Baumal-Bowen (cost disease) Hypothesis
- Comparative advantage of Thai agriculture
- Learning curve effect
- Export diversification: product and market

A sign of dynamism: emerging new crops

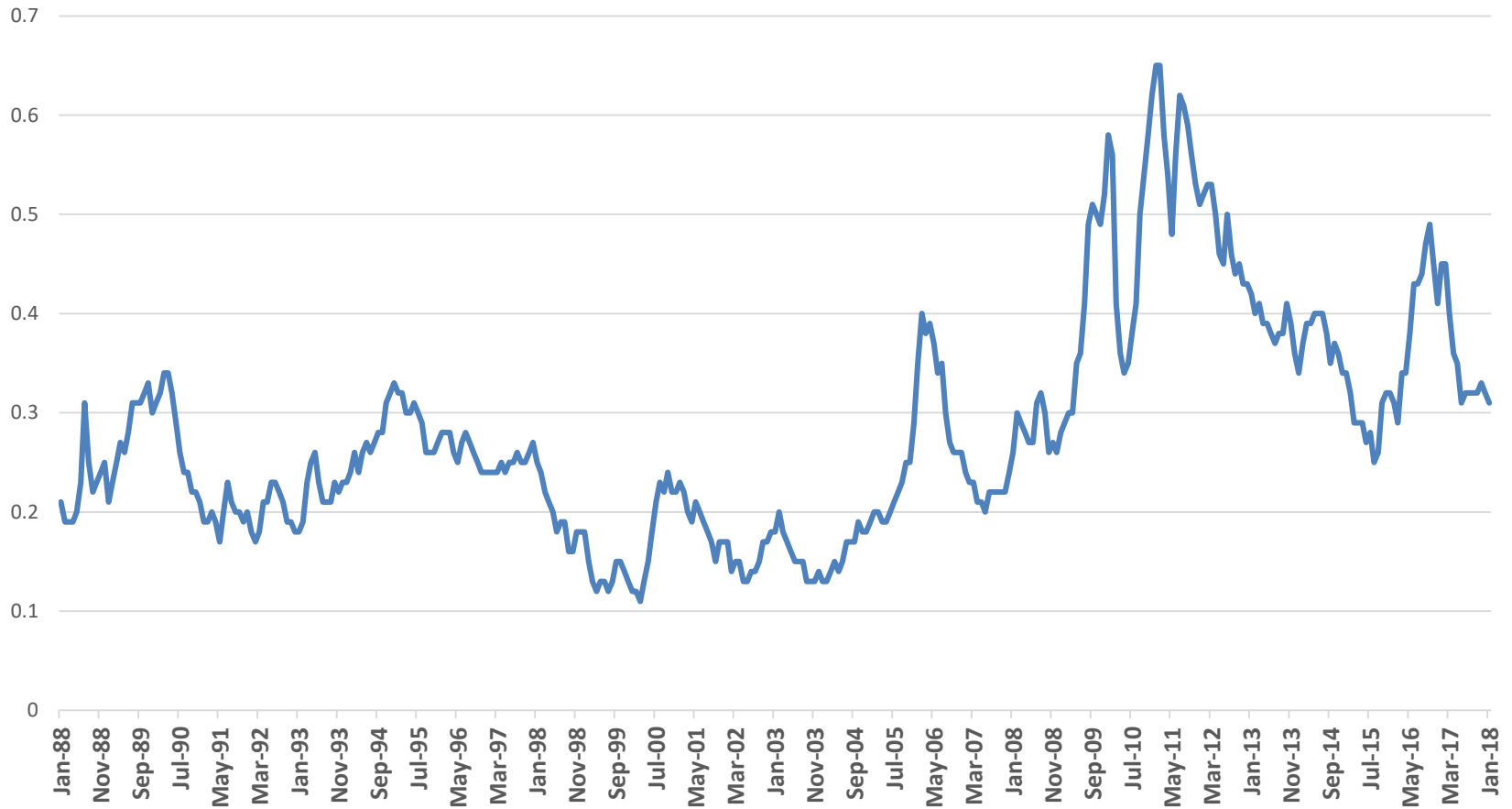
Crop Production Index



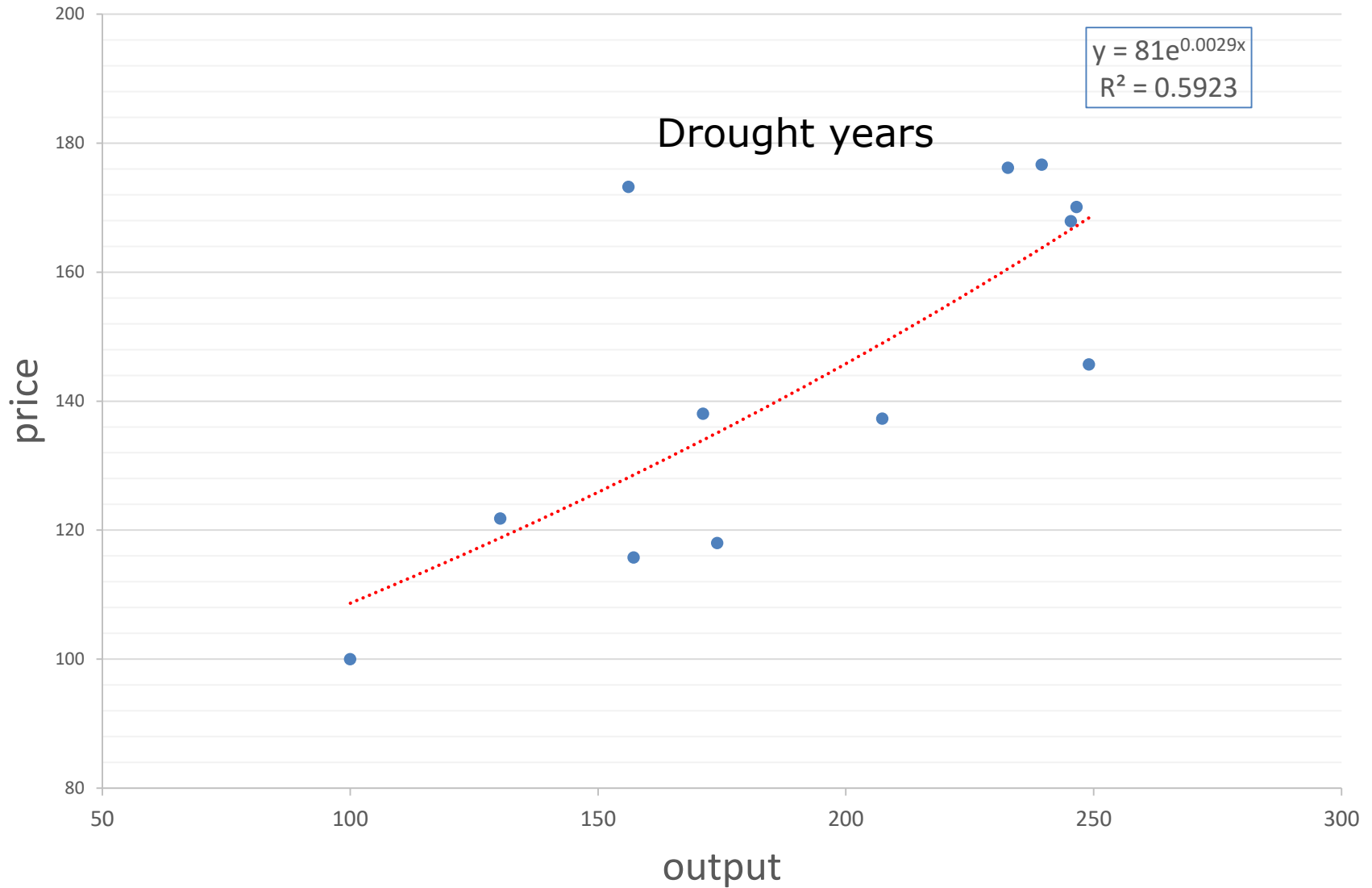
Supply shocks and price volatility

1988-2018

World Sugar Price (USD/kg)

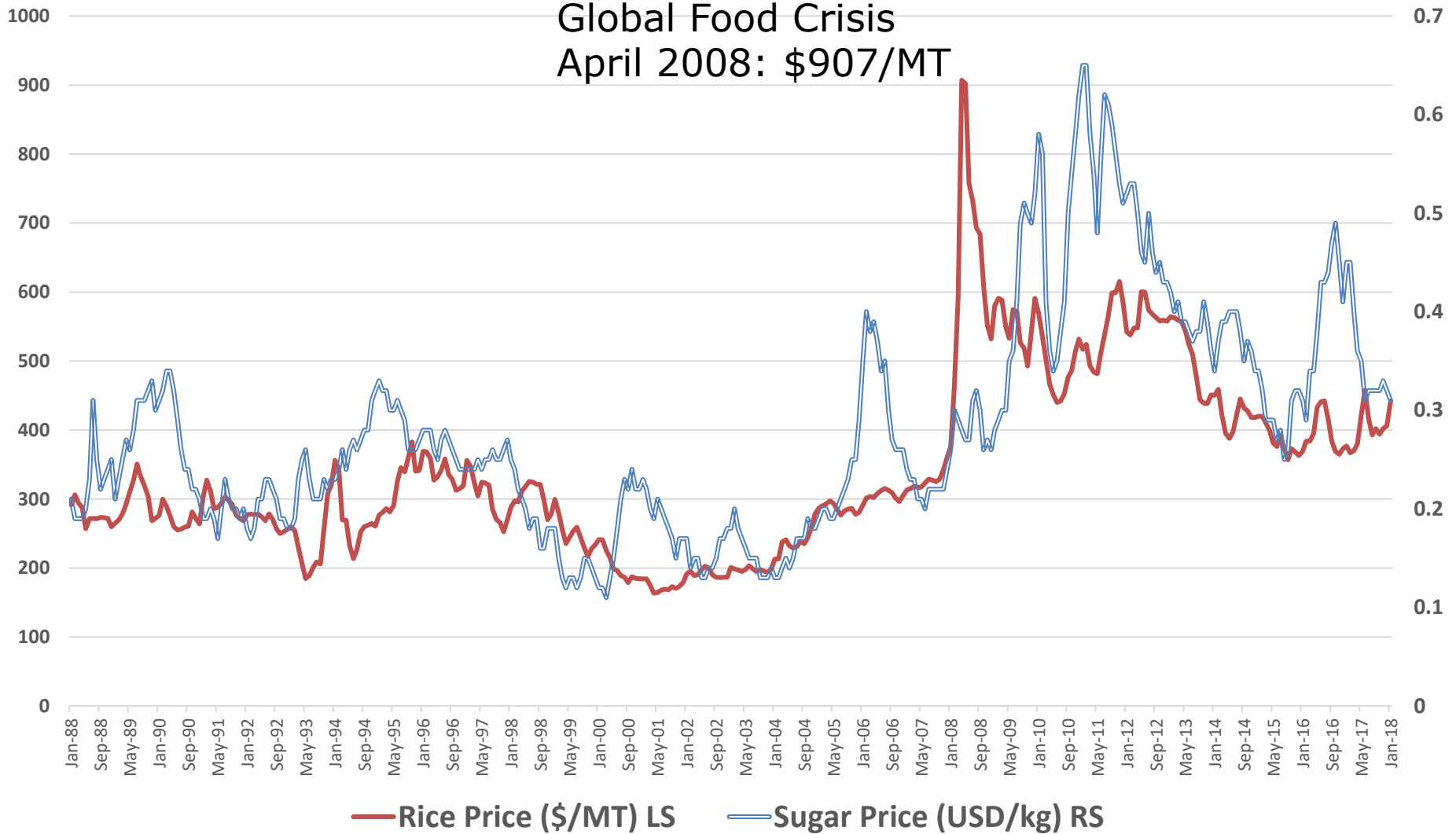


Sugarcane supply response to sugar price

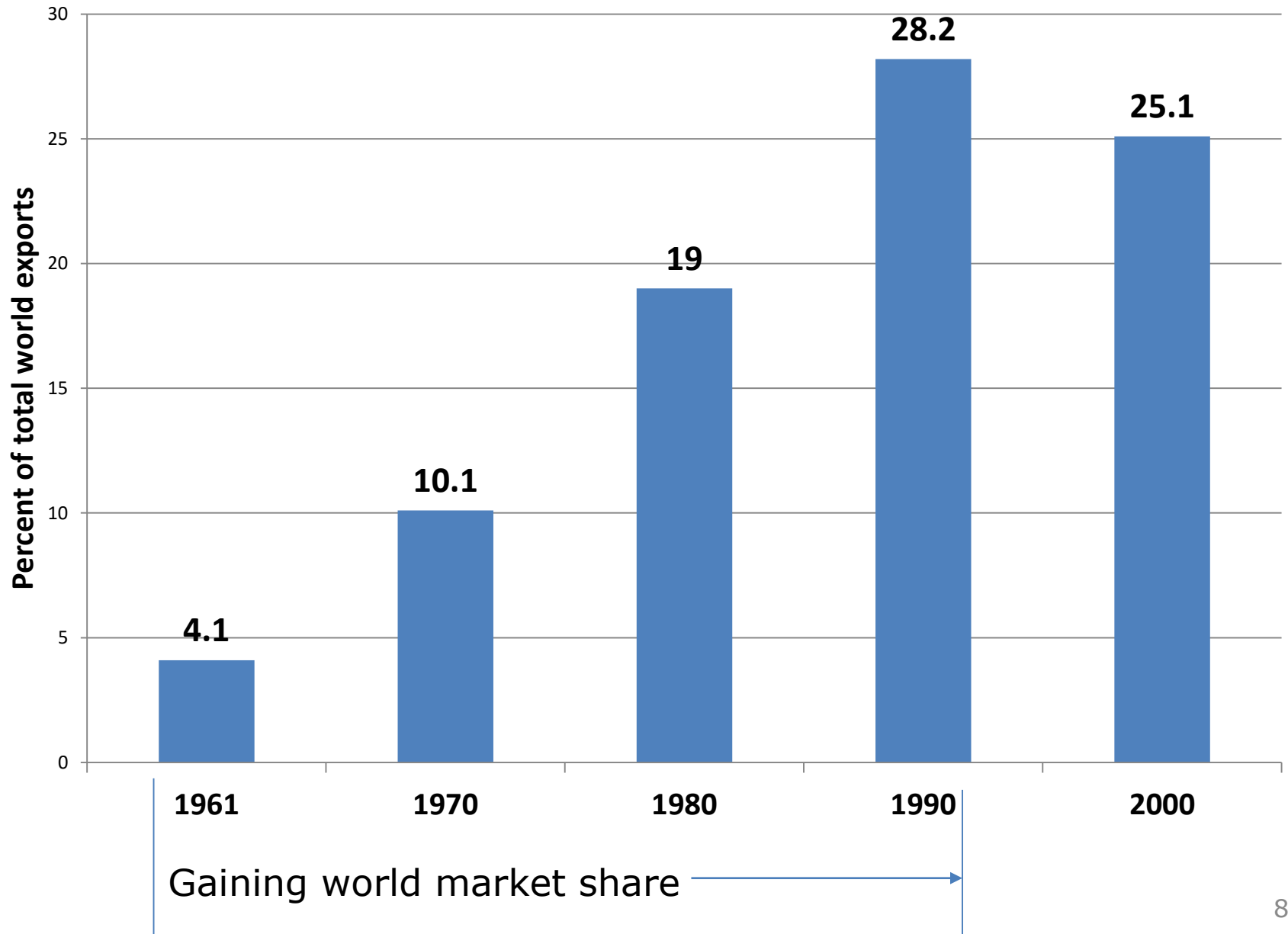


Rice (5 % broken milled white rice) and Sugar Prices in the past three decades

Global Food Crisis
April 2008: \$907/MT

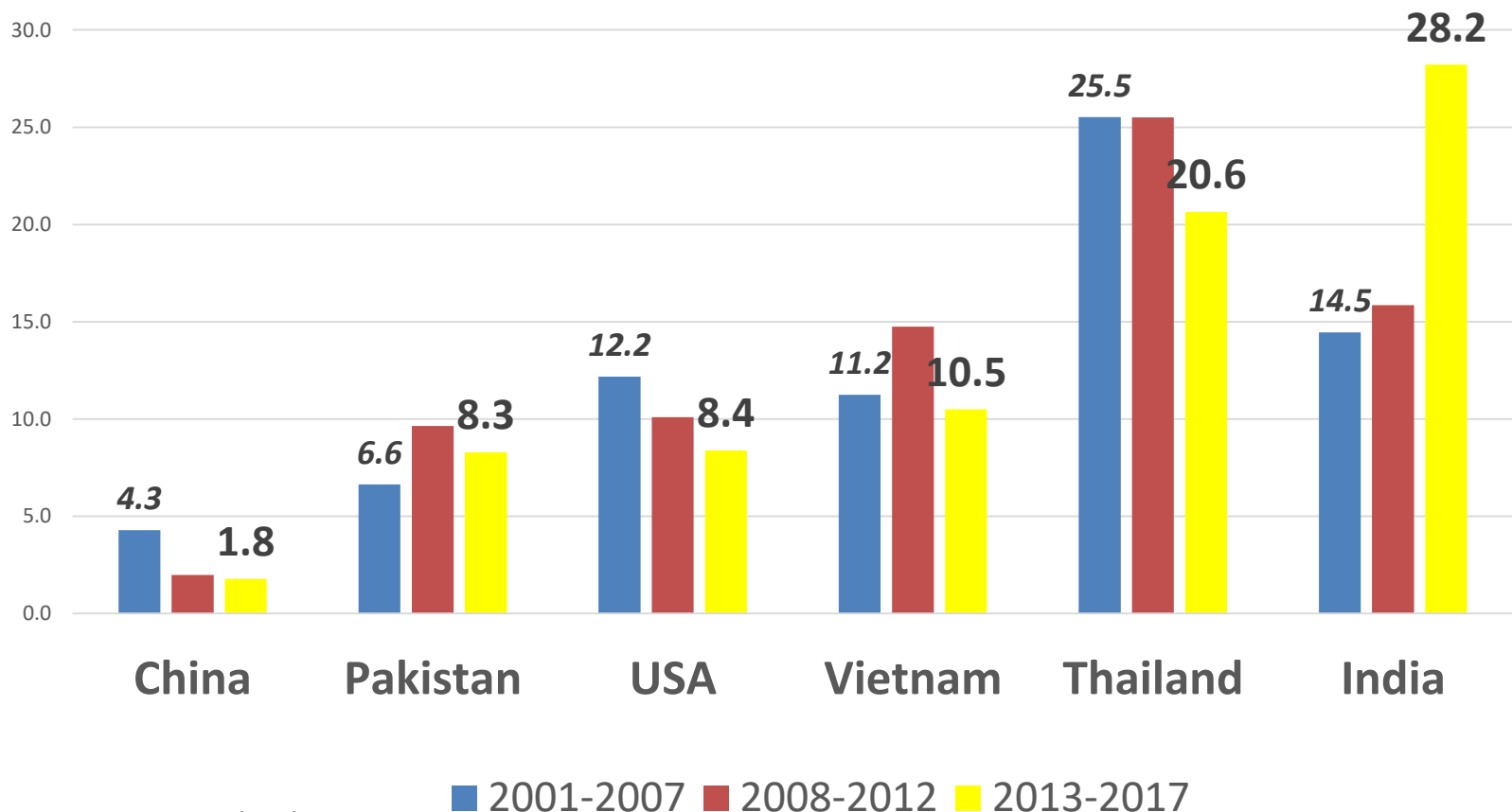


World Market Share of Thailand's rice exports



How long can Thailand sustain her world market share?

World Market Shares of Rice Exports



Source: International Trade Center

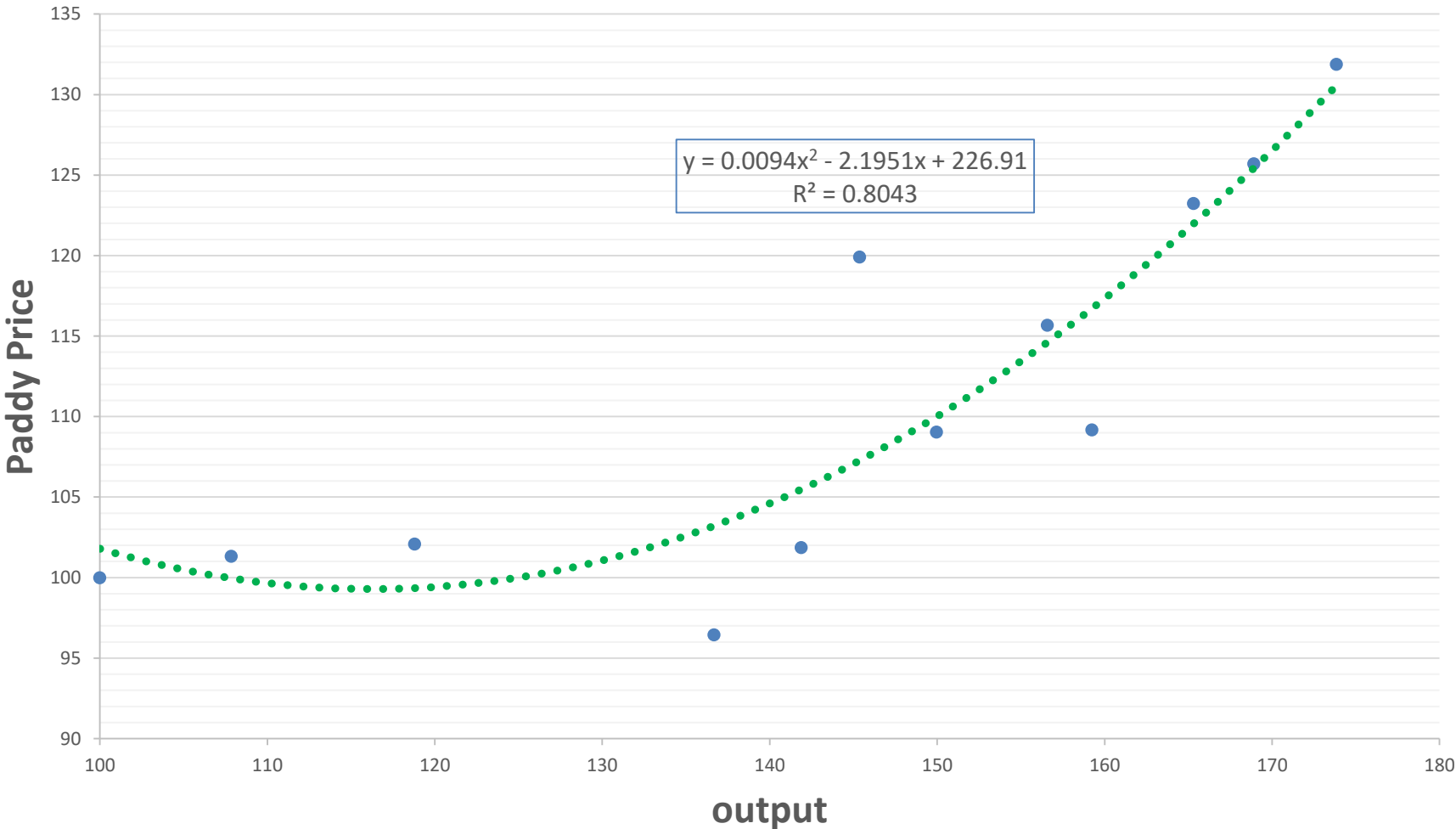
Why do we care about the market share?

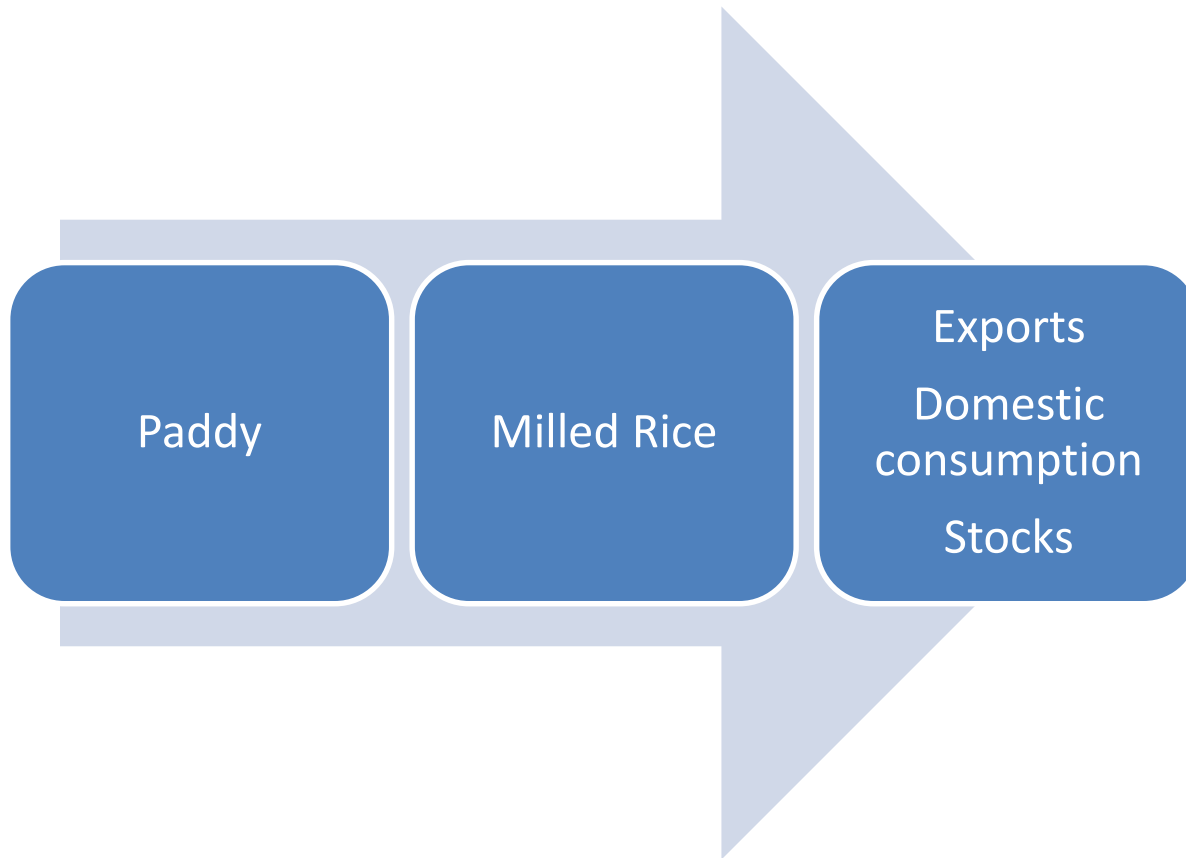
- A large market share implies a certain degree of monopoly power.
- By restricting supply of exports, Thailand can raise export earnings since the demand is somewhat price inelastic (in 1990).
- On the other hand, if the world market share is small, restricting the export supply can lead to shrinking export revenues.

The shape of the demand curve

- As a rule, when the demand is elastic, reducing price leads to higher revenues.
- If there are plenty of substitutes, and when the cost of production rises, the world market shares will be declining.
- A declining market share suggests that the product has lost competitiveness and begun to retreat or create new products.

Paddy supply responses to prices 2005-2016





Rubber Tapping

An eight- millimeter deep and a rough 30-centimetre long incision is made along a spiral shape underneath the cut of the previous day.



The viscous white liquid slowly drips into a cup attached to the tree for about four hours, until the cut has healed itself



Rubber sheet

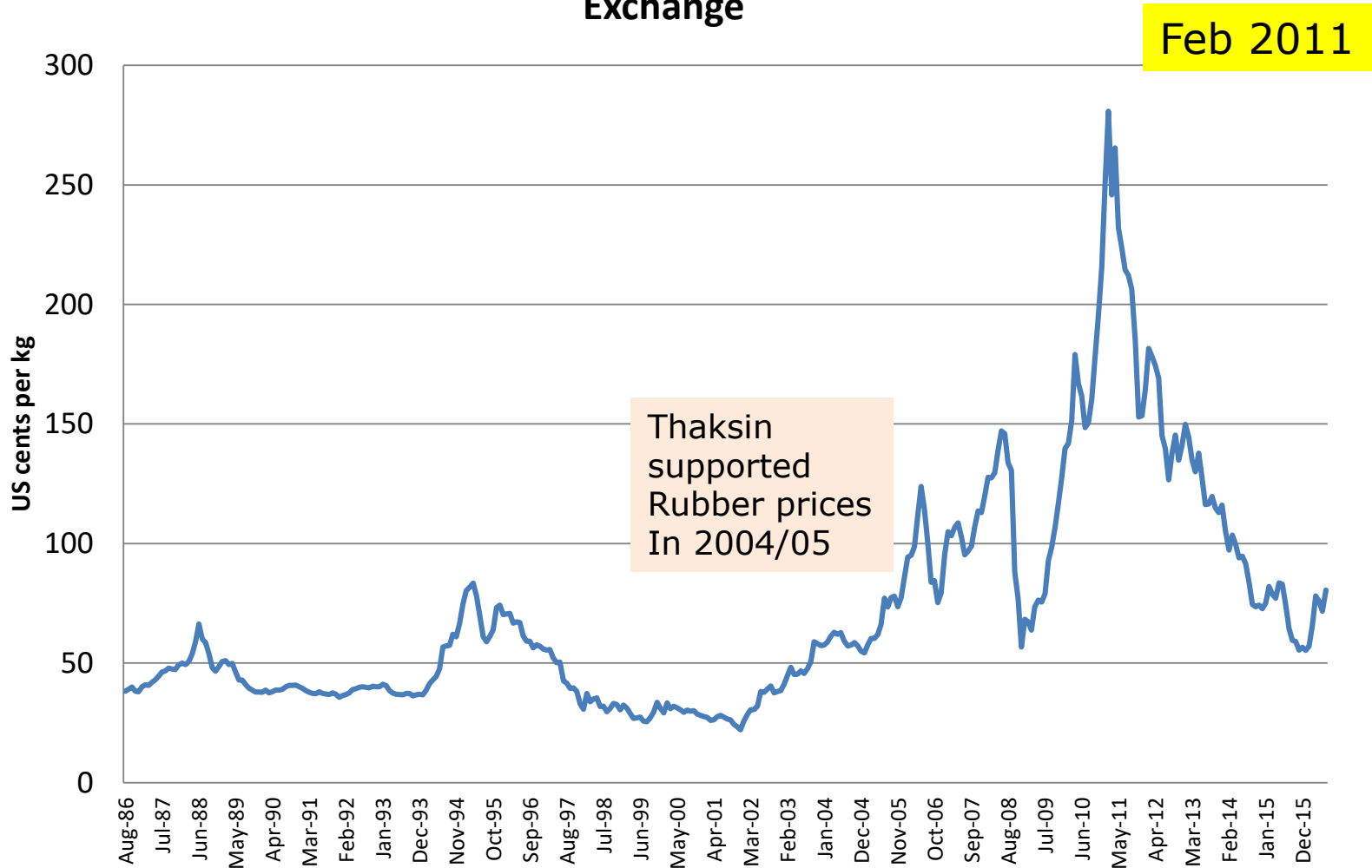
Prices for natural rubber have decreased dramatically since February 2011, affecting about two million people in Thailand who struggle to make a living.

It hurts my brain and drains my soul.



High prices brighten my heart

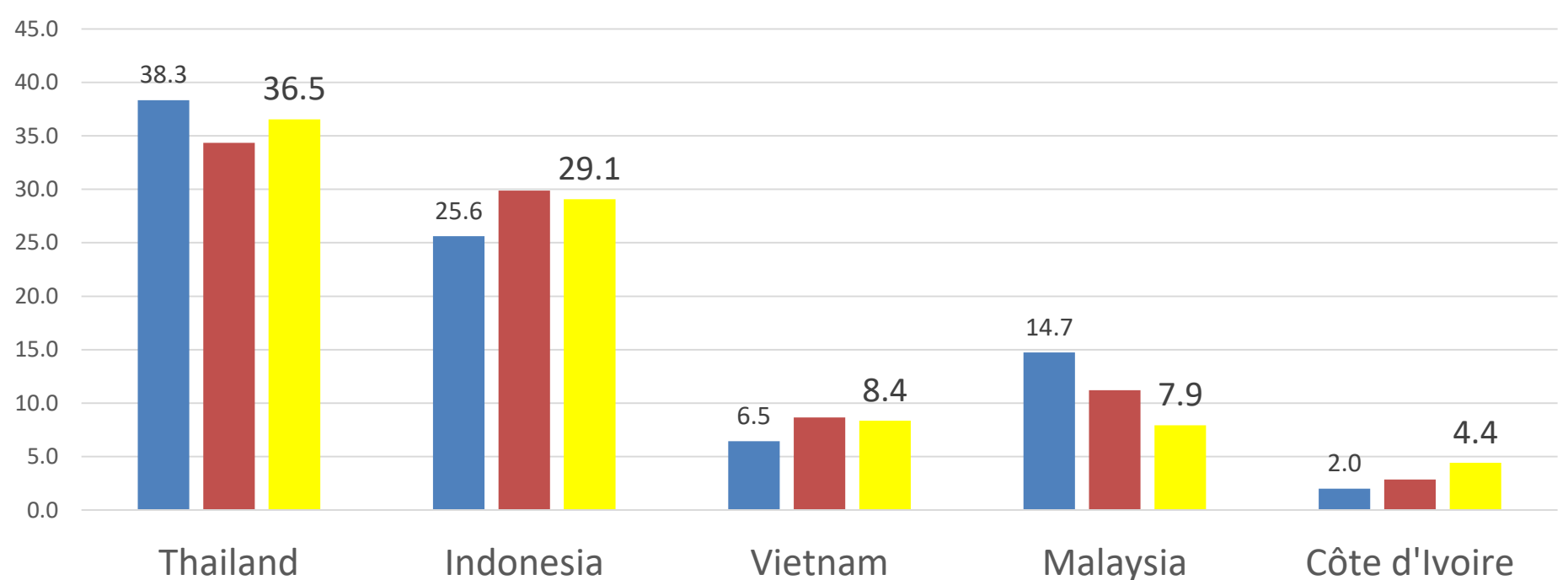
Rubber Price
Rubber, No. 3 Smoked Sheet (RSS3), Singapore Commodity Exchange



No ground for complacency: Rubber

World Export Market Shares of Natural Rubber

■ 2001-2007 ■ 2008-2012 ■ 2013-2017

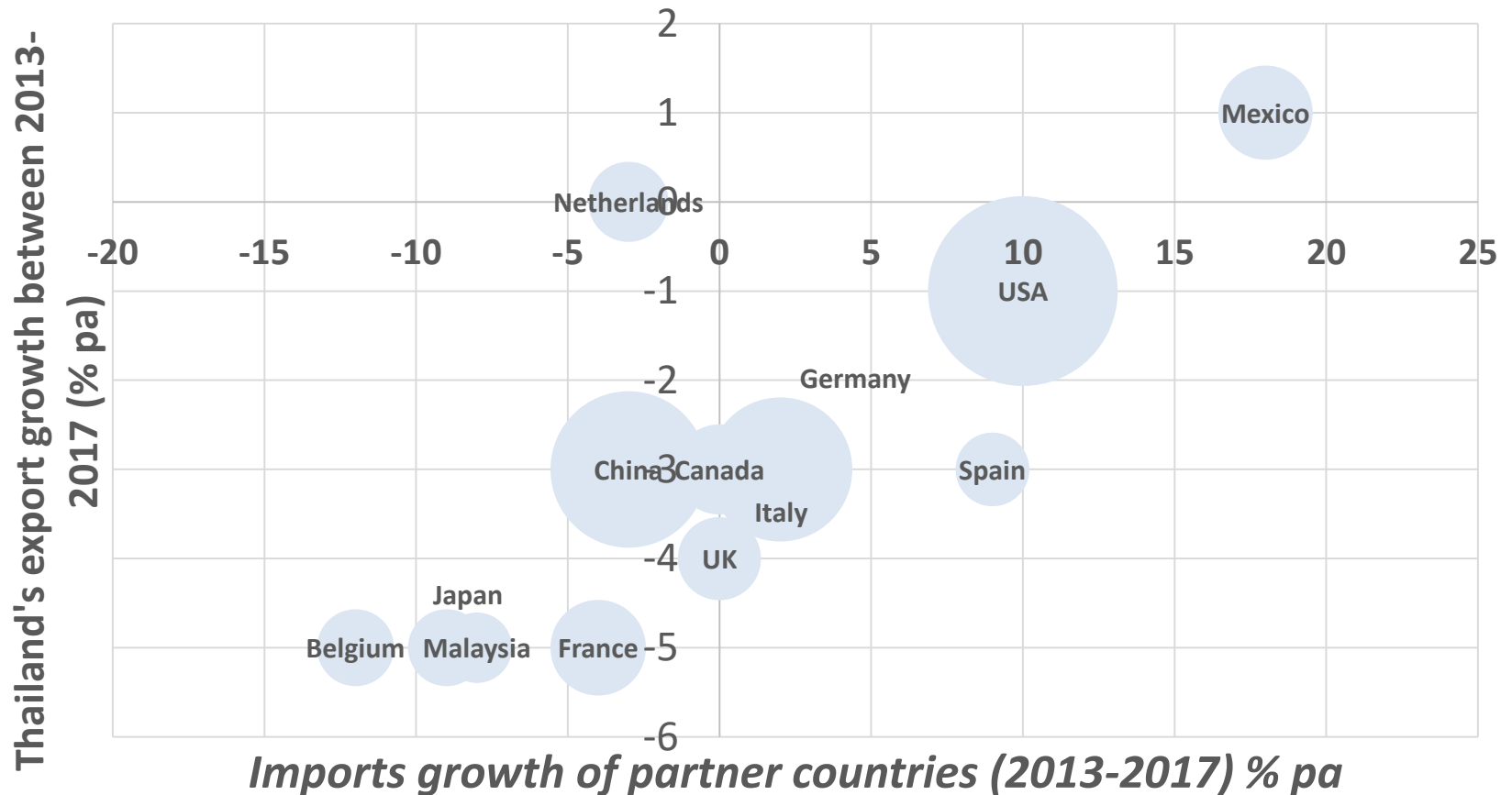


Source: International trade Center

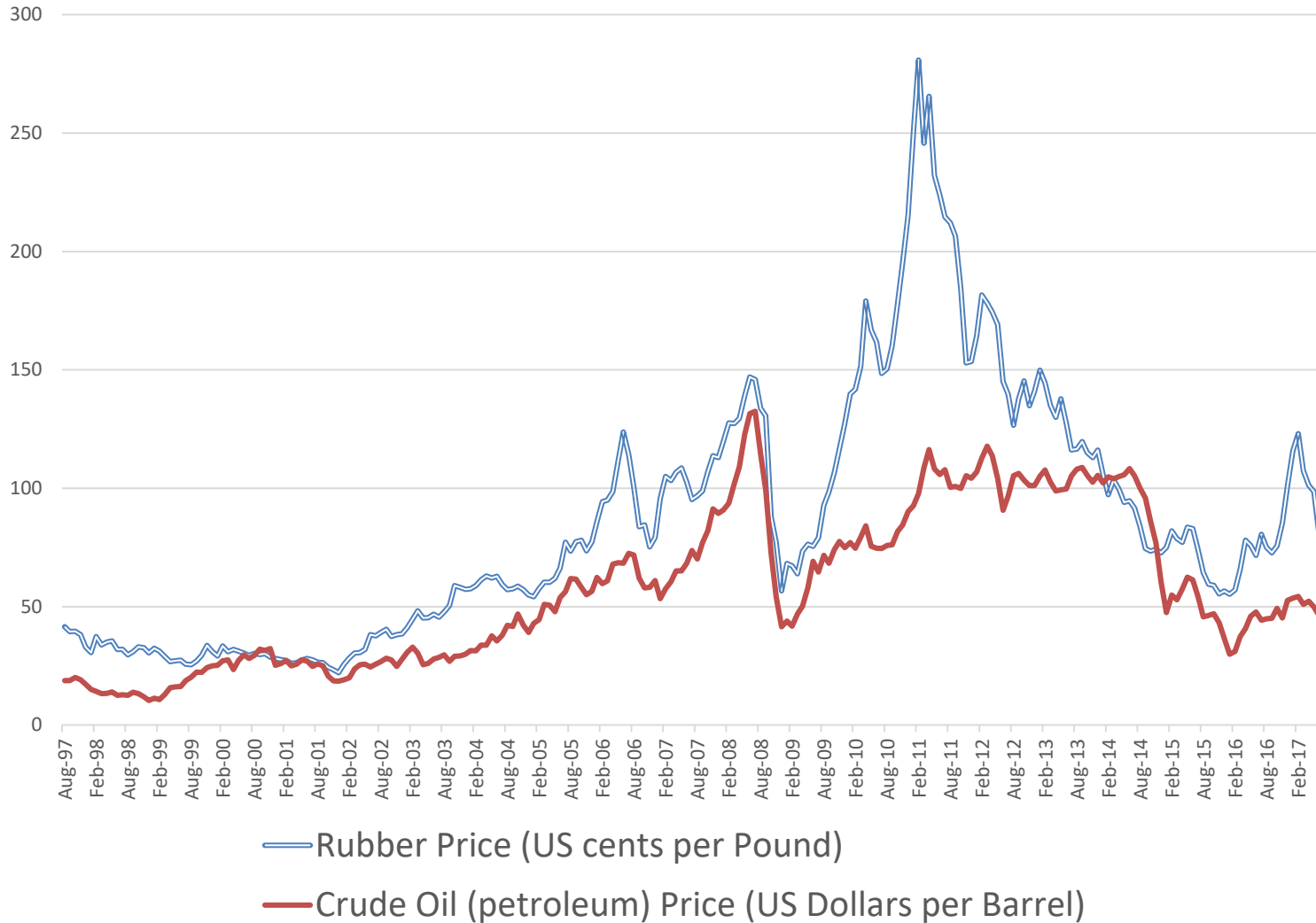
Rubber: Retreating and missed opportunities

(Bubble sizes indicate share in world import markets)

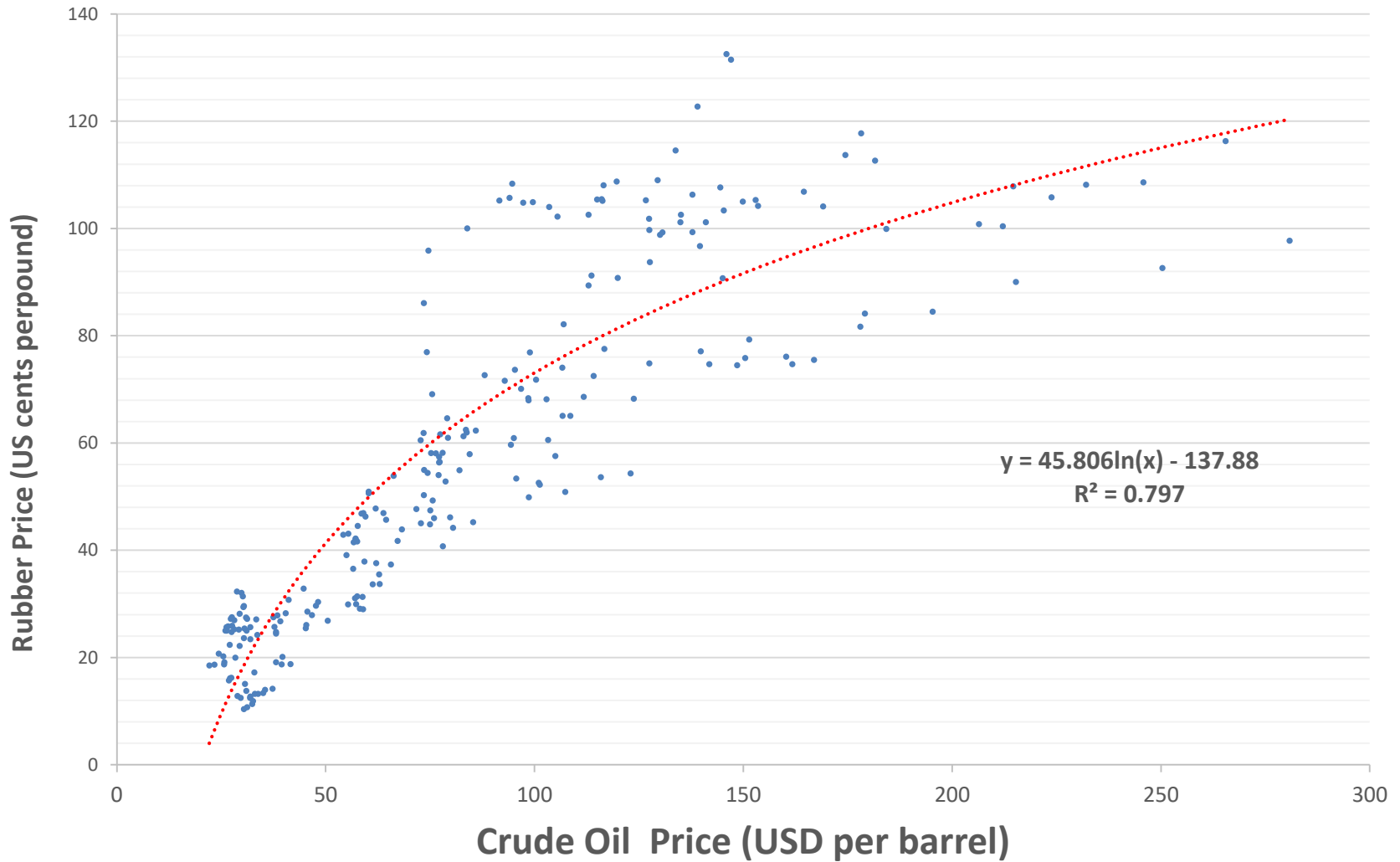
Source: International Trade Center



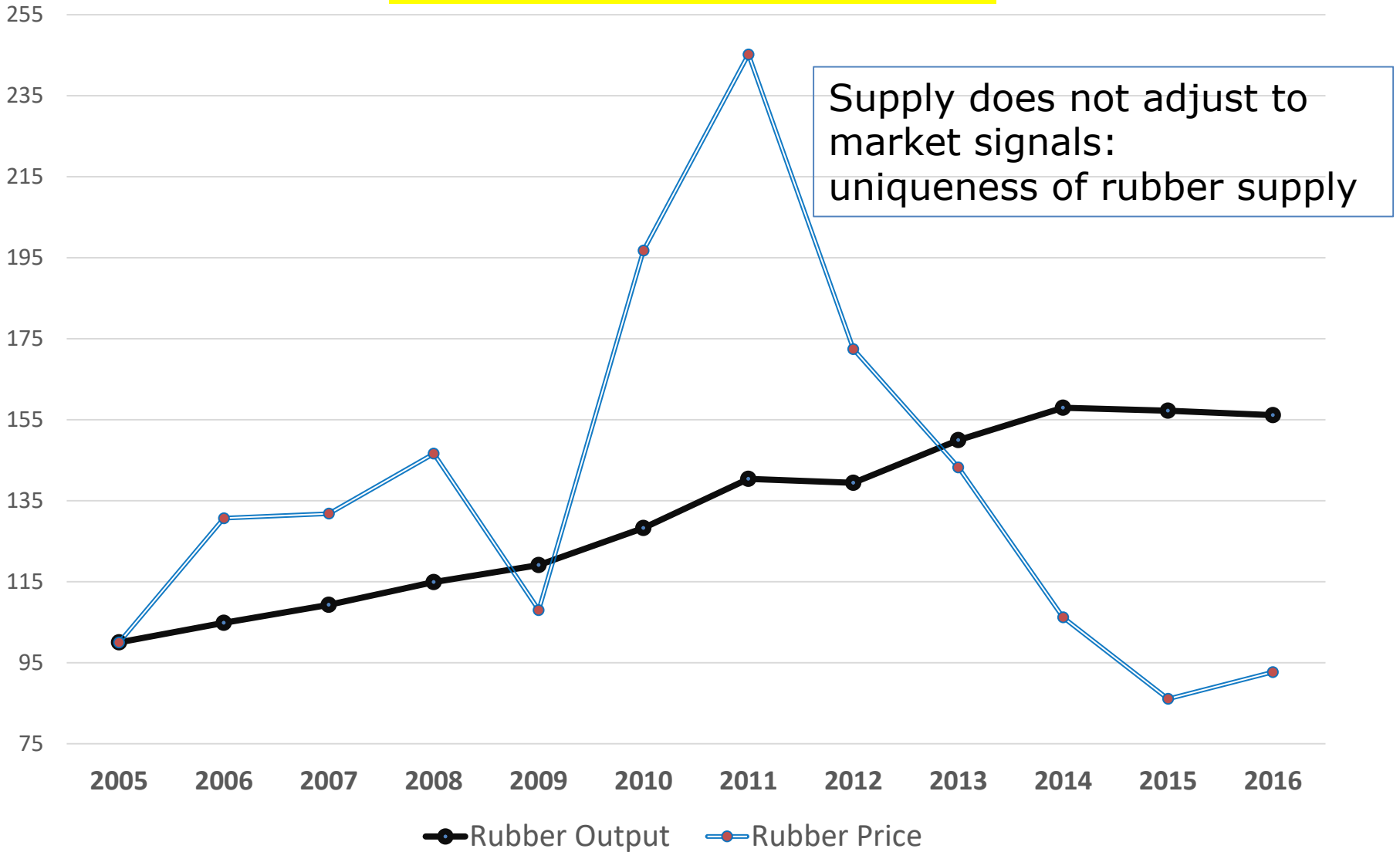
High Correlation: Rubber and Crude Oil Prices January 1997-September 2017



Crude Oil and Natural Rubber Prices January 1997- September 2017



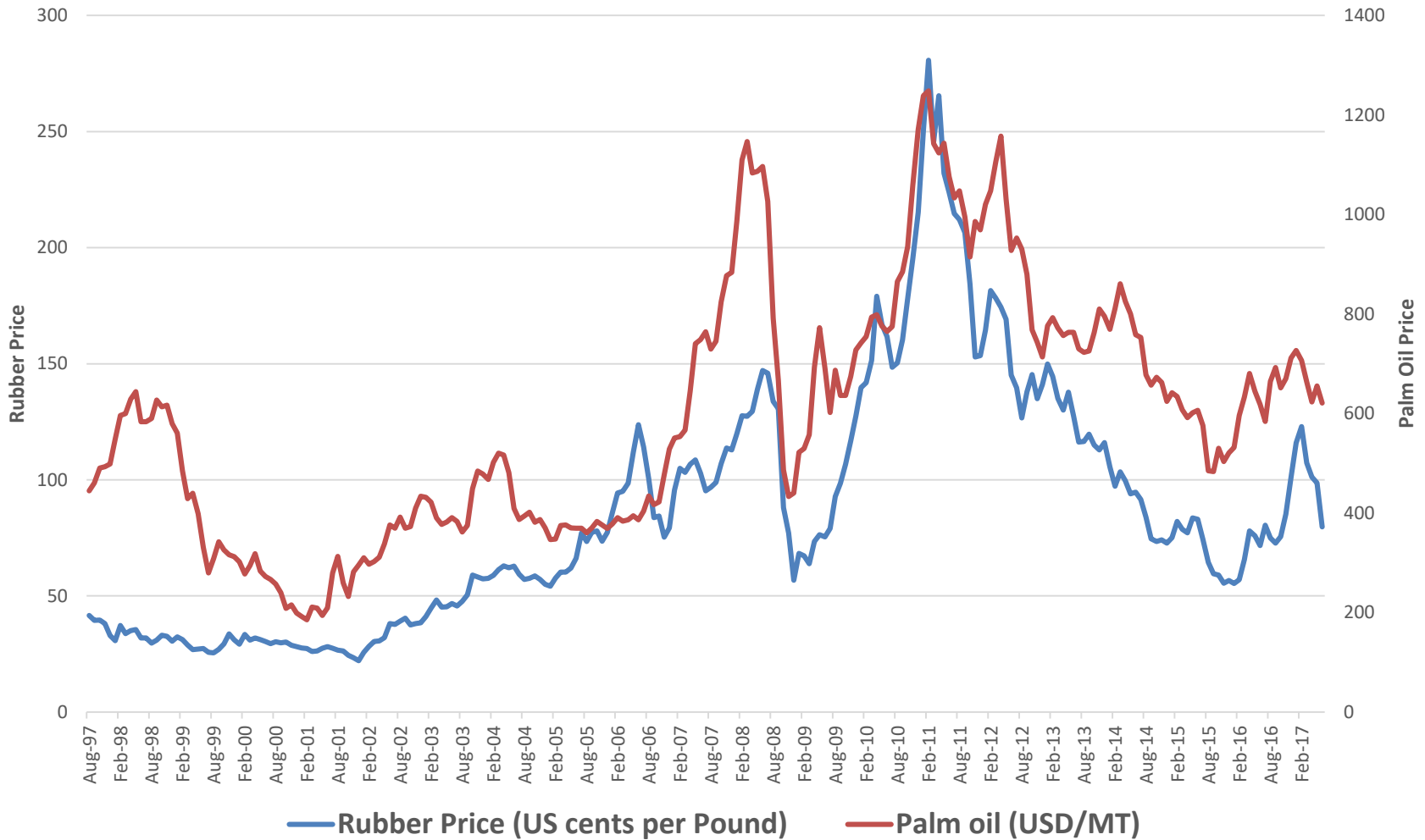
Rubber farmers are in trouble



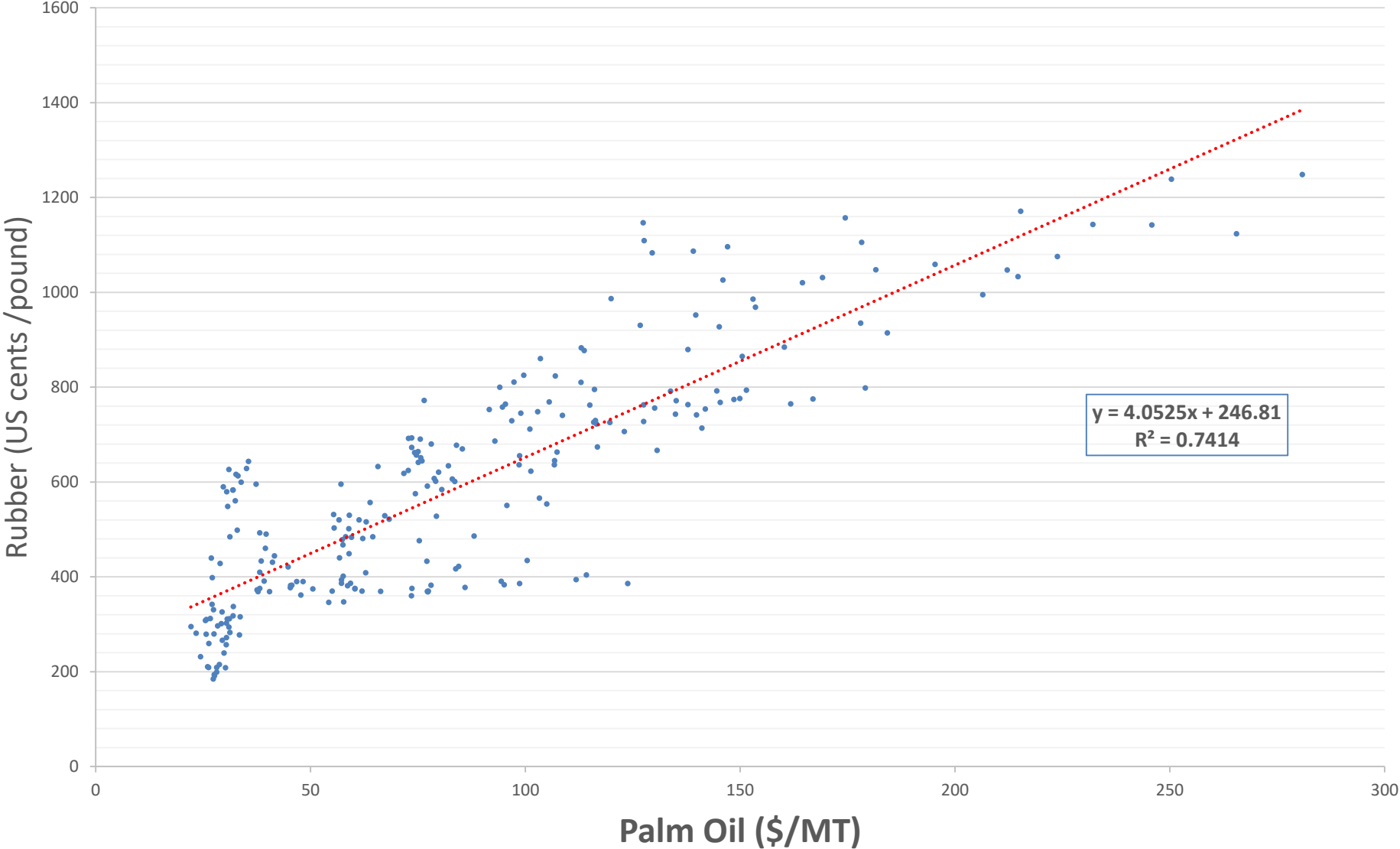
How about replacing rubber trees by palm trees?

- Due to the oversupply of natural rubber and the rising demand for ***synthetic petroleum-based rubbers***, many rubber farmers expand into the more profitable palm tree business to produce palm oil.
- The biodiversity decreases as palm oil trees cover more and more surface area in Southern Thailand.

High correlates: Palm oil and rubber prices

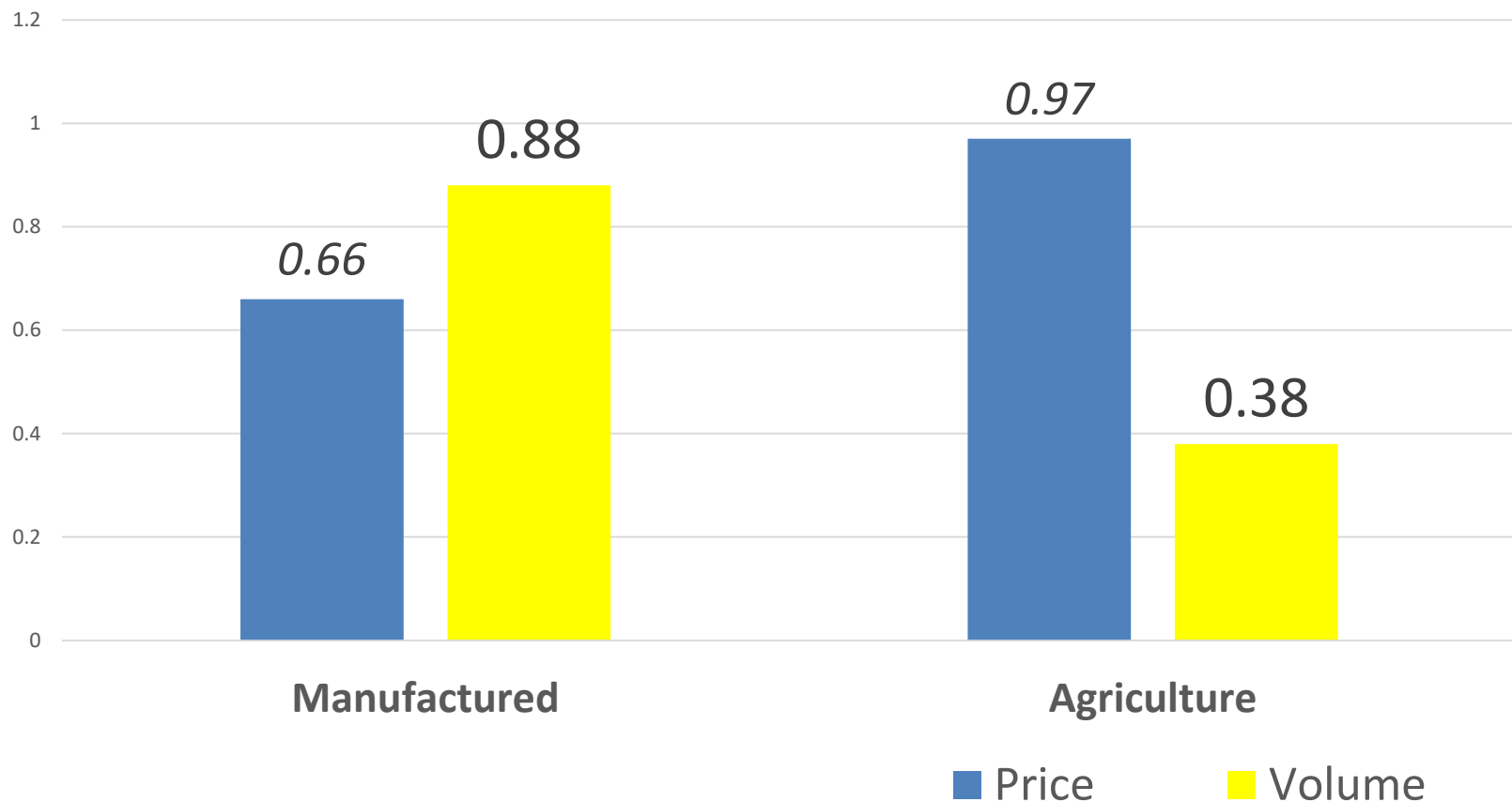


Diversification is not the way out



Prices matter more in agriculture exports
Volumes matter more in manufactured exports

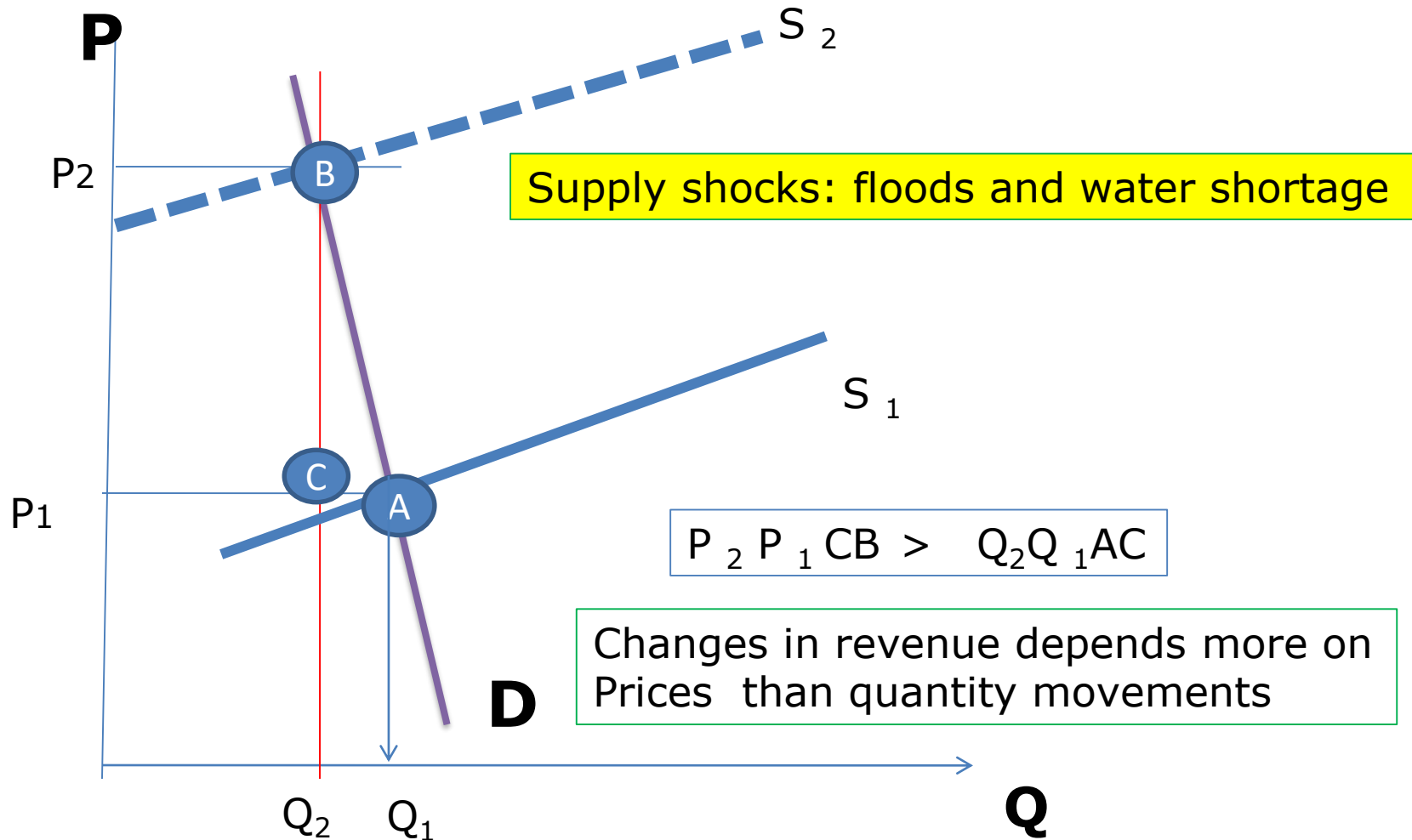
Correlates of export values
(Jan 2000-May 2018)



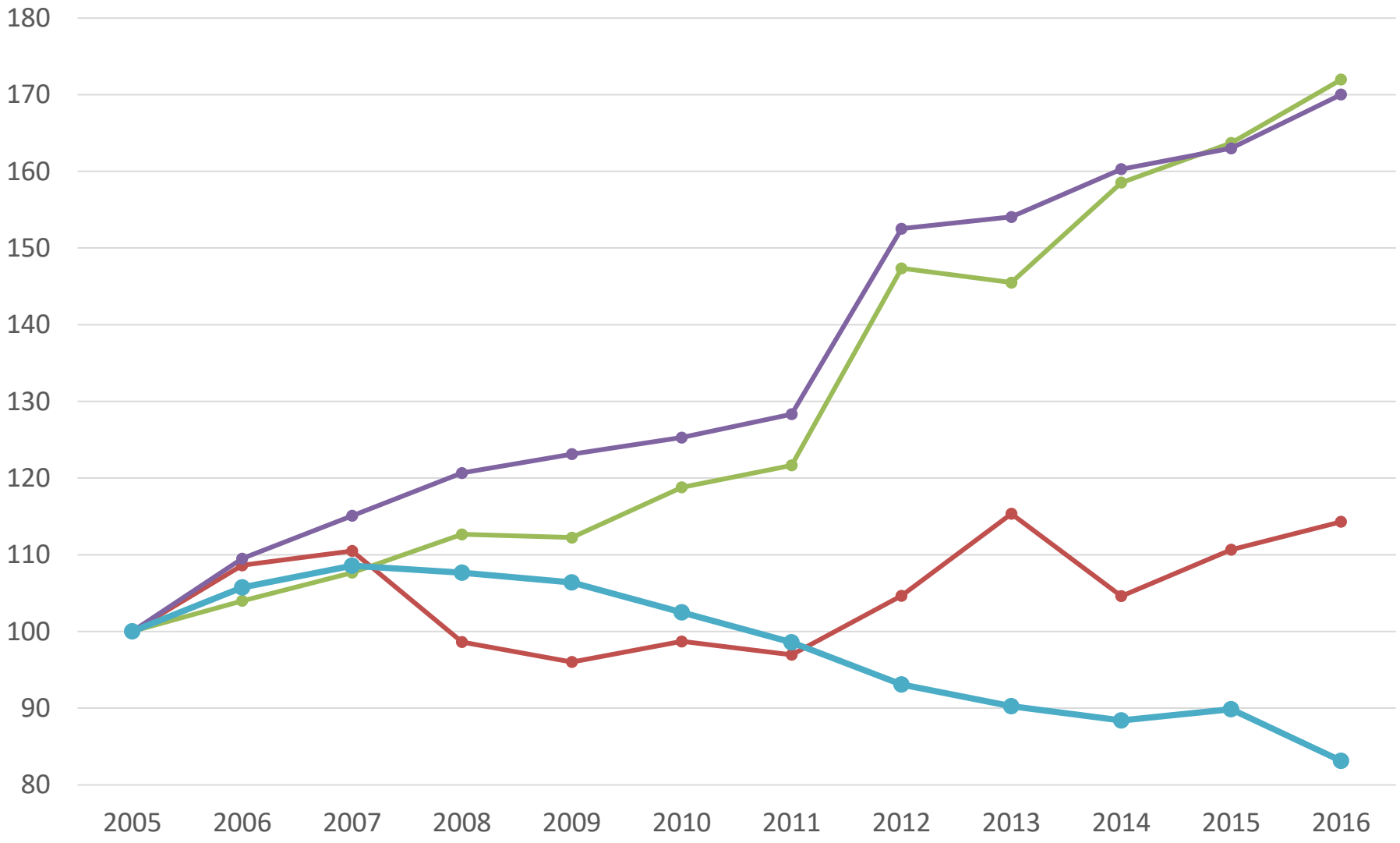
*If demand is **not** perfectly elastic*

- The export value index of agriculture tracks more closely the price index rather than the quantity index (0.38).
- Agricultural exports values are largely determined by price movements rather than volatile quantities.
- There is a positive correlation between total revenue and prices (0.97).
- Can Thai exporters set their own agricultural prices?

Nature of agricultural products markets When demand is price inelastic



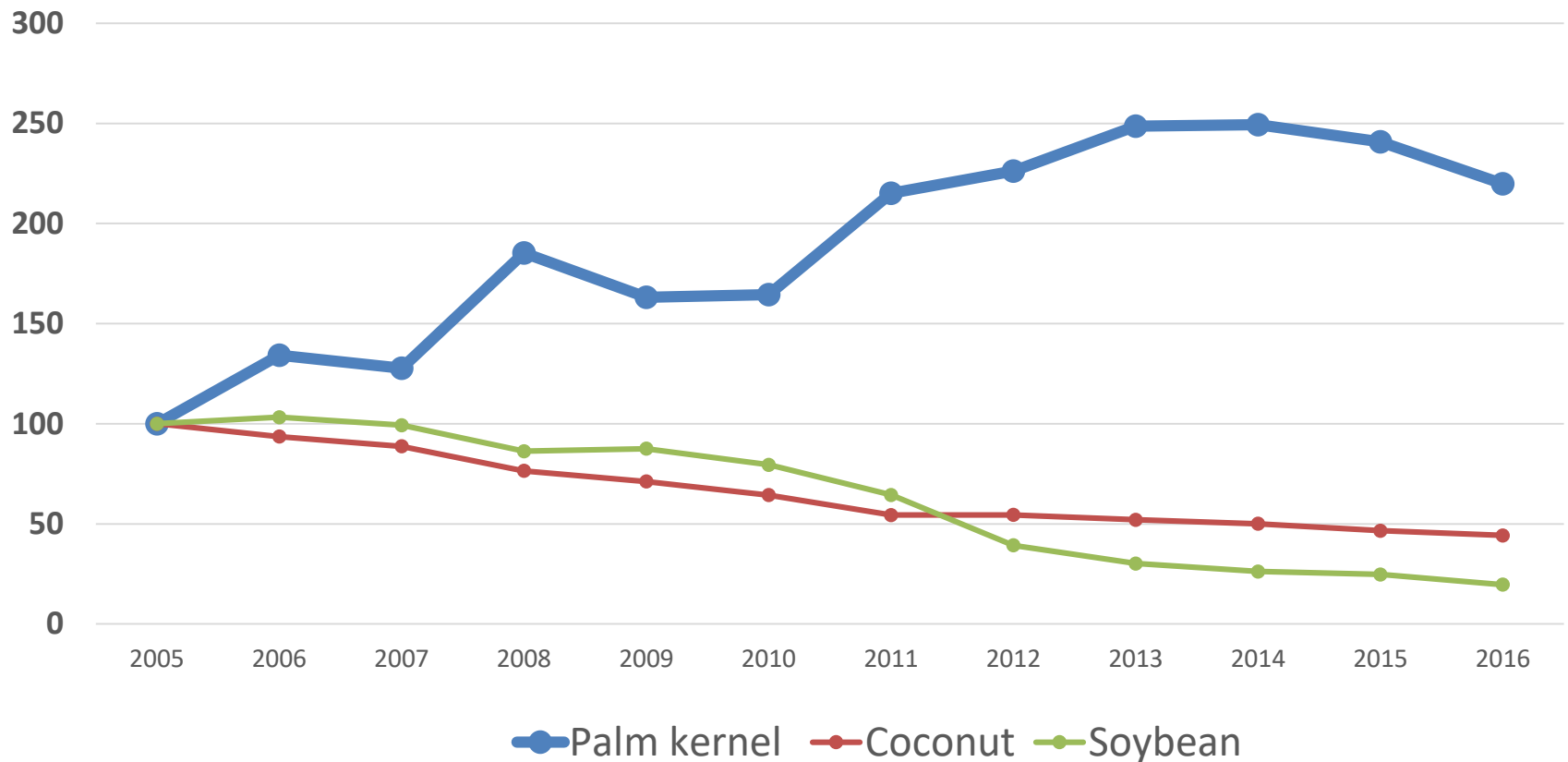
Livestocks Production



—●— Swine (weight over 100 kg.) —●— Fowl —●— Egg, chicken —●— Cattle

Changing Agricultural Production since 2005

Oil seeds Production



Cost disease

- Total sales depend on the product prices and quantities sold.
- But profits or net income are more important than total revenues.
- Wage rates are increasing in the farm sector.
- Declining fertility and rising non-farm wage rates sector causes shortages of labor and raise agricultural wages, further depressing net income of farmers.
- Aging population (declining health capital) causes further reduction in labor supply.

Baumal-Bowen Hypothesis

- In the **rising productivity** sector, output per man-hour increases more rapidly than the money wage rate.
- The **labor cost per unit** of output in the progressing sector must *fall*.
- The faster the pace of technological advance, the greater will be the rate of increase in the **overall wage rate**.
- Labor is free to move between the two sectors, the overall real wage must rise, following to the average rate of productivity improvement.

Baumal-Bowen Hypothesis

- To join the rank of rising productivity industries, the agricultural sector would have to learn to increase output per man and to continue to do so into the indefinite future.
- Live performing arts belong to a ***stable productivity*** sector of the economy.
- Bagatelle in A minor ("[Für Elise](#)") by [Ludwig van Beethoven](#) (1810) lasts 3 minutes

FUR ELISE

SOLO FOR LEAD PAN

Ludwig van Beethoven
Arr. Angelina Moore

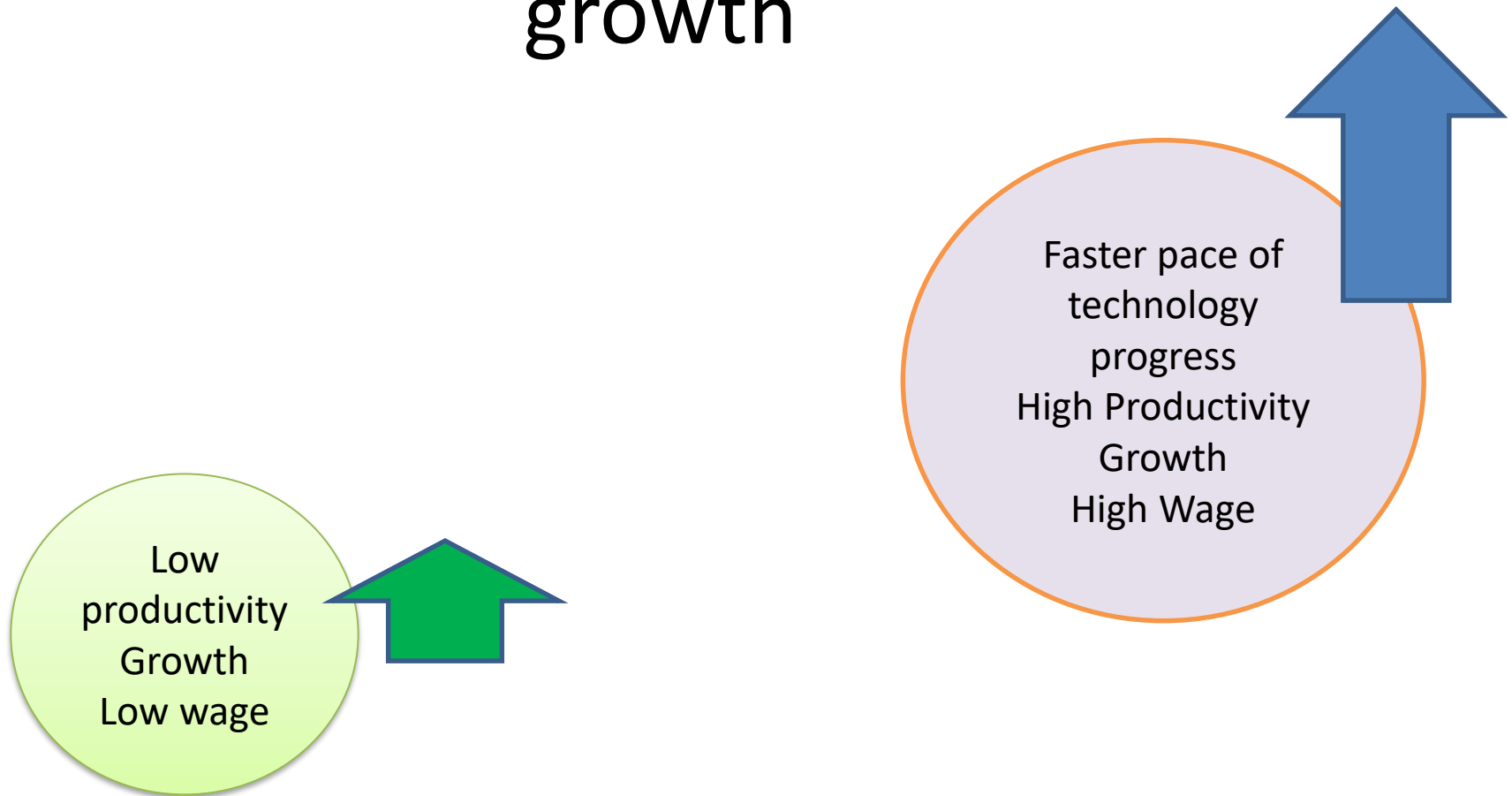
Poco Moto

The musical score is written on seven staves of music. The first staff begins with a treble clef, a key signature of one flat (B-flat), and a 3/4 time signature. The tempo is marked 'Poco Moto'. The first measure is marked with a '1' below the staff. The dynamics are marked 'pp' and 'p'. The second staff starts at measure 7 and includes first and second endings. The dynamic 'mf' is marked. The third staff starts at measure 16. The fourth staff starts at measure 23 and includes first and second endings. The dynamic 'p' is marked. The fifth staff starts at measure 30 and includes first and second endings. The dynamics 'mf' and 'p' are marked. The sixth staff starts at measure 37. The seventh staff starts at measure 41.

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Leading and lagging productivity growth

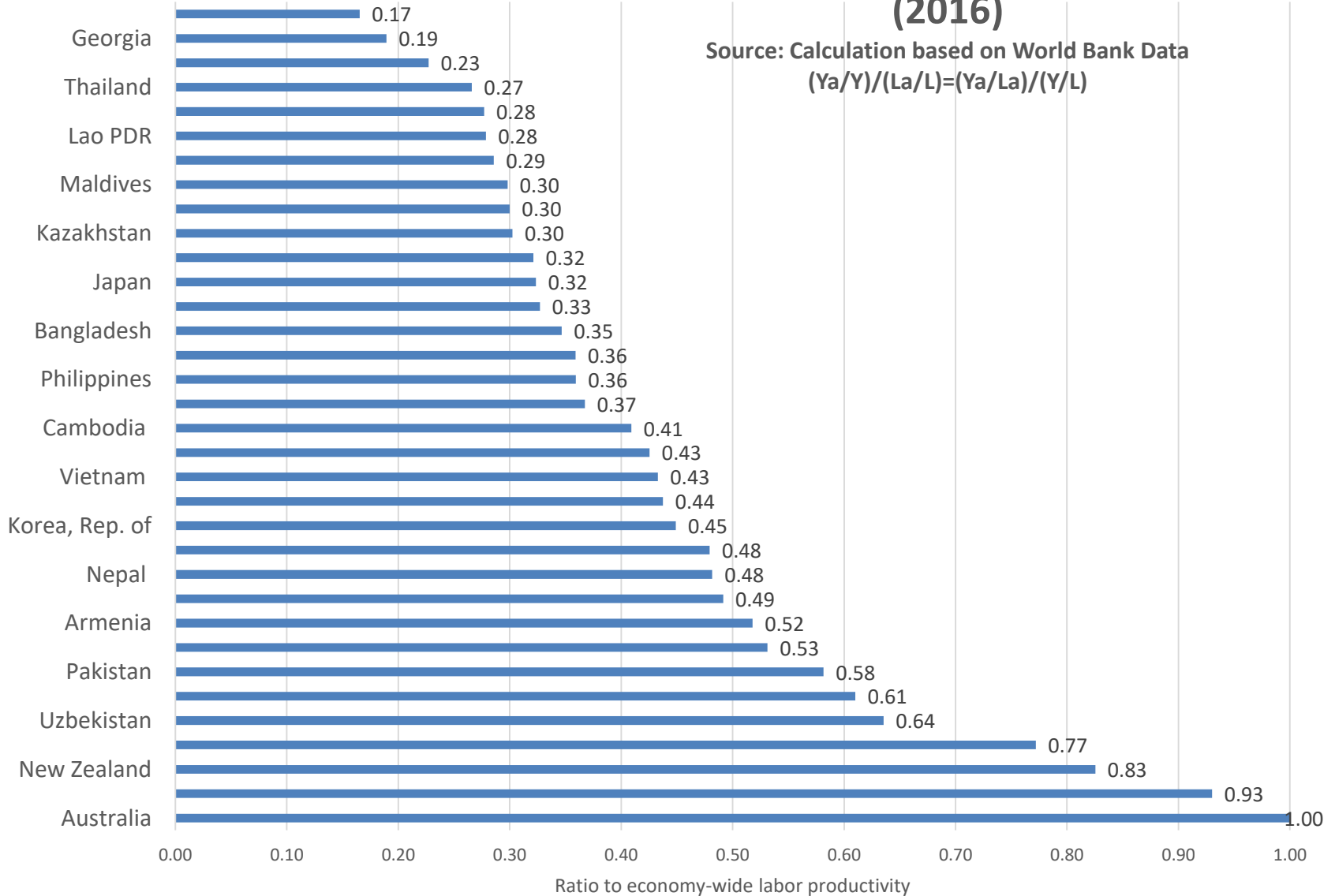


The rising productivity and wage rates in the urban areas put upward pressure on the costs in sectors that lag behind in productivity improvement.

The Cost Disease

Agricultural Labor Productivity Gap Index (2016)

Source: Calculation based on World Bank Data
 $(Y_a/Y)/(L_a/L)=(Y_a/L_a)/(Y/L)$



Productivity growth in Thai agriculture lags behind manufacturing sector's, preventing a natural transfer of agricultural workers to other sectors. Nevertheless, Thai agriculture remained competitive and diversified in the 1990s.

Dynamism of the Thai Agriculture

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Abstract

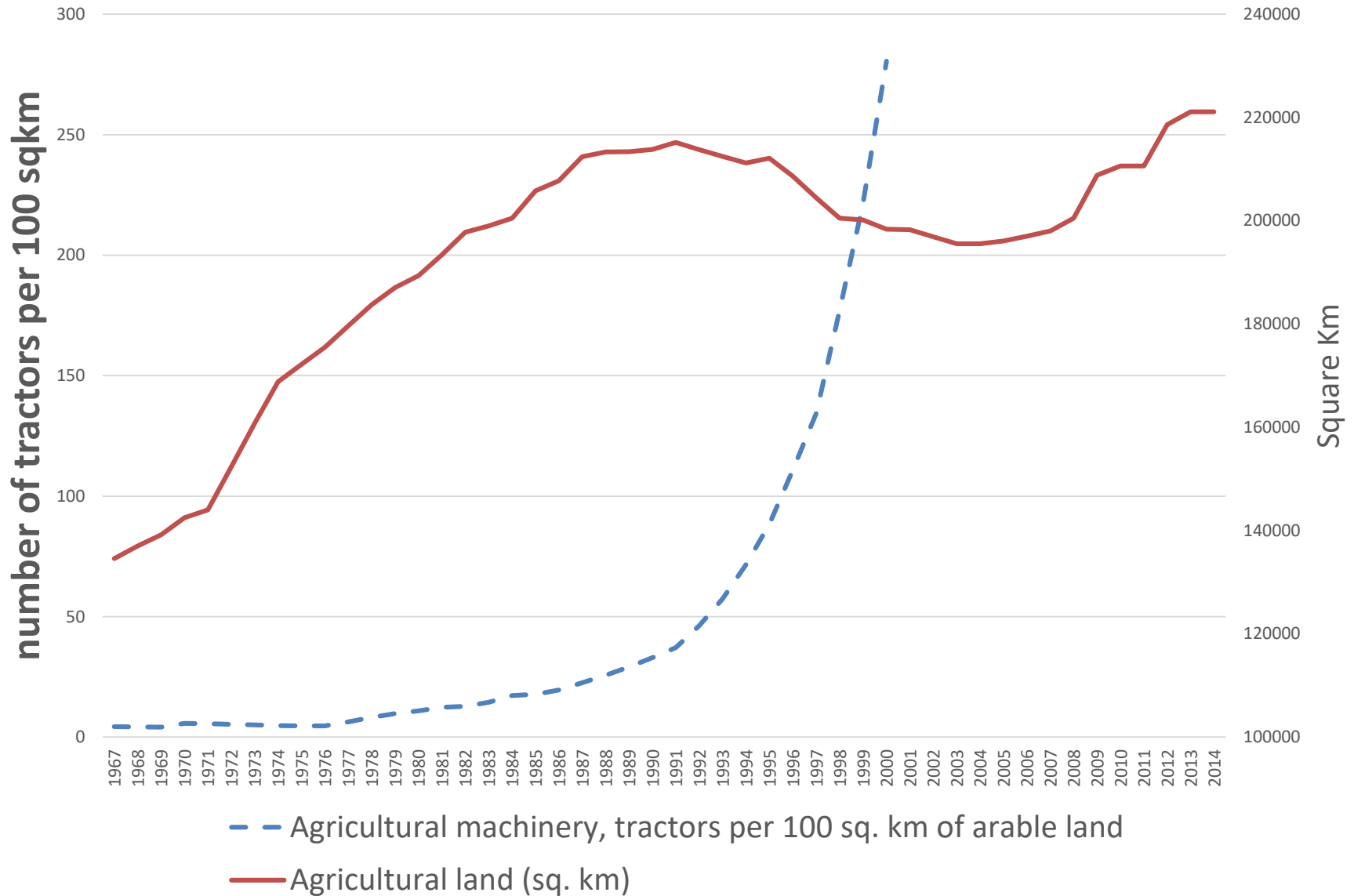
This paper traces the development of Thailand's agricultural sector over the past four decades. It analyzes the factors that are contributing to agricultural productivity changes. Productivity growth in Thai agriculture lags behind that in manufacture, preventing a natural transfer of agricultural workers. The paper analyzes the changing pattern of competitiveness of Thailand's agricultural exports by focusing on their growth and their world market shares. The results indicate that in general the Thai agriculture can remain competitive. Exports of agricultural products have been diversified over the years, and their ability to compete in the world markets has been enhanced. While traditional commodities may lose their importance in the future, new agricultural products will emerge. Processed food industry will be the key to the future of Thailand's agriculture, but maintaining export competitiveness requires constant upgrading of food-safety standards. Dynamism of the Thai agriculture through continued productivity improvement will enable Thailand to cope with new challenges and random shocks from both demand and supply sides.

Keywords: Agriculture, Thailand, productivity; *JEL Classification:* O5



Rice transplanting method has remained unchanged over centuries.

Agricultural inputs: Land and machine



A rice-seeding machine at Suphan Buri's Rice Science Institute September 11, 2017



Prime Minister Prayut Chan-o-cha had a photo op on a rice-seeding machine Monday at Suphan Buri's Thailand Rice Science Institute. He held a mobile cabinet meeting, but was greeted by key politicians of the Chartthaipattana Party, which dominates the province, and got his first political-party endorsement to stay in office indefinitely. (Photo via [Twitter/@wassanananum](https://twitter.com/wassanananum))

The role of infrastructure development

The role of the government is crucial in providing investment in infrastructure and agricultural research in order to make sure that farm productivity can be enhanced continuously. The government must reduce distortions in markets of farm output and factor inputs. Agricultural credit, an important factor input, has been provided to Thai farmers by the Bank of Agriculture and Agricultural Cooperatives. The current support of the rural sector has gone too far in injecting money into rural areas without considering the basic cost-benefit principle and without concern about alternative uses of limited financial resources. Intervention by the government has already gone to the point of guaranteeing prices of rice and rubber. As experiences of Japan and Taiwan indicate, the decline in agriculture's terms of trade induced resource flows and encouraged industrial development (Hondai, 1985). However, there must be continuous technological change in agriculture to offset the terms of trade that continuously move against agriculture. When productivity in agriculture increases, it will allow labor to shift to non-agricultural sectors rapidly without having to distort the terms of trade in favor of agriculture.

The decline in agriculture's terms of trade induced resource flows and encouraged industrial development.

But there must be continuous technological change in agriculture to offset declining terms of trade to shift labor to non-agriculture sectors.

Accompanying policy on non-agricultural sectors

Policies generating growth in the agriculture sector may not be enough to reduce rural poverty. They must be accompanied by expansion of the non-agricultural sector. Agriculture and non-agricultural sectors are interrelated through migration and financial resource flows in the form of income transfer and deposit-lending activities of the banking sector. Strong growth in the non-agricultural sector can reduce rural poverty despite stagnation in the agriculture sector. Although the income gaps between the agriculture and non-agriculture sectors tend to decline, the convergence process, left to itself, will take a long time. Enhancing agricultural productivity can reduce income inequality more effectively than the mere process of labor migration can do. Dynamism of the Thai agriculture and its survival depend primarily on continued productivity improvement in the sector.

Enhancing agricultural productivity can reduce income inequality.

Dynamism and survival of agriculture depend primarily on continued productivity improvement.

Resilient rice and rubber until now?

- The world market share of Thai rice suffered from a decline from 24 percent in 1961 to only 10 percent in 1970.
- But its *resilience* was demonstrated by the recovery of the *market share*: rising from 19 percent in 1980 to 26 percent in 2000.
- Rubber gained a significant market share from 8.6 percent in 1961 to 38 percent in 2000.
- “Success is not final, failure is not fatal”

$$\eta = \frac{\partial \ln X}{\partial \ln Y_w} = \frac{\% \Delta X}{\% \Delta Y_w}$$

If $\eta < 0$, product X is disappearing

- Commodities with low **income elasticity of demand** like jute disappeared completely in the period 1981-2003.
- Maize was a commodity boom in the period 1961-1980, Thailand's exports of maize also grew by 13.8 percent.
- Its world growth rate declined to 0.34 percent in the period 1981-2003, when Thailand's exports of maize also declined sharply by 15 percent.
- Cassava also turned from rising stars in the period 1961-1980 into retreat in the second period.
- Thailand's exports of cassava also adjusted accordingly to the negative price incentives and the world market retreat.
- Currently there are **500,000 cassava farmers** in Thailand.

Nothing remains unchanged

- Canned pineapple exports of Thailand also adjusted its position from **rising stars** into **falling stars** in the second period.
- The top five agricultural exports commodities followed the same pattern of other successful commodities.
- In the future some of these top products would soon be disappearing and they would be replaced by newly emerging agricultural commodities.
- *This is an element of dynamism and resilience of Thai agriculture.*

Emerging new products suggest agricultural dynamism

- Vegetable and fruit exports are chosen in this paper to illustrate the flexibility of the agricultural export sector.
- When the world market expanded during the period 1976-1989, the Thai processed food industry responded at high growth rates in both value and quantity terms.
- The learning curve effect causes dynamism and resilience.

Learning-by-doing raises long-run growth path

- Doing refers to the capability of workers **to improve their productivity** by regularly **repeating the same type of action**.
- The concept of learning-by-doing has been used by Kenneth Arrow in his design of **endogenous growth theory** to explain effects of innovation and technical change.
- Robert Lucas (1988) adopted the concept to explain **increasing returns to embodied human capital**.
- learning-by-doing and increasing returns provide an engine for long run growth.

Lucas Jr, Robert E. "Making a miracle." *Econometrica: Journal of the Econometric Society* (1993): 251-272.

- The main engine of growth is the accumulation of human capital or the accumulation of knowledge
- The main source of differences in living standards among nations is differences in **human capital**.
- **Physical capital** accumulation plays an essential but *subsidiary role*.
- Human capital accumulation **takes place in** schools, in research organizations, and in the **course of producing goods and engaging in trade**.

Robert E. Lucas (1993) "Making a
miracle." *Econometrica*

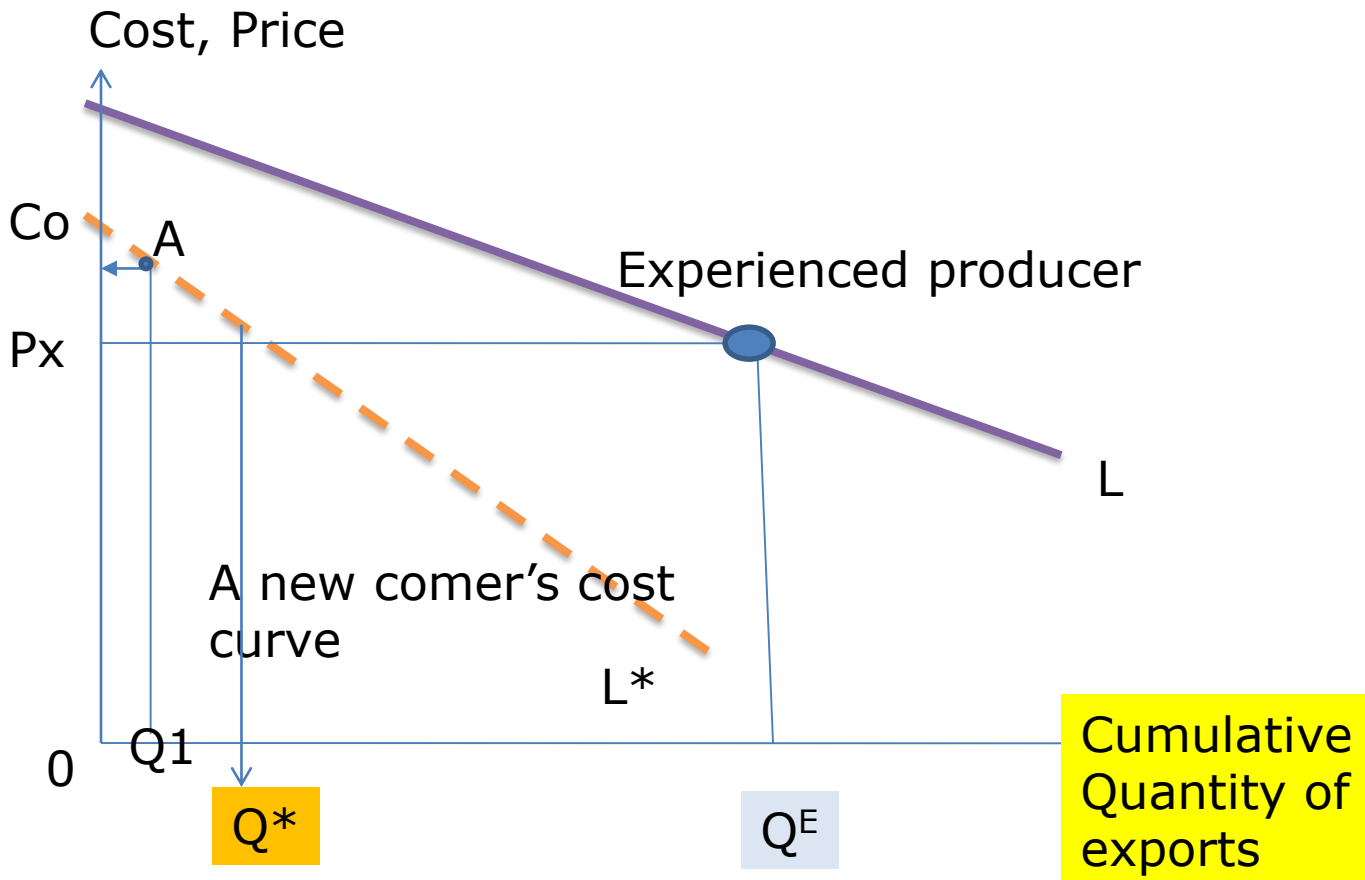
To continue moving up the quality ladder

- Little is known about the relative importance of these different modes of accumulation, but for understanding periods of very rapid growth in a single economy, ***learning on the job seems to be by far the most important.***
- For such learning to occur on a sustained basis, it is necessary that workers and managers continue to take on tasks that are new to them, to **continue to move up** the "quality ladder."
- For this to be done on a large scale, the economy must be ***a large scale exporter.***

The learning curve effect

- The learning curve shows that ***unit cost is lower***, the greater the cumulative output of a country's industry to date.
- A country that has extensive experience in an industry (e.g. rice production) may have lower unit cost than other countries with little or no experience in exports, even if the second country's learning curve (L^*) is lower, for example, because of lower wage.

Learning by exporting:
 When the new comer's market share is small (Q_1),
 it has higher unit cost of production. Give it time, the new comer can beat the
 experienced exporter when they have accumulated exported more than Q^* .



Our competitor: Next-door neighbor

- Burma is now forecast to export 2.4 million tons in 2017, up fourfold from a decade ago.
- Burma's exports have expanded rapidly, most notably to China.
- These would be the largest exports for Burma in many decades. Yet both in terms of volume and market share, this is far below the exports recorded prior to World War II.
- At that time, Burma was consistently the world's largest exporter of rice, supplying around 40 percent of global trade with India as the largest buyer.

Learning by doing (exporting)

- Starting from low bases, growth rates in the first period would always be greater than after the commodities have firmly established their positions and exported in large volumes.
- Thus in the second period between 1990 and 2003, the growth rates slowed down appreciably from the first period.

Snapshots from the past

- The changing pattern of Thailand's agricultural exports in the last four decades is shown by snapshots of top five agricultural commodities.
- Shares of rice and natural rubber in total agricultural exports have been declining gradually as new products have emerged and old products have faded away.
- Jute, maize, and cassava were no longer the principal agricultural commodities as there have little productivity improvement.

Principal Agricultural Exports: 1961

(percent of total Agricultural exports)

	Share
Milled Paddy Rice	42.7
Rubber Natural	
Dry	25.7
Jute	7.5
Maize	7.3
Cassava Flour	5.2
Total of top five:	88.4

High Concentration

- Back in 1961, milled paddy rice and natural rubber were main export products.
- Jute, maize, and cassava flour were other items on the top five items accounting for 88.4 percent of total agricultural exports.

Principal Agricultural Exports: 1970

(percent of total Agricultural exports)

	Share
Milled Paddy Rice	24.3
Rubber Natural	21.7
Maize	18
Cassava Dried	9.8
Jute	6.9
Total Share	80.7

Principal Agricultural Exports: 1980

(percent of total Agricultural exports)

	Share
Milled Paddy Rice	28.1
Cassava	19.8
Rubber Natural	18.1
Maize	10.5
Sugar (Raw)	4.3
Total top five:	80.8

Principal Agricultural Exports: 1990

(percent of total Agricultural exports)

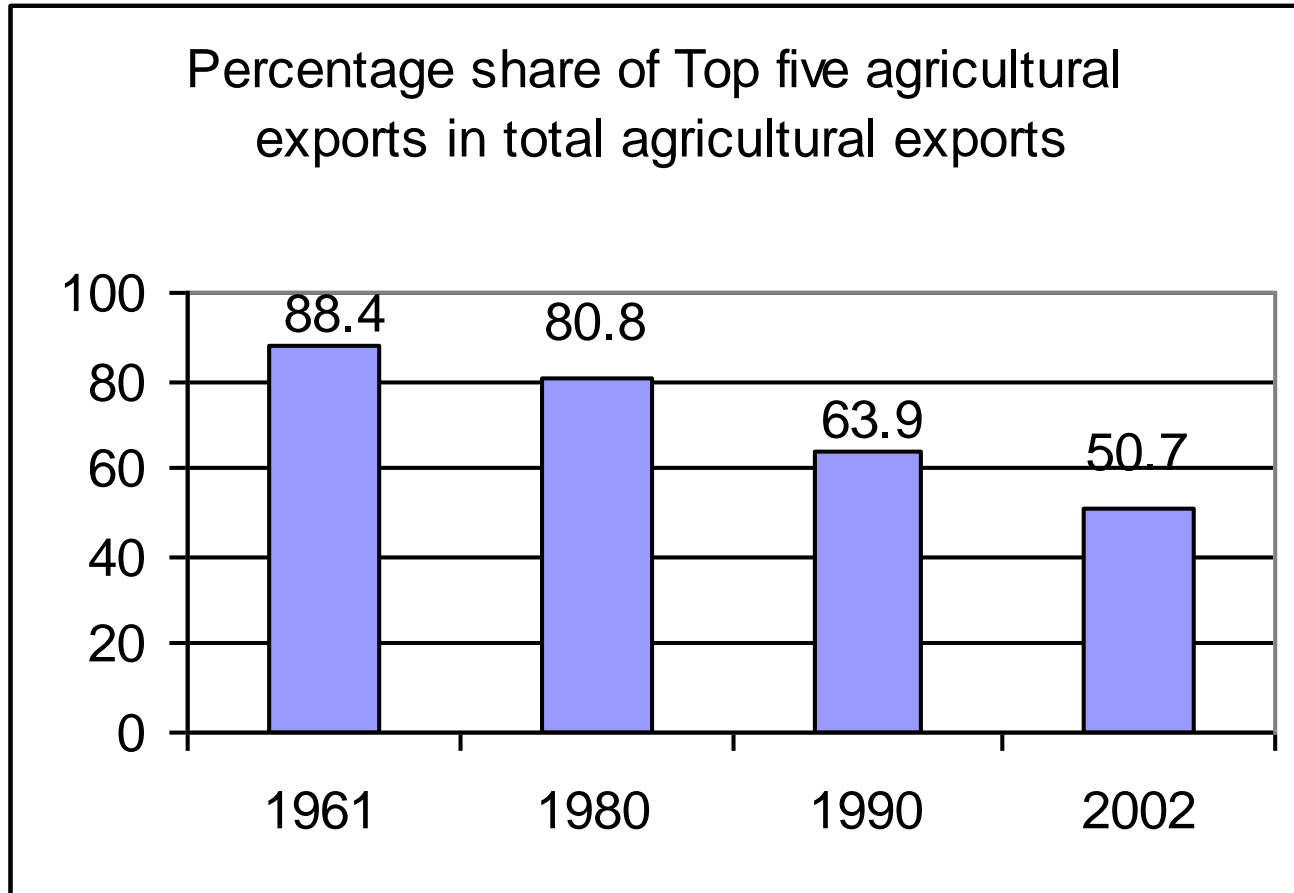
	Share
Milled Paddy Rice	18.5
Rubber Natural Dry	16.2
Cassava Dried	14.7
Sugar (centrifugal raw)	9
Chicken Meat	5.5
Total sum of top five:	63.9

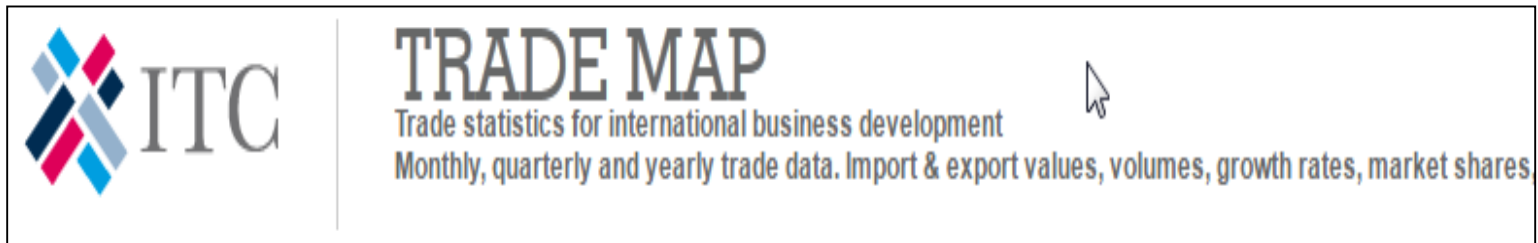
Principal Agricultural Exports: 2002

(percent of total Agricultural exports)

Items	Share
Rubber Natural Dry	17.3
Milled Paddy Rice	17.1
Chicken Meat	6.5
Meat Canned chicken	5.2
Sugar refined	4.6
Total share	50.7

Diversification of agricultural exports implies less concentration of principal exports





Y-Axis: Annual growth of trade partner countries' imports: 2000-2015 (%)
X-Axis: Share of partner countries in Thailand's exports in 2015 (%)

Prospect of Thai rice exports percentage change 2013-2017

Bubble size indicates share in world imports



Conclusion

- Being resilient requires adaptability to market demand and production flexibility.
- Minimizing export instability can be done through product and market diversification.
- what commodities and which markets where the country exports matter.
- Dynamisms is demonstrated by creating new products to suit changing demand pattern.

Questions

- What would be the pattern of Thai agricultural exports in 2020? Would rice and rubber still be the principal agricultural exports?
- How is *Baumol-Bowen* cost disease related to the performance of Thai agriculture?
- How long can Thailand maintain its export market shares in rice and rubber?
- *Is there any relationship between the Baumol-Bowen cost disease and the Dutch disease?*

Midterm Questions

October 8, 2015

1. “Hyperinflation leads to dollarization.” State whether you agree or disagree with the statement and provide reasons.
2. Discuss the resilience of the Thai economy after experiencing internal and external shocks.
3. Compare and contrast the root causes of the Asian Financial Crisis and the Global Financial Crisis. Also discuss how Thailand coped with the crises.

Midterm Questions

October 8, 2015

4. How inclusive are political institutions in Thailand? How has the quality of institutions affected Thailand's economic development?

5. In 2011, the daily minimum wage was raised from 250 baht to 300 baht per day.

(In 2018, the daily minimum wage increased to 320 baht)

Examine whether the wage hike has led to inflation, poverty reduction, and exodus of Thailand's direct investment to neighboring countries.