

Palm oil in Indonesia and Malaysia: A case of dynamic comparative advantage?

by
Lars C. Bruno

Introduction

Palm oil has been one of the fastest growing agricultural sectors the past half a century. Today palm oil is the most traded and produced vegetable oil in the world, and is used in a large number of products.¹ Its legacy would at first glance seem mixed. On the one hand, it has been criticized for leading to the destruction of rainforests in Indonesia and Malaysia. On the other hand, palm oil has lifted many out of poverty in these two countries.² Despite this mixed legacy, the palm oil sector is likely to expand in the future.

The nature of its future expansion is crucially dependent on the direction of technological progress and innovation. For instance, a new technology, which allows for more palm oil extraction per tree, could lead to less land being required to meet demand thereby limiting the impact on the environment. In addition, such improvements could lead to a more profitable industry, which could lead to increased welfare for countries producing palm oil.

The level of technology largely determines a country's comparative advantage, as seemingly is also the case in the palm oil industry. Malaysia has since the 1960s moved from mainly exporting crude palm oil to exporting the higher value added processed palm oil in the 1970s and eventually created more forward linkages to food processing, chemicals and biodiesel since the 1980s. This gradual increase in value-added has made Malaysia the technological leader within the industry. Indonesia, however, has recently overtaken Malaysia in both production and exports of palm oil. The high growth of the Indonesian palm oil sector has been driven primarily by increased exports of crude palm oil.

The paper uses a flying-geese framework to analyse the nature of dynamic comparative advantage in the palm oil sector. The literature on the palm oil sector has thus far focused mainly on revealed comparative advantage and the linkages of palm oil in the two countries by themselves. This paper instead focuses on the interdependency of Indonesia and Malaysia and analyses the comparative advantage in both countries over time.

This paper first introduces the international palm oil market and its ascendancy. The second and third parts give a brief overview of the history of the palm oil sector in the two largest producers, Indonesia and Malaysia. In the fourth part the flying-geese framework is explained and attempted to fit the palm oil sector. In the fifth part the comparative advantage of Indonesia and Malaysia are compared to analyse whether these fit with the prediction of the flying geese theory.

¹ Based on data from FAO (2016).

² Larson (1996 p.3).

1. World palm oil market, 1960-2013

Palm oil has grown from a relative minor to one of the major agricultural crops in the world. As shown in figure 1, exports of oils has been increasing since 1961. There is a large degree of substitution between various vegetable oils which make them competing with each other.³ Palm oil as a share of oil exports has been gradually increasing and in 2013 it accounted for 44.6 % of all oils exported (this figure includes exports of palm kernel oil). The export shares of its closest competitors were 13.0 % (soybean oil), 12.3 % (sunflower oil) and 8.8 % (olive oil, includes both virgin and residues).⁴

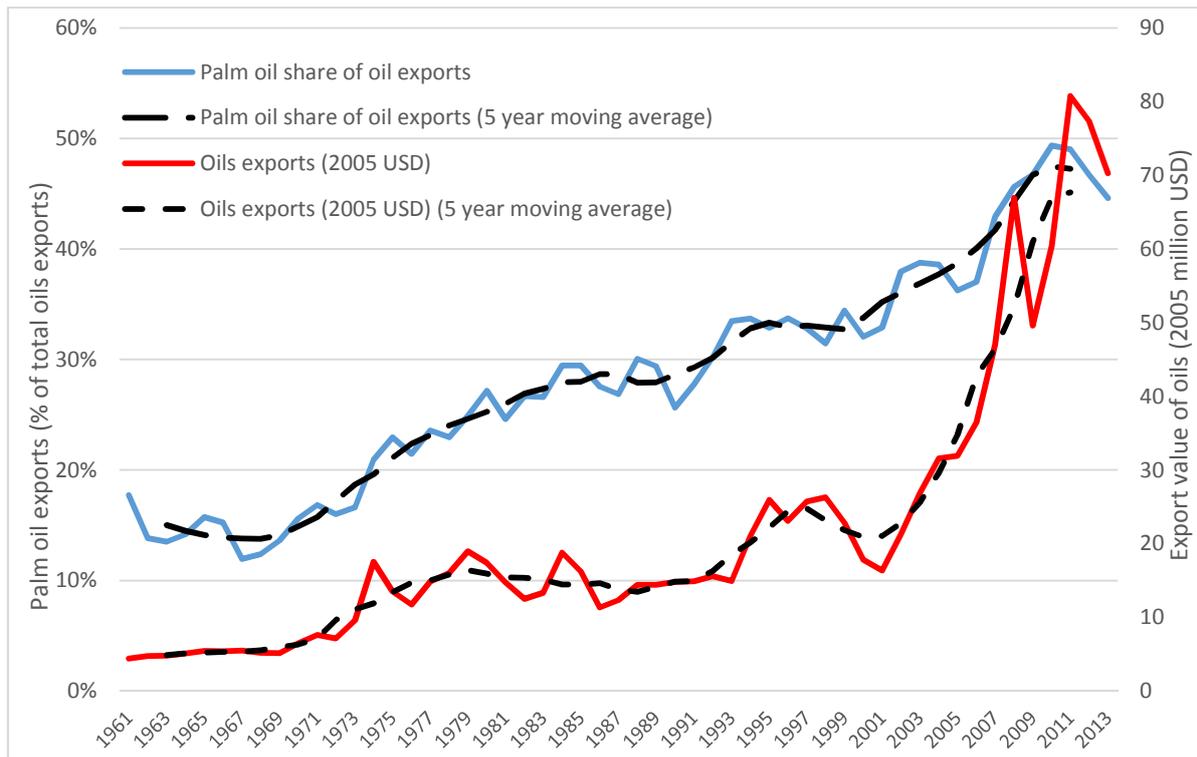


Figure 1: Palm oils share of total oils (per cent) and total export value of oils, 1961-2013

Palm oil includes both exports of palm oil and palm kernel oil

Oils defined as the sum of all oil categories in the FAO online database

Source: FAO (2016)

Several factors are important for the rise of the palm oil industry. The first, and arguably the most important, is the high productivity of palm oil compared to other vegetable oils, see table 1. The oil yield, meaning the amount of oil per hectare, was 4.29 for palm oil in 2006-08. The second highest yield, for rapeseed oil, was only at 1.16. This difference in oil yield has been present since the early 1960s. This means that the value per hectare from palm oil far exceeds any of its competitors.⁵

³ See for instance Amiruddin, Abraham, and Shariff (2005).

⁴ All figures from FAO (2016).

⁵ Palm oil needs certain climatic conditions in terms of temperature and rainfall to be produced optimally, and both Indonesia and Malaysia have these climatic conditions.

Table 1: Value per ha (nominal values based on a three-year moving average)			
	1962-64	1984-86	2006-08
Crude Palm Oil - Malaysia			
Oil Yield*	2.40	3.31	4.29
Price - USD**	237	466	662
Value per ha	569	1,545	2,844
Rapeseed Oil - European Union			
Oil Yield*	0.58	0.90	1.16
Price - USD**	245	467	924
Value per ha	141	421	1,069
Soyabean Oil - USA			
Oil Yield*	0.18	0.17	0.31
Price - USD**	243	499	826
Value per ha	45	85	259
Sunflower Oil - Argentina			
Oil Yield*	0.20	0.47	0.69
Price - USD**	268	535	942
Value per ha	54	251	651

Source: Calculations based on FAO (2016) and MPOB (2011).

*Oil Yield is calculated as the three-year moving average of production (tonnes) per harvested area (ha) using FAO data

** Prices are three-year moving averages of annual average prices in dollar per metric tonne registered on the North West Europe Market

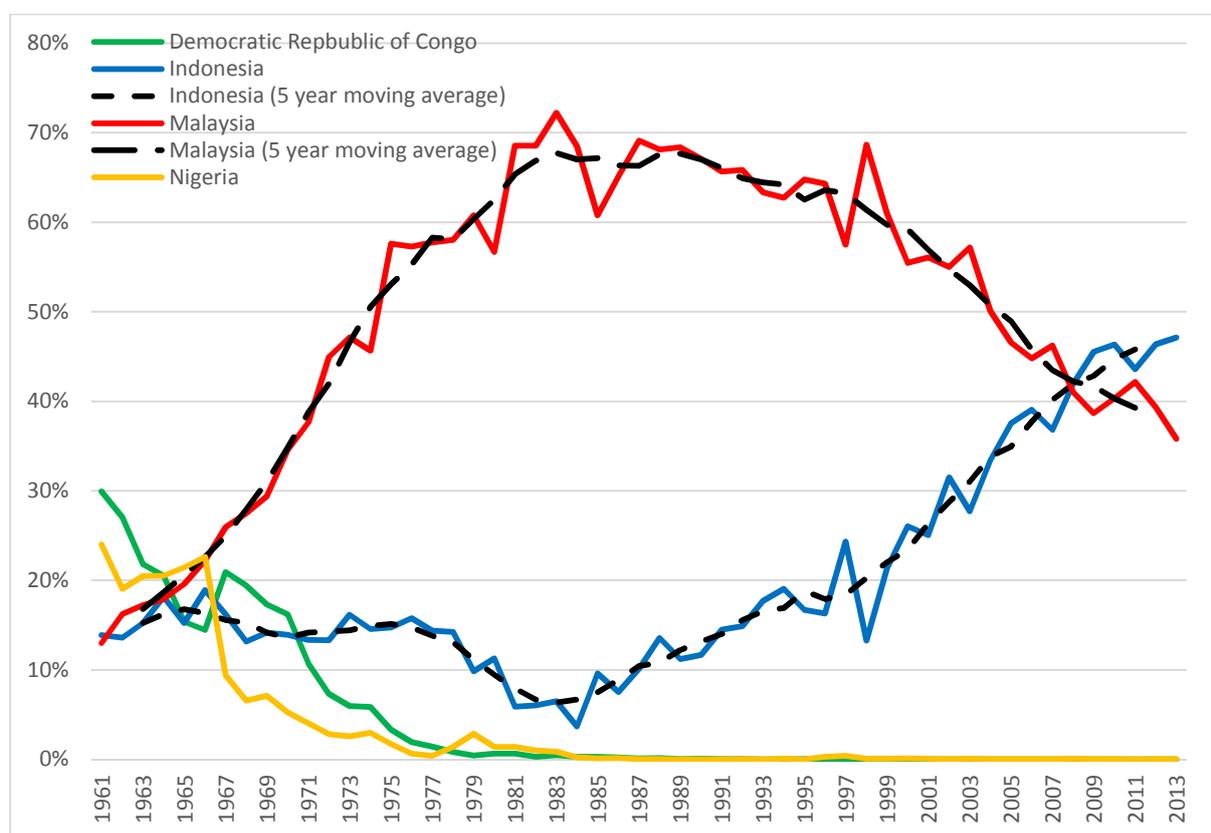


Figure 2: Market share (per cent) of total export value of palm oil, 1961-2013

Palm oil includes both exports of palm oil and palm kernel oil

Source: FAO (2016)

A second factor was the ascendancy of Malaysia as a major producer within palm oil from 1960 onward. Figure 2 shows the relative market shares of the four major exporters over time. In 1961, Malaysia ranked fourth with an export share of 13%. However, Malaysia's spectacular growth in palm oil production and exports saw them become the major exporter within a decade. The market share reached a peak at 72% of world exports of palm oil in 1983, and Malaysia's share was above 60% each year from 1979 to 1996 (above 50% from 1975 to

2004). Since then, Indonesia has increasingly become the major player within palm oil. Indonesia's rise in the palm oil market started in the mid-1980s, and the high export and production growth since then has turned Indonesia into the highest palm oil exporter (from 2008) and producer (from 2006), in both cases overtaking Malaysia.

The role of Malaysia as a major producer has been important in several vital areas. First, the country was responsible for increased technological progress, which for instance led to an increase in oil yield. Several palm oil companies improved their research through the creation of the Oil Palm Genetics Laboratory.⁶ In addition, the Malaysian Department of Agriculture launched a research exchange programme with West Africa. The most important technological change has been the improvement of the palm trees through the introduction of new species. The introduction of the DxP variety in the late 1960s and early 1970s is a likely cause of the increase in plantation yields in the late 1970s and early 1980s.⁷

A second area has been the development of new products, which uses palm oil as an input, thereby increasing the value-added content of palm oil. To increase the value-added, the government promoted the establishment of the refinery sector through investment and tax incentives, and most importantly, an export tax on crude palm oil starting in 1973. The export tax increased the cost of crude palm oil for European refineries and led to increased investments in palm oil refineries in Malaysia. The World Bank opposed the export tax, as Malaysia did not have a comparative advantage in capital-intensive production. British plantation owners in Malaysia also opposed the tax, as they preferred to have palm oil processed in Europe.⁸ Despite the initial scepticism, the palm oil refinery sector in Malaysia enjoyed high export growth for its products and increased competitiveness over time (Gopal, 2001).

Finally, the government support in Malaysia was important for increasing production, technological progress and the opening up of new markets. Through government schemes, the state was directly involved in production. The most important of these schemes was the Federal Land Development Authority (FELDA), which changed its focus during the period from being a purely poverty reducing institution to becoming a commercially active state company.⁹ The state also purchased most of the foreign-owned companies to increase the equity share of indigenous ownership as a part of the New Economic Policy.¹⁰ In addition to direct involvement in production and industrial policy, the state institutions' support was important. The Palm Oil Registration and Licensing Authority (PORLA) was responsible for giving licences and controlling prices in the palm oil sector. The Palm Oil Research Institute of Malaysia (PORIM) was responsible for conducting public research in palm oil. Following a rationalisation process in 1998, PORLA and PORIM merged to form the Malaysian Palm Oil Board (MPOB). The government is also the main owner of the current Malaysian Palm Oil Council (MPOC); a private company that promotes palm oil by launching marketing campaigns and trade missions. Direct government involvement in agricultural markets has been much criticised. However, in the case of the Malaysian palm oil sector, heavy government involvement has been compatible with high growth. Pletcher (1991) mentions two factors that he believes have been important for successful state intervention.

⁶ See for instance Corley and Tinker (2015) and Kajisa, Maredia, and Boughton (1997).

⁷ Bruno (2014).

⁸ According to Bek-Nielsen, the founder of United Plantations, the British plantation owners were afraid of upsetting Unilever, their biggest customer, who preferred to process the vegetable oils in Europe (Fold, 1998 p.401).

⁹ On the evolution of FELDA regimes, see Pletcher (1991 pp.628-630). See also Simeh and Ahmad (2001 pp.2-4) for an overview of the government institutions in the palm oil sector.

¹⁰ See Pletcher (1991 pp.630-631).

The first is that the price mechanism, though influenced, was never controlled. The second is that the policies that helped shape the palm oil sector were internally consistent and consistent across time.

Malaysia's role in establishing the modern palm oil industry was therefore crucial. However, following the introduction of manufacturing free trade zones and the higher wages offered there, Malaysians became increasingly unwilling to work on plantations. This created a labour shortage in the palm oil industry. This situation is a chronic problem for the industry, which, despite attempts to raise labour productivity and mechanisation, refuses to go away. Since 1986, the inflow of foreign workers, especially from Indonesia, is meeting the palm oil industry's need.¹¹ Indonesia's increasing role is important for the continued expansion of the palm oil sector. Indonesia is a far larger country than Malaysia and its potential for palm oil production therefore is far greater.

3. Malaysian palm oil sector - A brief overview

To understand the development of the Malaysian palm oil sector, it is useful to understand the nature of the production process. The palm oil sector has three levels of processing. *Plantations* produce the palm oil fruit from the palm trees; these fruits are called fresh fruit bunches (FFB). Following detachment from the palm tree, processing of FFBs must take place within 24 hours to have sufficient quality. *Mills*, the second level, process FFB to produce crude palm oil (CPO), and as a by-product, palm kernel (PK).¹² As the processing of FFBs has to be quick, mills are located close to or even on the plantations. *Refineries*, the final level, process CPO to produce various products called processed palm oil (PPO). CPO, PK and PPO products can also be used as inputs in other industries such as the oleochemical industry.¹³ For analytical purposes, I will divide the palm oil sector in three levels:

1. Plantations and mills: As FFB need to be quickly processed in mills to produce CPO, mills have to be located in close proximity to plantations. It is therefore natural to consider these two levels of productions as one.
2. Refineries: The production of PPO is a more capital-intensive process which yields higher value-added.
3. Biodiesel, oleochemicals and other finished products: Both CPO and PPO can be utilised further to produce higher value-added products such as biodiesel, food products and soaps.

¹¹ For the labour constraints in the plantation industry, see Daud (2006).

¹² Crushing factories process palm kernel to produce crude palm kernel oil, which is an important by-product of the palm oil sector.

¹³ For good introductory overviews of the palm oil sector, see Moll (1987), Teoh (2002) and Rasiah and Shahrin (2006).

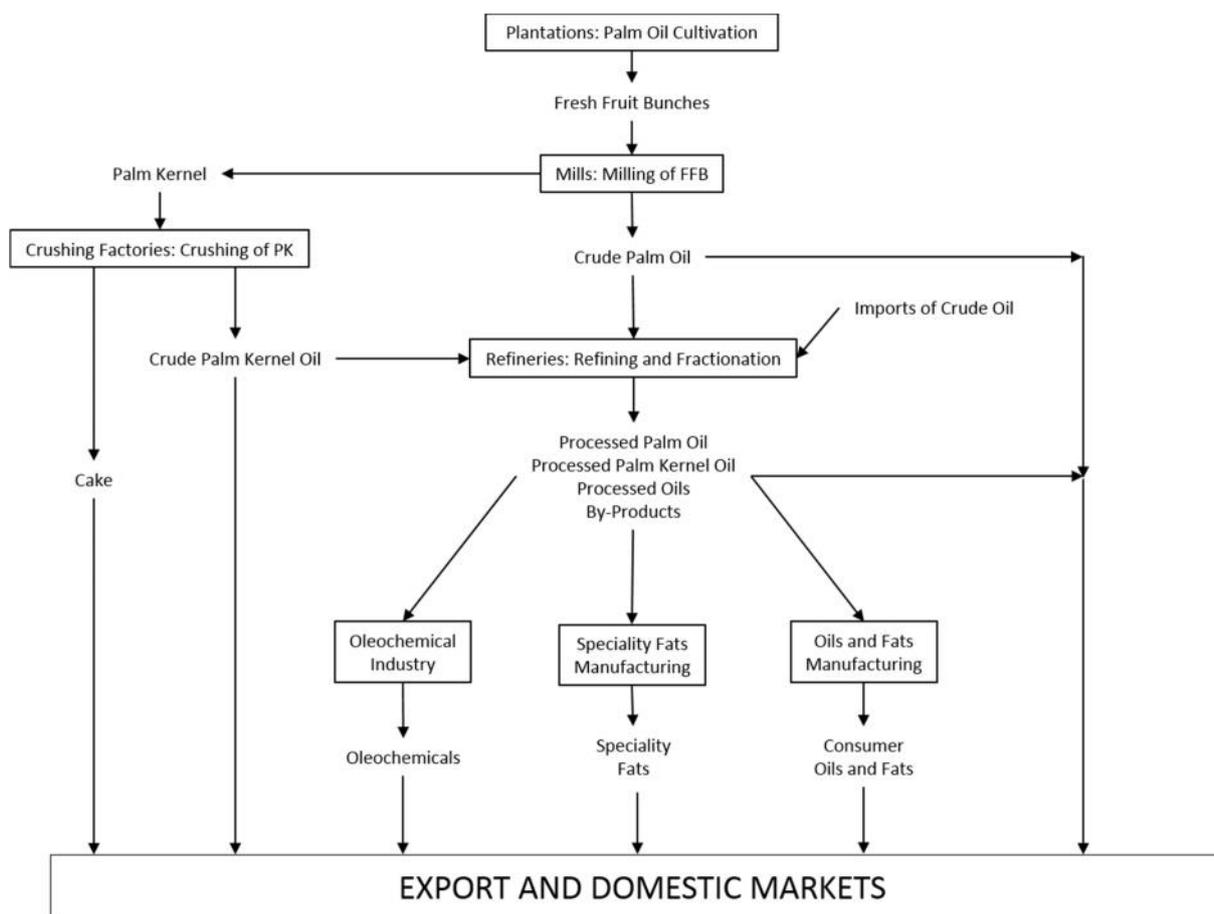


Figure 3: Schematic Summary Malaysian Palm Oil Industry
Source: Gopal (2001 Figure 3.1 p.131)

Phase 1: Colonial times (1875 to 1957)	The introduction of palm oil in the 19 th century and its first commercial exploitation from 1917: <ul style="list-style-type: none"> • Slow growth in crude palm oil production and exports
Phase 2: Promotion of palm oil production (1957 to 1973)	Government promotion of palm oil: <ul style="list-style-type: none"> • Investment and tax incentives • High growth in crude palm oil production and exports
Phase 3: Promotion of refineries (1973 to 1986)	Government promotion of increased value-added: <ul style="list-style-type: none"> • Investment and tax incentives • Increased institutional support • Export tax on crude palm oil • High growth in crude palm oil production • High growth in processed palm oil production and exports
Phase 4: Promotion of upstream and downstream activities (1986 onwards)	Government promotion of backward and forward linkages: <ul style="list-style-type: none"> • Investment and tax incentives • High institutional support • Continued high growth of processed palm oil production and exports • Continued high growth of crude palm oil production • Establishment of the oleochemical industry with subsequent high growth

The modern expansion of the sector started in the 1960s, though commercial production of palm oil first started in 1917 (see table 2). In colonial times, the palm oil sector was slow to develop, with production and exports increasing only modestly.¹⁴ In the 1960s, the government strongly promoted palm oil as part of a

¹⁴ Pletcher (1990 p.329).

strategy of reducing the Malaysian dependence on rubber and tin.¹⁵ Favourable prices and operating costs that were potentially lower than rubber made palm oil a natural long-term replacement for rubber.

Following the rapid increase in crude palm oil production and exports in the 1960s and early 1970s, the structure of the industry changed. The government believed that a continued increase in exports hinged on increasing the value-added of production. To increase the value-added, the government promoted the establishment of the refinery sector through investment and tax incentives, and most importantly, an export tax on crude palm oil starting in 1973.

Despite the initial scepticism, the palm oil refinery sector in Malaysia enjoyed high export growth for its products and increased competitiveness over time. Refineries increased their processing capacity from below 0.1 million tonnes in 1971 to close to 10.5 million tonnes in 1990, see table 3. Table 3 also reveals that the average size of refineries gradually increased over time; since it was a capital-intensive industry, it had considerable economies-of-scale to exploit. In addition, most of the oil processed at the refineries came from domestic producers, as the expansion of the processed quantity was closely correlated with increases in local production from 1980 and onward. There was a dramatic change during the 1970s, when CPO processed compared to CPO production was only 4 %, but this figure increased to 95 % by 1980 and has since been at a minimum around 90 %. Figure 2 presents more evidence of the increased importance of refineries as processed palm oil replaced crude palm oil as the main palm oil export product in the 1970s and has kept this position ever since. Gopal (2001) analysed the competitiveness of the palm oil refineries by comparing the profit margins between Malaysian refineries and European ones in the time period 1980 to 1994. Gopal's analysis strongly indicates that the Malaysian refineries became more competitive than the European ones towards the end of the 1980s.¹⁶

Table 3: Palm Oil Refineries Capacity in Operation Malaysia 1971-2015

Year	Capacity in operation Million metric tonnes	Palm oil refineries in operation No.	Average refinery size in operation Million metric tonnes	CPO Processed at Refineries/CPO Production Percentage
1971	0.08	2	0.04	4 %
1975	0.80	10	0.08	21 %
1980	2.88	45	0.06	95 %
1985	5.35	38	0.14	89 %
1990	10.45	37	0.28	106 %
1995	10.15	41	0.25	100 %
2000	14.60	46	0.32	93 %
2005	17.31	48	0.36	94 %
2010	22.89	51	0.45	93 %
2015	25.33	52	0.48	73 %

Source: Gopal (2001) Table 4.1 for 1971-1995; and MPOB (2000; 2005) Table 2.14 and MPOB (2010) Table 2.17 for 2000-2010

¹⁵ Substantial replanting grants were given for planters shifting from rubber to palm oil (Pletcher, 1990 p.337).

¹⁶ An earlier study by Todd (1978) had concluded that the Malaysian palm oil refinery industry was not competitive at the end of the 1970s.

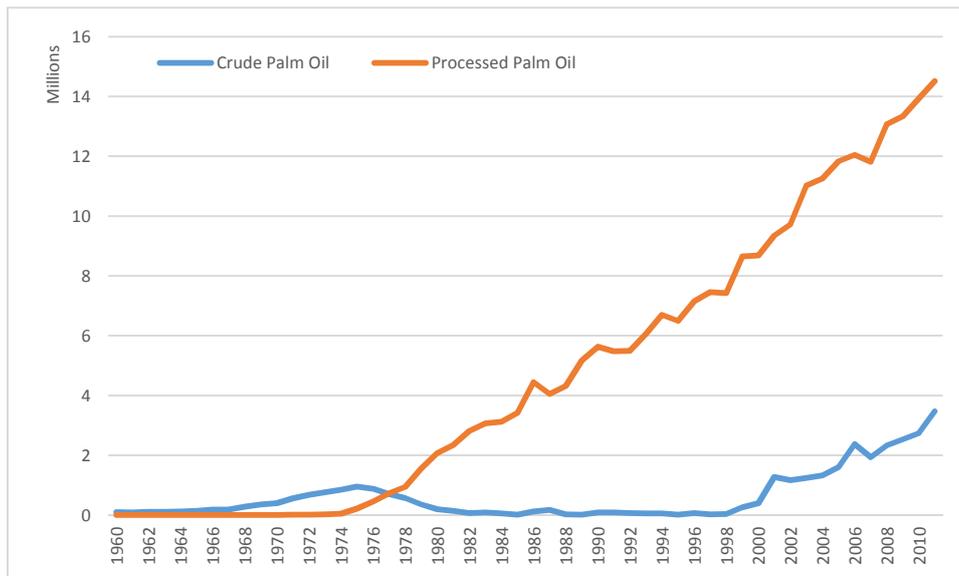


Figure 4: Exports (Metric Tonnes) 1960-2011

Source: Gopal (2001) Table 4.4 for 1960-74; and MPOB (2012) Table 4.1 for 1975-2011

Several factors contributed to the increased competitiveness of the palm oil refinery sector. The most important factor is probably that cost efficiency at Malaysian refineries increased through learning-by-doing. In addition, the refineries went through two restructuring processes in which ineffective refineries went bankrupt. Another important point is that Malaysian refineries had a higher degree of specialisation than those in Europe. European refineries used various vegetable oils to produce processed oil products; Malaysian refineries almost exclusively used palm oil. Such specialisation did create technological challenges, as Malaysia developed new technology to treat large volumes of palm oil. Malaysia increasingly became the main innovator within the industry as it met the challenge of creating palm oil-specific technology. The refineries probably benefited from this development, as the specialisation led to efficiency gains over their European rivals.

By the second half of the 1980s, the palm oil industry had matured and was increasing its backward and forward linkages to other industries. One of these was the oleochemical industry, which expanded its capacity from 1.1 million tonnes in 1994 to 2.7 million tonnes in 2015.¹⁷ Most of the oils processed were palm oil or palm kernel oil in which Malaysia had a comparative advantage given its domestic supply. Oleochemicals, in value terms, has a higher export value than other finished products or biodiesel.¹⁸

4. Indonesian palm oil sector - A brief history

Indonesia's modern surge into the palm oil market started from the mid-1980s, despite the fact that palm oil had been both introduced and commercially exploited earlier in Indonesia than in Malaysia. Indonesia's world market share of palm oil exports decreased from 14 % in 1961 to only 4 % in 1984 (figure 1). Following Larson (1996) and Rasiah and Shahrin (2006), the development of the palm oil sector can broadly be described in four phases as summarised in table 4. In the first phase, commercial planting started in Sumatra in 1911, and expanded to roughly 90,000 hectares by 1938. However, with the advent of World War II and the period following independence, growth was slow following 1938 until 1968.

¹⁷ Figures from Basiron (2001) and MPOB (2016).

¹⁸ If one takes the export value of oleochemicals, finished products and biodiesel for 2015 together, oleochemical constituted 84 % of the total value exported, while the share for the other two was 13 % and 4 % respectively. All figures from MPOB (2016).

Table 4: Phases of development in the Indonesian palm oil sector

Phase 1: Colonial and immediate post-colonial times (1848 to 1967)	The introduction of palm oil in the 19 th century and its first commercial exploitation from 1911: <ul style="list-style-type: none"> • Initial high growth until 1938 • Slow growth in crude palm oil production and exports from World War II and early independence
Phase 2: Promotion of domestic-oriented palm oil production (1968-1988)	Direct government investments: <ul style="list-style-type: none"> • State-owned plantations • Price caps on palm oil to protect domestic consumers
Phase 3: Promotion of export-oriented palm oil production (1988 to 1994)	Joint government-private promotion of palm oil: <ul style="list-style-type: none"> • Promotion of smallholders • High growth in crude palm oil production and exports
Phase 4: Promotion of refineries (1994 onwards)	Government promotion of increased value-added: <ul style="list-style-type: none"> • Investment and tax incentives • Increased institutional support • Export tax on crude palm oil • High growth in crude palm oil production • High growth in processed palm oil production and exports

The year 1968 marked a shift in policies and the beginning of the second phase with state-led production, as the former Dutch estates were re-organized into state-owned plantations.¹⁹ From 1968 to 1988, the expansion was primarily led by government investments in state-owned plantations called the *Perseroan Terbatas Perkebunan* (PTPs). In the late 1970s the government promoted smallholder production of palm oil as a tool for rural development (Larson, 1996 p.5; Rasiah and Shahrin, 2006 pp.21-22). The agricultural policy was focused on securing food security with state-ownership common in strategic industries. In addition, there were price caps on palm oil in order to control inflation.²⁰

The third phase from 1988 to 1994 marked a transition from state-led to market-led growth, as most of the growth occurred in joint government-private sector development schemes called the *Pir-trans* (Larson 1996 p.5). From 1994, the final phase up until present, witnessed a phase in which the private sector became the main vehicle for expansion with government support, which is more similar to the organisation of the Malaysian palm oil sector.

5. Flying Geese and natural resources

5.1 Flying Geese theory

One popular theory of East and Southeast Asian development has been the ‘flying geese formation’ of development originally developed by Kaname Akamatsu.²¹ Kiyoshi Kojima subsequently expanded upon the theory.²² The flying geese theory states that there is a lead goose, a technological leader, while the other countries follow the technological leader like a formation of flying geese. In the flying geese theory, latecomers successfully enter new sectors using technology imports from mature economies to upgrade their

¹⁹ According to Larson (1996 p.5) the former Dutch estates were organized into 28 separate units, while other previously nationalized palm oil estates were returned to their previous owners.

²⁰ Controlling inflation through controlling the prices of agricultural products is common in Indonesia and many other developing countries. The Indonesian government successfully managed to control inflation by keeping rice prices low, as rice constitutes 68 % of food. However, cooking oil only constituted 0.4 % of household expenses (4 % for the poor), so the arguments for controlling palm oil prices based on inflation were weak (Larson 1996). The regulations were complex, and by the end of the 1980s, there were four separate prices administered. According to Tomich and Mawardi (1995) these regulations harmed both consumers and producers.

²¹ The theories were published in English in the 1960s, see for instance Akamatsu (1962). However, many of the theories had been developed in the 1930s (Akamatsu 1935, 1937). For more recent contributions see for instance Kojima (2000), Ozawa (2002) and Cutler *et al.* (2003).

²² Kojima (1960, 1970, 1995, 2000).

production structure. The industry typically has a declining advantage in the mature economy from which the technology is being imported (Rana 1990, Geda and Meskel 2008).

The theory consists of three interrelated processes.²³ The first process is on the micro-level within one country and a single product in which a product goes through four phases:

- (i) Import: First consumption of the good in question
- (ii) Production: Local producers start producing the good that is being imported
- (iii) Export: Local producers produce more than is being consumed domestically leading to excess production being exported
- (iv) Re-import: A potential final phase which was added by Kojima to depict the import of the good after a country has stopped produced the good itself

This one country-one product process has several similarities with Vernon (1966) product life-cycle theory. The import-production-export sequence, the original stages of Akamatsu's approach, all rose and fell in an inverted V or U shape as shown in figure 5:

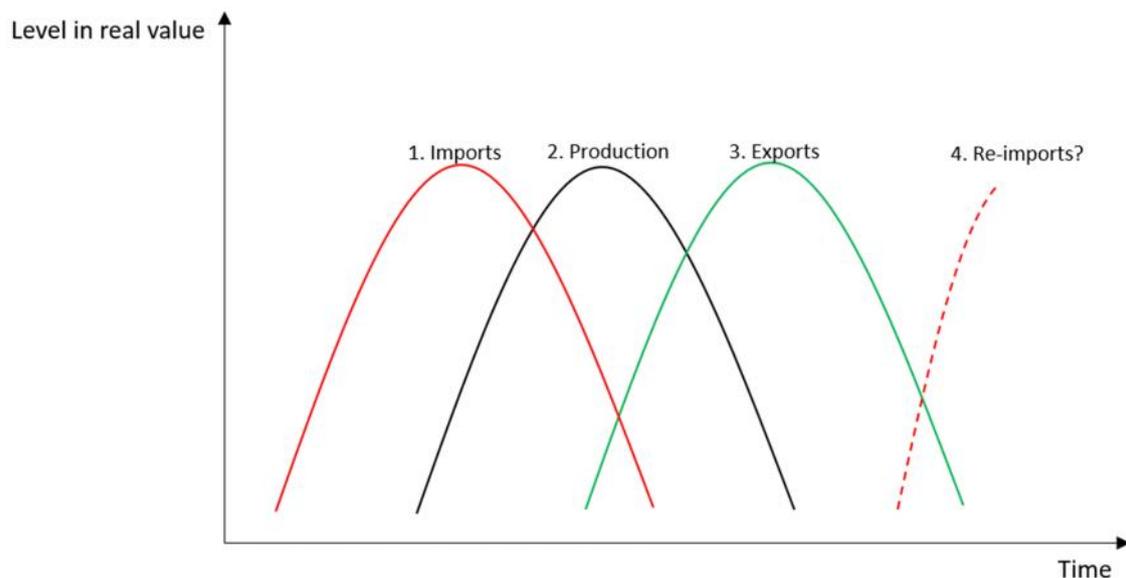


Figure 5: Import-production-export cycle of the Flying Geese theory with a potential fourth phase

The second process is within one country, but with multiple products (Kumagai 2008). This process is concentrated more at the macro-level and states that industries become increasingly more diversified, with an upgrade occurring over time from simple consumer goods, to capital goods and further, to goods that are more sophisticated. This second process could also lead to increased sophistication within a product group. The mechanisms through which these changes occurred were not explicitly specified by Akamatsu. Kojima (2000) places the emphasis on changing factor prices, especially wages. Obviously, changing factor prices, especially increased wages, will change the comparative advantage of a country's labour-intensive exports in periods of high economic growth. Less clear, however, is how a country moves towards higher value-added capital-intensive and technology-intensive exports. The issue of technology learning is especially debated as there is

²³ Kumagai (2008) argued that much of the confusion of what constitutes the Flying Geese model is that Akamatsu himself developed three different theories which he all labelled "Flying Geese".

considerable disagreement whether such a process is essentially market-driven or some degree of industrial policies are required.²⁴

The final process is between multiple countries (Kumagai 2008). This process states that countries are in different stages of development with following countries (less developed) following a lead goose (most developed). This means that there is pecking order from most advanced running to the lesser advanced countries as illustrated in figure 8. It is this pattern that has given the Flying Geese theory its name as the pattern resembles a formation of flying geese.

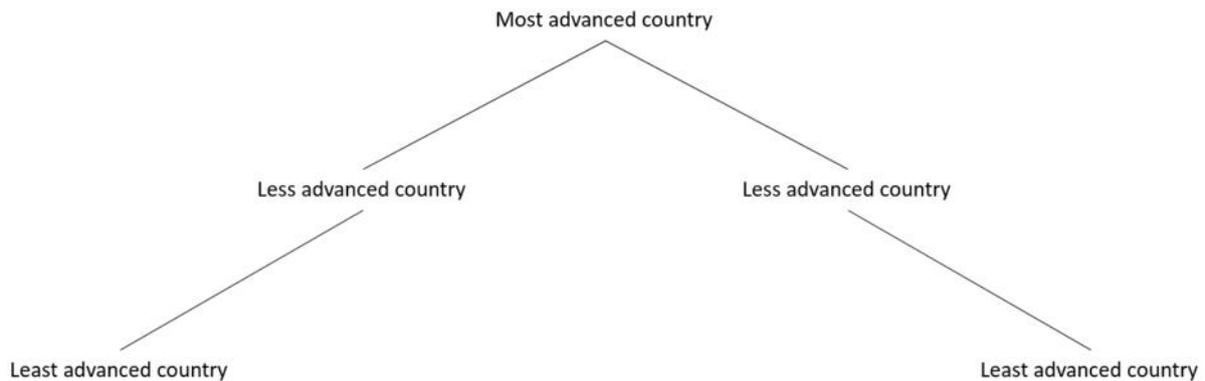


Figure 6: Pecking-order based on stages of development, the “Flying-geese formation”

A country will upgrade its export structure over time, meaning that the less advanced sectors will lose its comparative advantage, which will then be produced by a following country. This continual upgrading over time is a form of dynamic comparative advantage, which is different from the traditional static comparative advantage of the Heckscher-Ohlin model.

5.2 Palm oil industry

An obvious question is to what extent the Flying Geese framework fits the palm oil sector, as the theory was originally intended for manufacturing sectors.

On one level, it is impossible to use the first process of the Flying Geese theory, namely the import-production-export cycle. The theory makes the implicit assumption that production can be moved from one country to another and downplays the role of country-specific factors. This may be valid for most manufacturing sectors, but is less applicable for the palm oil sector. Climatic conditions are vital for the location of palm oil plantations and mills, with Indonesia and Malaysia having the right pre-conditions. It is unlikely that countries in vastly different climatic zones will be able to produce palm oil as efficient. Therefore, it is unlikely that Indonesia and Malaysia will experience the traditional import-production-export cycle associated with the Flying Geese model at the first level of value-added, meaning plantations and mills.

²⁴ Schröppel and Nakajima (2002) noted that the theoretical emphasis of which mechanisms that drive changes between phases has shifted over time. Akamatsu, inspired by List, opened for the possibility for industrial policies, even though Akamatsu had a more positive view of the role of imports. Kojima, however, emphasized that his process was essentially market-led in greater accordance with the more western neoclassical framework.

The second process, however, is far more relevant for the palm oil sector. The continual upgrading of the export structure, going towards more high-value added products over time, is less restricted geographically. European refineries and oleochemical plantations also process palm oil to produce higher value-added products. It is therefore feasible that the first level of value-added, the production of CPO, is conducted in a different location than processing, the second and third level of value-added. The theory therefore remains relevant as it describes increased levels of sophistication within the same industry.

The third process, the pecking order over time, is obviously relevant and there is an obvious candidate for the most advanced country, Malaysia, and the follower country, Indonesia. As these two countries constitute more than 80 % of the world's palm oil production it is sufficient to look at these two countries.

5.3 Methodology

To analyse how comparative advantage has changed over time, I will use the revealed comparative advantage as indicator.²⁵ The revealed comparative advantage (RCA) is defined as:

$$RCA_{i,j} = \frac{X_i^j / X_t^j}{X_i^w / X_t^w}$$

In which X is exports, the subscript indicates the commodity exported in which i is good i, and t is total export, whilst the superscript indicates the country in which j is country j and w is the world. RCA measures the share of the commodity j as a share of total exports in country i divided by the commodity as a share of total world exports. In effect RCA measures whether the share of exports in a country's total share is higher than the world share, with a result greater than 1 indicating a comparative advantage.

The analysis compares the relative comparative advantage of Malaysia relative to Indonesia for various product groups:

$$R_{i,M} / R_{i,I} = \frac{R_{i,M}}{R_{i,I}}$$

A $R_{i,M} / R_{i,I} > 1$ indicates that Malaysia has a RCA higher than Indonesia, while a $0 < R_{i,M} / R_{i,I} < 1$ indicates that Indonesia has a higher RCA than Malaysia.

The data used is from the COMTRADE database are various product groups based on the SITC 3 classification on the five-digit level from 1989 to 2014. The product groups chosen are broadly similar to the ones chosen by Arip, Yee, and Feng (2013). The data is classified in three categories, with the first level of processing being crude palm oil and crude palm kernel oil. The second level of processing is the export from the refineries, processed palm oil and processed palm kernel oil. The final category are various by products and forward linkages. The different product categories used are summarized in table 5:

²⁵ This method was first proposed by Balassa (1965) and still a commonly used method of measuring comparative advantage empirically.

Table 5: Different levels of processing and SITC3 codes

First level of processing

42221 Crude palm oil

42241 Crude palm kernel oil

Second level of processing

42229 Refined palm oil and fractions thereof

42249 Refined palm kernel oil and fractions thereof

By products and forward linkages

08138 Oilcake and other solid residues of oil from palm nuts or kernel

09101 Margarine (excluding liquid margarine)

51217 Fatty alcohols, industrial

51222 Glycerol (glycerine); glycerol waters and glycerol lyes

55411 Soap and organic surface-active products and preparations, in the form of bars, cakes, moulded pieces or shapes, and paper, wadding, felt and non-wovens, impregnated, coated or covered with soap or detergent, for toilet use (including medicated products)

55415 Soap and organic surface-active products and preparations, in the form of bars, cakes, moulded pieces or shapes, and paper, wadding, felt and non-wovens, impregnated, coated or covered with soap or detergent, for other uses

55419 Soap in other forms

55421 Organic surface-active agents, whether or not put up for retail sale

55422 Surface-active washing or cleaning preparations, n.e.s., put up for retail sale

55423 Surface-active washing or cleaning preparations, n.e.s., not put up for retail sale

6. Flying-geese in palm oil?

The figure for the relative RCA are presented in table 6. One can observe that Indonesia has a RCA in the first level of processing. The average RCA was 0.48 for crude palm oil and 0.34 for crude palm kernel oil for 2010-2014. This means that Indonesia appears to have a comparative advantage in producing crude palm oil and crude palm kernel oil over Malaysia. An interesting observation is that the trend is not one directional, as Malaysia since 2000 has increased its RCA relative Indonesia in crude palm oil and since 2005 in crude palm kernel oil. In the pure FGT this would not happen, as Indonesia would strengthen its comparative advantage over time. However, two factors might explain this pattern. First, Malaysia has since the East Financial Crisis increased its exports in crude palm oil, which has driven these figures. The government policy was to support agriculture to higher extent than previously following the crisis, which led to increased promotion of palm oil. The RCA for both Indonesia and Malaysia has been increasing the entire period which indicates that both countries are getting more specialized in the first level of processing. Second, and as mentioned previously, the first level of processing is special as it is subject to climate specific conditions. Therefore one would not expect changing comparative advantages as the FGT would suggest.

Table 6: Malaysia revealed comparative advantage relative to Indonesia

	1989-1994	1995-1999	2000-2004	2005-2009	2010-2014
<i>First level of processing</i>					
42221 Crude palm oil	0.08	0.08	0.28	0.24	0.48
42241 Crude palm kernel oil	1.43	0.12	0.09	0.10	0.34
<i>Second level of processing</i>					
42229 Processed palm oil	42.37	6.94	1.90	1.17	1.08
42249 Processed palm kernel oil	38.86	54.22	2.00	1.43	1.16
<i>By products and forward linkages</i>					
08138 Oilcake	3.61	1.54	1.28	0.71	0.68
09101 Margarine	12.92	0.46	0.11	0.25	0.28
51217 Fatty alcohols, industrial	2.61	6.36	2.08	1.38	1.34
51222 Glycerol (glycerine)	4.64	2.15	3.32	2.13	1.21
55411 Soap and organic surface-active products	1.02	0.56	0.33	0.26	0.23
55415 Soap and organic surface-active products	0.43	0.26	0.18	0.11	0.05
55419 Soap in other forms	10.88	24.96	16.20	3.60	3.09
55421 Organic surface-active agents	0.08	0.27	0.34	1.04	1.77
55422 Surface-active washing/cleaning preparations	2.99	0.72	0.27	0.28	0.54
55423 Surface-active washing/cleaning preparations	2.28	2.58	1.91	0.94	1.28

Source: Own calculations based on data from COMTRADE (2016)

The figures represent the relative revealed comparative advantage. A score of > 1 means that the RCA is higher for Malaysia than for Indonesia; while a score of < 1 means that the RCA is higher for Indonesia.

For the sake of brevity, the full names of the products were not included in this table.

The second level of processing is in line with the theoretical predictions of the FGT. Malaysia had a clear comparative advantage at the start of the period, which has gradually declined over time. In 2010-2014 the figure for processed palm oil and processed palm kernel oil were 1.08 and 1.16 respectively. In fact, in recent years the figure dropped below 1, indicating that Indonesia has gained a comparative advantage over Malaysia in the second level of processing.

The final category, by products and forward linkages, provides further evidence of shifting comparative advantage from Malaysia to Indonesia. In the period 1989-1994 Malaysia had a comparative advantage in 8 out of 10 products, while Malaysia only held a comparative advantage in 5 out of 10 in 2010-2014. In addition, the trend in all but one product group was that Indonesian comparative advantage grew stronger over time relative to Malaysia.

Conclusion

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