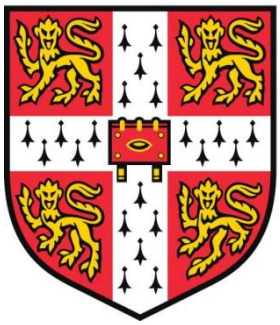
Agro-Commodity Global Value Chains and Upgrading: The Case of Malaysian Palm Oil



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Summary

This dissertation consists of three closely related essays on upgrading in agro-commodity value chains, which is an important issue for many developing countries that produce and export commodities in mostly unprocessed form. The essays are based on fieldwork in Malaysia and focus on its palm oil, which is the world's largest oils and fats product by production and export volumes.

The first essay examines the suitability of vertical specialisation for participation and upgrading in agro-commodity value chains based on the case of Malaysian palm oil. It uses data from interviews, site visits, and industry and economic statistics to analyse upgrading at the sector and firm levels. The essay suggests that upgrading is prone to sectoral linkage development and vertical integration at local lead firms. The development is driven by production characteristics, sectoral dynamics, eco-historical settings that are unique to agro-commodity value chains, as well as firm motives seeking resources, markets, efficiency gains, and strategic assets.

The second essay studies Malaysia's industrial policy for its palm oil sector through three distinct stages of development. The findings show that resource-based industrialisation (RBI) requires selective state intervention targeting macroeconomic conditions, infrastructure, business climate, and human capital. The Malaysian experience also highlights the importance of local firms in driving RBI investments, contrary to the emphasis in the literature which either overplays the importance of foreign linkages or dismisses nationality of firms as a non-factor for industrialisation.

The third essay investigates economic and social outcomes from upgrading in the Malaysian palm oil sector using gross value added data. It shows that economic upgrading can but does not automatically lead to social upgrading. The essay finds that economic upgrading in value chains improves income of groups of individuals at different rates depending on their position in the value chains. Skills and productivity performance provide only partial explanation for the uneven social outcomes; the differences in institutional arrangements and political representation accorded to the groups are likely to be important factors as well.

For Ho-Yan and Our Parents

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List of Abbreviations

ADM	Archer Daniels Midland
BPA	Bilateral payment arrangement
CPKO	Crude palm kernel oil
CPO	Crude palm oil
CPOPC	Council of Palm Oil Producer Countries
CSPO	Certified sustainable palm oil
DOA	Department of Agriculture
DOS	Department of Statistics
ECR	Export credit refinancing
EOI	Export-oriented industrialisation
EPF	Employees Provident Fund
EPU	Economic Planning Unit
ETP	Economic Transformation Programme
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FCPO	Crude Palm Oil Futures
FDI	Foreign direct investment
Felcra	Federal Land Consolidation and Rehabilitation Authority
Felda	Federal Land Development Authority
FFB	Fresh fruit bunches
FGV	Felda Global Ventures
G2G	Government-to-government
GAP	Good Agriculture Practice
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
GNI	Gross national income
GRI	Government research institute
GSP	Generalised System of Preferences
GVA	Gross value added
GVC	Global value chain
IMP	Industrial Master Plan
ISI	Import substitution industrialisation
KPF	Felda Investment Cooperative (Koperasi Permodalan Felda Malaysia)
KWAP	Retirement Fund Incorporated (Kumpulan Wang Persaraan)
LTAT	Armed Forces Fund Board (Lembaga Tabung Angkatan Tentera)
LTH	Pilgrims Fund Board (Lembaga Tabung Haji)
M&As	Mergers and acquisitions
MARDI	Malaysian Agricultural Research and Development Institute
MATRADE	Malaysia External Trade Development Corporation

MIDA	Malaysian Industrial Development Authority
MIMOS	Malaysian Institute of Microelectronic Systems
MITI	Ministry of International Trade and Industry
MOF	Ministry of Finance
MPIC	Ministry of Plantation Industries and Commodities
MPOB	Malaysian Palm Oil Board
MPOC	Malaysian Palm Oil Council
MYR	Malaysian Ringgit
NEP	New Economic Policy
OBM	Original brand manufacturing
ODI	Outward direct investment
ODM	Original design manufacturing
OECD	Organisation for Economic Cooperation and Development
OEM	Original equipment manufacturing
OPGL	Oil Palm Genetics Laboratory
OPP	Outline Perspective Plan
PKC	Palm kernel cake
PNB	National Equity Corporation (Permodalan Nasional Bhd)
POCPA	Palm Oil Credit and Payment Arrangement
PORIM	Palm Oil Research Institute of Malaysia
PORLA	Palm Oil Registration and Licensing Authority
PPKO	Processed palm kernel oil
PPO	Processed palm oil
PPP	Purchasing power parity
R&D	Research and development
RBD	Refined, bleached, deodorised
RBI	Resource-based industrialisation
RISDA	Rubber Industry Smallholder Development Authority
RSPO	Roundtable on Sustainable Palm Oil
SAP	Structural adjustment programme
SME	Small and medium sized enterprise
SPOC	Sustainable Palm Oil Cluster
TNC	Transnational corporation
UMNO	United Malays National Organisation
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UPM	Universiti Putra Malaysia
WTO	World Trade Organisation
WWF	World Wide Fund for Nature

1 Resources, Industrialisation and Globalisation

Interest in agriculture and agribusiness tends to ebb and flow over time. Before the publication of *World Development Report 2008: Agriculture for Development*, the last report by the World Bank that focused on agriculture was published in 1982. Throughout the decades of the 1980s and 1990s, agriculture was considered a sunset industry. Since the turn of the millennium, agriculture and agribusiness have received revived interest on account of several developments, including the more immediate commodity booms and food price crises.

The resurgence of agriculture as a development agenda in part reflects its relevance to key aspects of development ranging from structural transformation, employment, poverty reduction, rural development, food security and nutrition intake (see, for example, Ghatak and Ingersent (1984); Ishikawa (1978); Johnston and Mellor (1961); Southworth and Johnston (1967); Timmer (1991)). Historically, countries that modernised their agriculture and built agro-industries out of it performed better on the Human Development Index than those who did not (Wilkinson & Rocha, 2009).

It is also fuelled by a new understanding of the sector's production linkages to manufacturing and services that are effected through evolving supply chains, which are increasingly characterised by groups of firms undertaking geographically dispersed activities in vertically fragmented yet functionally coordinated production networks (Abonyi, 2005; Dicken, 2011). The organising framework known as global value chains (GVCs) has spread to wide-ranging industries such as garments, automobiles/ automotive parts, consumer electronics, telecommunications and even services (UNCTAD, 2002, 2013).

Improving the terms of participation in agro-commodity value chains through upgrading will benefit developing countries. Most of these countries still derive substantial export incomes from commodities. In addition, three out of every four persons in developing countries live in rural areas and rely on agriculture for livelihood (UNCTAD, 2015; World Bank, 2007). The impetus for upgrading is even greater for economies with lower income levels: of the 49 Sub Saharan African economies, 11 rely on a single commodity for 50% of their export earnings and nearly three-quarters rely on three commodities for half or more of export earnings (Taylor, 2016). The dissertation is based on research and analysis from the perspective of developing countries and their firms, using the case of the Malaysian palm oil sector from the 1960s to the present.

1.1 Resources and Industrialisation

Industrialisation refers to the sustained structural transformation of a traditional economy into a modern economy, in which manufacturing plays a significant role in total activity (Szirmai, Naude and Alcorta, 2013; Weiss, 2011). Economic growth increases national income and wealth, and industrialisation is an important growth engine. Manufacturing is recognised for having higher productivity level and growth potential as well as offering greater linkage possibilities to other parts of the economy than agriculture and services. Manufacturing also offers the greatest potential for expansion via exports since goods are highly tradeable (Weiss and Jalilian 2016). Economic gains from industrialisation and growth are important for – though by no means an automatic process – reducing poverty, solving social problems, and improving the well-being of the population. Clear evidence exists for a strong positive connection between industrialisation and human development measured along the dimensions of poverty/ equality, education and health (see, for example, Upadhyaya and Kepllinger, 2014).

The exact threshold at which an economy is said to have industrialised is open to debate but most agree that economies broadly share some economic characteristics before and after industrialisation. Economies before industrialisation typically have low output per head, a fairly large agricultural sector, and rely more on unskilled labour in production. Industrialised economies have higher outputs on increased efficiency and productivity per head, a relatively large manufacturing sector, and use new technology and more capital in production. Beyond these common traits, the paths to industrialisation show considerable divergences, depending on countries' initial conditions and the era during which industrialisation took place (Pollard 1990).

Britain is recognised as the first country that successfully industrialised in the mid-18th century beginning with specialisation, division of labour, and innovations in cotton textiles. Technical progress characterised by the improvement of the Newcomen steam engine took place over the next several decades. Firm profits were reinvested, while machines were incorporated into production on a wide scale. In the early 19th century, European industrial followers similarly concentrated on productive investment but relied more on banks and focused on different products (coal mining and textiles for Belgium; fine silk, embroidery and watch-making for Switzerland; and luxury goods requiring artisanal skills for France). The US followed a radically different path towards industrialisation by focusing on primary exports (World Bank, 1987; Szirmai, Naude and Alcorta, 2013; Weiss, 2011). From the late 19th century, the latecomers – Germany, Russia and Japan – industrialised by making use of the modern technologies developed in the leading industrial economies in what Gerschenkron (1979) refers to as the

"advantages of backwardness". In Japan – and later in Korea and Taiwan in the 20th century – the government invested in infrastructure and industries. Japan and Korea also created large conglomerate national firms in strategic sectors to drive industrial development; while Taiwan relied more on the small and medium-scale private sector. Industrialisation subsided since the beginning of the 20th century and resumed unevenly post-war. East Asia rapidly industrialised while Latin America and Sub-Saharan Africa showed little change or even signs of deindustrialisation.

Clearly, the state played a more active role in late industrialisation than in early industrialisation. However, the debate on industrial strategy for the contemporary world remains unresolved. Disagreements exist in relation to several aspects: 1) the treatment of foreign trade ('open' versus 'closed' trade policy, particularly the use of import taxes and trade restrictions to protect domestic industry); 2) the degree to which foreign investment should be relied upon for technology and funding for industrial projects ('dependent' versus 'independent' policies); 3) the relative role attributed to the market or state planning in industrial development (price mechanisms to allocate resources between firms, versus the use of price and non-price controls to influence resources allocation); and 4) the extent to which technology used should reflect a country's comparative advantage and/ or be created indigenously (Weiss 2002, 2011).

While industrialisation rightly concentrates on the augmentation of manufacturing base, it was often misinterpreted to mean that non-manufacturing sectors are unimportant. This reflects a poor understanding of production linkages between manufacturing industries and non-manufacturing activities. With the notable exception of RBI, the development literature is replete with misgivings about the role of natural and agricultural resources in industrial development, on account of at least six strands of argument. First, resource-based activities benefit foreign capital, with minimal spillovers to those in the immediate vicinity of the activities (the enclave theory) (Singer, 1950; Humphreys et al., 2007; McMillan & Rodrik, 2011). Second, real exchange-rate appreciation and domestic inflation reduce competitiveness of manufactured exports, investments in non-resource export sectors and long-term growth (the 'Dutch Disease') (Corden & Neary, 1982; Gylfason et al., 1999; Sachs & Warner, 2001). Third, resource-abundant countries' dependence on commodity exports constrains the incentive for industrial development, as was the case with Canada (where the 'Staples Trap' theory was developed) (Watkins, 1963; Innis, 1933; North, 1955). Fourth, decreasing relative prices of commodities to manufactured goods and slow rate of technical progress in the primary sector cause developing countries to lag behind the industrialised world (the Prebisch-Singer hypothesis) (Prebisch, 1950; Singer, 1950). Fifth, a common misinterpretation of structural change that agriculture is unimportant, since the share of manufacturing in output and labour force rises as the

agricultural share declines during economic growth (Kuznets, 1966; Timmer, 1991; Kaldor, 1967; Chenery et al., 1986). Lastly, potential gains from resource abundance are offset by social conflict, violence, institutional weaknesses, rent-seeking and corruption (Easterly & Levine, 1997; Tornell & Lane, 1999; Mehlum et al., 2006).

Agriculture or Agribusiness? The Missing Production Linkages

The debate on whether resource-intensive sectors can provide a base for industrial development concerns two dimensions: the potential of production linkages, and the technological and knowledge content in these linkages.

Empirical inquiry into linkage effects of resource-intensive sectors, typically by applying input-output analysis to specific locations and ventures, has produced mixed results. Stilwell et al. (2000) estimate that linkages between mining and the rest of the economy are minimal in South Africa. San Cristóbal and Biezma (2006) find that only three subsectors in EU mining and quarrying are key sectors in that they are more stimulated by overall industry growth and have greater impacts in terms of investment expenditures on the national economy than other sectors.

Other studies suggest that linkage effects in resource-intensive sectors are not inherently and *can* in fact be substantial. Alrawashdeh and Thyabat (2012) show that mining has a strong forward and backward linkage to the Jordanian economy, and that five sub-sectors are considered as key sectors. Morris et al. (2012) show that in a number of cases in Sub-Saharan countries, backward and forward linkages – and even lateral linkages (segments within a value chain that feed into other value chains, e.g. logging equipment originally designed for the timber sector being modified for use in sugarcane production) – have developed in varying degrees around diverse mining and agricultural industries.[1]

The second aspect of the resource debate is the technological and knowledge intensity in the production linkages. Resource-intensive sectors are seen as unable to provide firms in developing countries with technologies and knowledge, either foreign or indigenous, to innovate and industrialise. For example, the widely used Pavitt's taxonomy of sectors characterises agriculture and traditional sectors (resource-intensive sectors presumably included) as supplier-

[1] For example, Gabon's timber industry has evolved beyond logging and integrated processing functions to make higher value-added sawn wood, veneer sheets and plywood. Zambia's copper mining has expanded downstream into manufacturing of semi-frabricates (albeit undertaken by a US processing conglomerate and a Chinese state-owned enterprise), with substantial backward linkages in the form of many local suppliers for mining activities.

dominated, and having a low intensity of technology driven by large suppliers of machinery, materials and inputs (Pavitt, 1990).

However, as with supposedly weak linkage effects, technological backwardness in activities based on resources is not a given. As Lederman and Maloney (2006) put it:

> It is each country's choice either to exploit their natural resources with outdated technologies or enclave production systems, or to invest in related skills in transfer, adaptation, and creation of more productive technologies and in the setting of adequate institutions for the efficient and sustainable use of natural resources and of the public revenues associated with oil and mineral activities. When natural resource-rich societies take appropriate complementary policies, they indeed become very rich and grow fast; when they don't, they can certainly waste the great development opportunities that nature holds out for them. It is perplexing that modern agriculture, forestry, and fisheries based on transgenetics and biotechnology, as well as modern oil and mineral exploration and production based on major scientific and technological advances in geology and other earth sciences are still routinely classified as 'low-technology' activities by most of our fellow economists.

Empirically, Martin and Mitra (2001) use a panel data set for 50 countries over the 1967-1992 period and find that at all levels of development, technical progress as measured by total factor productivity grew 50% faster in agriculture than in manufacturing, suggesting rapid dissemination of innovations. Kuramoto and Sagasti (2006) find that the gold mining industry in Peru innovated in bioremediation technologies with applications outside mining for any pollution that is generated by industrial, agriculture or waste management activities.

Agriculture has distinct common technological and socio-economic characteristics, even though agricultural production is highly heterogeneous and varies by produce and location (Colman & Young, 1989; Corsi, 2002; Cramer et al., 2001; Fox & Johnson, 1970). Technologically, (1) agriculture has a tight link to land, which is a scarce and non-producible factor; (2) it involves a lengthy production process that has low reversibility; (3) its production remains an intensely local process, bound to specific climatic and soil conditions; (4) it is grounded in biophysical processes and is more susceptible than other sectors to biological cycles and natural factors, both of which have difficult to control; and (5) due to the perishable nature of certain agricultural produce, there is also a greater emphasis on freshness and agility in the logistics system. Several implications arise. First, agriculture has a high degree of asset fixity, where farmers find

it difficult to dispose of their capital equipment in the event of downsizing or closure. In the event of asset disposal, asset values are quite low relative to their purchases price so farmer end up owing more on purchase loans than assets are worth in the used equipment markets. Second, agriculture has a high degree of seasonality. Regular changes recur throughout the year, resulting in unevenness in resource requirements as well as output flows. Third, standardisation is relatively difficult in agricultural product. Fourth, risks and uncertainty are inherent and more difficult to control for in the production stages.

In most countries, the majority of agricultural output volume and workforce composition involves small, family-operated farms due to the lack of economies of scale and lower supervision costs of waged labour. These farming households are common in rural or suburban areas, providing a historical link between agriculture and rural development (Ellis & Biggs, 2001). The coexistence of informal and formal sectors is notable. In agricultural production for most countries, large-scale, industrial firms' involvement is relatively less than what is observed in other sectors, although this is fast changing. This culminates in relatively less market concentration and power in agricultural production for large-scale, industrial firms, which are nonetheless more concentrated outside direct agricultural production and have a stronger presence in the post-harvest food and non-food processing and marketing segments. As a consequence, agricultural production is usually highly fragmented and many costs are implicit, as with the case of family labour. Individual farmers have little market power, and are exposed to high risks of income fluctuations arising from volatile agro-commodity prices. The key factors used for agricultural production – labour, land, and water – are also less mobile (than factors used in industrial production), making any adjustment for other productive purposes within farm sectors slow.

With economic development, the share of agriculture as a percentage of a country's gross domestic product (GDP) tends to decline (Chenery & Syrquin, 1975; Kuznets, 1971). This is based on Engel's Law that the proportion of income spent on food tends to fall even if actual spending on food increases in absolute terms (Timmer, Falcon, & Pearson, 1983). Notwithstanding varied income elasticities for different food types,[2] as income expands, consumer demand for food rises at a slower pace than demand for manufactured consumer

[2] Inferior goods such as potatoes have a negative income elasticity, meaning an increase in income will lead to a fall in the demand because consumers switch to better substitutes. Normal goods such as animal protein are associated with positive income elasticity, where an increase in income will lead to a rise in demand. A normal good is considered a necessity good if its income elasticity of demand is less than 1, and a luxury or superior good if is income elasticity of demand is greater than 1. Sticky goods have a zero income elasticity of demand because an increase in income is not associated with any change in its demand.

goods and later on, services. This results in structural transformation of economies, where an expansion of the industrial/ manufacturing sector alongside national income growth is observed along an inverted U-shaped curve, before the share of industry, too, declines, giving way to the growing services sector. This often masks the continued importance of agriculture to economic development. An extended definition of agriculture to focus on agribusiness highlights the importance of production linkages along agro-commodity value chains and their full potential for industrialisation and economic growth (Figure 1.1).

Value Chain Links	*Inputs*	*Production*	*Trading*	*Handling, packing, and storage*	*Processing*	*Distribution and marketing*
Function	Produce and distribute the goods and services that producers buy as part of their business activities	Produce raw food, fiber and other agricultural products	Trade agricultural products and coordinate production and delivery at times	Provide services to preserve, store and transport agricultural products	Convert raw agricultural products into intermediate and finished products (food and non-food)	Distribute food and non-food products to the final consumer when and where the consumer wants it

Figure 1.1. Simplified production linkages in agriculture, agro-industry and agribusiness.

Agriculture is systematic primary production of plants and animals for use as food, feed, fibre, fuel, and other outputs. Agro-industry describes a subset of manufacturing industries where value is added to agricultural raw materials through processing and handling operations (Da Silva & Baker, 2009). Agribusiness includes but extends beyond the farm gate to cover a range of pre- and post-harvest activities involved in the production, transformation, preservation and preparation of agricultural production for intermediary or final consumption (Henson & Cranfield, 2009). Such differences are not merely a terminology issue. For instance, agriculture is one of the smallest sectors in the US, producing 2% of national output and directly employing 3% of the employed labour force. Once agricultural input industries, services, processing and marketing, wholesale and retail establishments are taken into consideration, the agribusiness complex employs nearly 21.6 million jobs or 15.8% of total employment in the United States, and accounts for 14% of the nation's GDP (Cramer et al., 2001). The case for agribusiness development is even more pressing for developing countries because their food system, including the production of primary goods and commodities, marketing and retailing, would account for more than 50% of their GDP (Jaffee et al., 2003). This ratio may be understated given the prevalence of the informal sector in these countries.

Historically, resource-abundant economies of new Western European settlement and of Latin America expanded rapidly at the end of the 19th century; and resource-rich countries grew faster

from 1913 to 1950 than the then-industrialised countries (Auty, 1998; Maddison, 1995). Using estimation techniques different from those of Sachs and Warner (2001), Lederman and Maloney (2006) find that natural resource abundance appears to be even positively related to countries' economic growth between 1975 and 1999 and that export revenue concentration, rather than natural resources, reduces growth.

In the US, collective learning as well as returns on large-scale investments in exploration, transportation, geological knowledge and mining-related technologies turned the country into a leader in production of a wide range of minerals (Wright & Czelusta, 2004). Similarly, once suppliers of simple intermediate products to more advanced economies in Western Europe, Sweden and Finland upgraded the technological level of their raw material-based industries (timber and iron ore) and use them as a foundation for diversification into machinery, engineering products, transport equipment, and various types of services since around the middle of the 19th century (Blomström & Kokko, 2003). In the two Nordic economies, industries based on domestic raw materials still account for a significant share of manufacturing activity (the forest and metal industries together employ one-fifth of Sweden's industrial labour and supply about a quarter of total Swedish exports – in Finland, the corresponding shares are even higher). This implies that raw material based production is not merely a temporary stage in economic development but can instead be a sustainable element of an advanced industrial structure. Importantly, the rapid change in industrial structure in both Sweden and Finland occurred since the early 1990s, when they developed information and communications technology and other knowledge-intensive manufacturing and services. At present, industrialised countries process 98% of their agricultural products with a value added of US$185 per tonne and minimal post-harvest losses; compared with 38% processed, US$38 in value added and 40% losses for developing countries (UNIDO, 2009).

1.2 Globalisation and Global Value Chains

Industrialisation has always been shaped by the wider external economic environment in which the process takes place. One distinct feature that differentiates the current era of industrialisation compared with its predecessors is international fragmentation of production across firms and borders, often referred to GVCs.

The previous dominant paradigm for industrial organisation was the modern corporation, based on the multidivisional and multinational enterprises that emerged in the US between the 1840s and 1920s. A modern corporation is posited to accumulate more upstream and downstream functions formerly mediated by the market within the boundaries of the firm (leading to

decreased variable costs and increased fixed costs), giving rise to vertical integration. Chandler (2002, 2003) argues that given their hierarchical internal organisation and large size, such corporations enjoy lower transaction costs because of routinised intra-firm interactions; higher accuracy of price and supply information; and better coordination of inputs and outputs, leading to more efficient utilisation of productive apparatuses and increased throughput. The thinking was influenced by the transaction cost approach pioneered by Coase (1937). While market and price mechanisms work well between firms, economic relationships between autonomous actors incur costs in search and information; bargaining; as well as policing and enforcement. Firms thus exist not because markets fail to produce the efficient outcomes but because in some cases, transactions operate *more* efficiently inside the firm. Williamson (1975, 1981) challenges Coase's view that the market is always efficient. "Opportunism" among contracting parties leads to uncertainty, complexity, bounded rationality, incomplete contracts and hold-up problem. These problems incur transaction costs (i.e. the costs of developing and monitoring exchange contracts) and lead to market inefficiency. Firms thus exist as hierarchies that exercise power over economic actors to mitigate transaction costs (conceptualised differently from Coase's version) and opportunistic behaviour.

Since the late 1970s, firms in advanced economies evolved in a way that defies Chandler's logic. During the global business revolution, aided by trade liberalisation and technological advances, firms from the Global North redefined their core competencies and became vertically specialised, shedding the activities and functions in the value chains that they can purchase from others, leading to an increase in vertical trade (Nolan, 2001; Nolan et al, 2008; Feenstra, 1998). Almost 60% of global trade at present is in intermediates, which are goods used as inputs in a further production process. The import content of exports was 20% in 1990, rose to 40% in 2010 and is expected to rise to around 60% by 2030 (Lamy, 2013).

As large firms from advanced economies consolidated their core business and improved their market position through massive mergers and acquisitions (M&As), they grew in size. Their influence and power also increased as the extent of conscious coordination and planning surrounding the value chains increased in a wide range of industries, and led to the emergence of core "systems integrator firms" and "external firms" with which they have no equity links (Nolan, 1999, 2001).[3] Functional integration of internationally dispersed activities across

[3] Similarly, Ruigrok and van Tulder (1995) describe the new form of organisation that arises from international business restructuring as an "industrial complex", which they see as a bargaining arena involving internal and external actors. The primary internal actors are the core firm, "which is the spider in the industrial web and which is best positioned to manage the dependencies in the industrial complex", and the supplying firms, workers and dealers. The external actors include governments and financiers.

multiple firms, with powerful transnational corporations (TNCs) occupying the commanding heights of various value chains for coordination purposes, differentiates the latest wave of 'globalisation' from the previous ones which reflected simple geographic spread of economic activities across national boundaries (Dicken, 2011). This gives rise to the concept of GVC, represented by the greyed quadrant in Figure 1.2, and has become a rich site for GVC research.

		Location (Spatial)	
		Local	International/ Offshoring
Organisation (Functional)	Within Firm (Hierarchical)	Domestic, in-house supply Onshoring (production at domestic locations with cheaper costs) Domestic direct investment Vertical/ horizontal integration	International insourcing (activities contracted to foreign subsidiaries/ affiliates) Foreign direct investment Vertical/ horizontal integration
	Outside Firm/ Outsourcing (Arms-length and quasi-hierarchical)	Domestic outsourcing Vertical/ horizontal specialisation	International outsourcing (activities contracted to 'independent' third parties abroad Vertical/ horizontal specialisation

Figure 1.2. The 'make or buy, and where' of production.

While fragmentation of production is not without limits and is more applicable to some industries than others (De Backer & Miroudot, 2012), the production process is increasingly getting sliced up into smaller segments in a complex way previously not possible. The emergence of GVCs has made production more services-intensive. However, because services inputs do not break down easily into the existing product classification and nomenclature systems, the role of services is often underestimated and poorly understood even as efforts to improve analytical and statistical measures of services have begun to intensify (Low, 2013).[4]

GVC as a form of industrial organisation has fuelled concern but also cautious optimism about benefits of GVC participation. Latecomer firms from developing countries are faced with two competitive disadvantages: they are dislocated from the main international sources of technology and R&D, and they are dislocated from the mainstream international markets that they wish to supply to (Hobday, 1995). Through GVCs, they can have better access to international product and input markets as well as technologies and knowledge, and acquire

[4] Low (2013) notes that the share of cross-border services transactions in international trade was estimated at just over one fifth of total trade in 2012 but the recent OECD/WTO work on measuring trade in terms of the value-added to products by different countries along supply chains, rather than in gross terms, has yielded a dramatically different picture. In 2008, for example, the share of commercial services in world trade was estimated at 23% in gross terms and 45% in value-added terms.

new capabilities to be more efficient and productive. However, power and capability asymmetry within actively managed value chains also complicates performance and prospects of a great number of developing-country firms which are connected to lead firms through multi-tiered supplier networks.

Upgrading

Understandably, upgrading has been an important issue in GVC research and policy. In a narrow sense, upgrading means acquiring the skills, competences and supporting services to raise productivity and to capture higher value-added. More broadly, upgrading is about actively and purposefully changing the way firms are linked to GVCs.

Sources of capabilities for upgrading have been extensively explored in the GVC literature and elsewhere, with some overlaps. The first approach highlights the importance of development agencies and donors as well as non-governmental organisations. These entities have been especially important in agribusiness value chains, where the agencies and organisations typically target smallholder farmers and small agro-enterprises through measures such as rural infrastructure development, agricultural extension services, training and technical support (Jaffee et al., 2003). The second is the theory of agglomeration in the Marshallian sense in economic geography and business studies. It addresses domestic transfers and linkages within clusters or industrial districts made up of a critical mass of firms performing interconnected activities. Firms reap collective efficiency through external economies of scale and joint actions (Krugman & Venables, 1995; Markusen, 1996; Porter, 1996). The third is innovation systems in which generation, application and diffusion of knowledge occur through interactions between private and public institutions and actors within sectoral, regional or national settings (Freeman, 1995; Lundvall, 2012; Nelson, 1994). Firms, personnel and industry groups are important network elements; as are public institutions (e.g. universities and research laboratories) and state policies (e.g. training, funding and technical assistance).

For the GVC framework, foreign linkages in export-oriented value chains can be an important source of capabilities for upgrading. This is a marked departure from the early view inspired by dependency theory that developing countries will be harmed by their reliance on foreign direct investment, which may involve significant equity stake (with ownership control or effective management decision power in foreign enterprises) or non-equity forms of cross-border

investment modalities (licensing, leasing, franchising, start-up and international production sharing agreements).[5]

Some consensus has emerged more recently around a more benign view that FDI can be an important bundle of resources and assets for capital accumulation and productivity gains. The resources are: 1) more stable financial capital (FDI inflows are less footloose than initially thought because they are for long-term projects, unlike short-term portfolio investments for fast returns); 2) modern technologies that may otherwise be unavailable without FDI; 3) access to export markets (which allows technological learning, realisation of scale economies, competitive stimulus and market intelligence); and 4) transfer and spillover of skills, organisational practices and management techniques (UNCTAD, 1999). Such benefits are not without a caveat. The UNCTAD report, led by Sanjaya Lall, cautions that simply opening up to FDI was not the best policy stance since some investments "may lead to static gains, but not necessarily to dynamic ones" and therefore "do not substitute for domestic effort" (ibid).

Within GVCs, local firms may learn from foreign lead firms through two main channels: active transfers and 'unintended' knowledge leakage (Fu et al., 2011; Saliola & Zanfei, 2009). Upgrading effects are most significant for local firms new to global markets (Dolan & Humphrey, 2000; Gereffi, 1999; Keesing & Lall, 1992). But upgrading is not a given. The extent of active support for upgrading by the lead firm or the global buyer is closely linked to how a value chain is governed, namely how parameters for the processes are established, monitored and enforced. Upgrading targeted by local firms may in fact be hindered were it to encroach on the global buyers' or lead firms' core competence (Humphrey & Schmitz, 2002; Schmitz & Knorringa, 2000). Studies have attempted to map the characteristics and determinants of governance and how different types of governance, in turn, affect upgrading possibilities (Table 1.1. See, for example, Gereffi et al., (2005); Milberg (2004); Pietrobelli and Rabellotti (2011)).

As governance moves towards hierarchical control, the level and impact of active support from lead firms increases, especially in product and process upgrading. In comparison, support for

[5] In world systems theory best associated with Wallerstein (2011), TNCs as agents of core economies draw upon resources from semi-peripheral and peripheral economies, leaving the latter in a perpetual state of under-development. Rather than contribute to local financial capital, TNCs extract financial capital out of host countries through transfer pricing and profit repatriation (Moran, 1998; Fry, 1983). FDI can serve as the vehicle through which TNCs dominate host countries' markets, create technology dependence and stifle local competition (Evans, 1979). Additionally, footloose FDI increases the power of TNCs vis-à-vis host country governments and leads to interference in local politics and policy (Apter, 1976; Fry, 1983).

functional upgrading is negative or at best neutral across all governance patterns. Functional upgrading is still possible but only if lead firms decide to vacate certain spaces, and if the suppliers demonstrate their capabilities and can make the required investments. For lead firms, governance is necessary for managing various risks inherent in value chain production (supplier failure, performance, conformance and price risks). Hence governance evolves as risk profiles change.

Although lead firms often hold considerable power over other firms in the value chains, governance is not a one-way, top-down interaction. It is inaccurate to assume that suppliers have no leverage for bargaining in their interactions with lead firms. First, switching costs for lead firms are potentially high, especially if there is a limited pool of alternative suppliers. Second, the very basic function of a value chain is to ensure the smooth running of repetitive linkage interactions and to enable risk-sharing among firms. It is therefore in the mutual interest of firms to maintain their relationships, even as they continuously find ways to avoid over-dependence on each other. Third, the specification and enforcement of parameters incur costs from monitoring, inspection and control. Parameters concern what is to be produced (product standards), how it is to be produced (process standards), at what price it is to be produced (cost), and how much is to be produced and delivered by when (delivery and logistics) (Humphrey and Schmitz, 2001). Trust and reliability can minimise enforcement costs.

Table 1.1. Characteristics, determinants and implications of governance for upgrading.

	Arms' length relationships (Market transactions)	*Quasi-hierarchical modes (Modular, Relational, Captive)*	*Hierarchy/ intra-firm trade (Foreign direct investment)*
		Characteristics	
Degree of explicit coordination and power asymmetry	Low	Moderate to high	High
Type of goods flow	Inter-firm trade	Inter-firm trade	Intra-firm trade
Product characteristic	Low design and specification requirement Standard, non-differentiated Non-durables	Low technological requirement High design and process specification Non-durables	High technological and design requirement Quality-based differentiation Durables
Industry example	Natural resource-based (sugar, tobacco, wine, fruits, vegetables, minerals)	Specialised products and traditional manufacturing (textile, garments, footwear, chemicals, basic equipment)	Complex products (automobile and auto components, aircraft, consumer electronics)
Typical lead firm/ buyer type	Volume traders/ processors Retailers	Brand owners Retailers	Producers (makers)
Typical supplier location	Low-income developing countries	Low- and middle-income developing countries	Middle-income developing countries and high-income developed countries

Determinants			
Complexity of transactions	Low	Moderate to high	High
Ability to codify transactions	High	Moderate to high	Low
Capabilities in the supply base	High	Moderate	Low
Appropriability of knowledge	Low	Low	Medium to high
Barriers to entry	Low to high (land use can be politically sensitive)	Low	High
Implications for Upgrading			
Active buyer-supplier transfer of technology	Unlikely	Likely	Necessary
Suppliers' learning mechanisms	Knowledge spillovers Imitation	Knowledge embodied in standards, codes and technical definitions Face-to-face interactions with buyers Deliberate transfers of technology confined to a narrow range of tasks (e.g. assembly)	Imitation Turnover of skilled managers and workers Training Knowledge spillovers
Buyers' impact on suppliers' upgrading	Positive (but passive) on product and process upgrading Neutral to negative on functional upgrading	Positive (active) on product and process upgrading Often negative on functional upgrading	Neutral to positive on product and process upgrading Neutral to negative on functional upgrading

Source: Adapted from Gereffi et al. (2005); Kaplinsky (2005); Milberg (2004); Pietrobelli and Rabellotti (2006, 2011).

Upgrading in Agro-Commodity Value Chains

The international operating environment for agro-commodity value chains has changed with significant shifts in national agricultural policy (Barrett, 2012; Barrett et al., 2010). Since the 1980s, the international debt crisis triggered unprecedented macroeconomic reform under structural adjustment programmes (SAPs), typically by reducing fiscal and balance-of-payment deficits and divesting state enterprises to the private sector in line with the free market paradigm. As a result, statist control of agriculture collapsed. Subsidies and non-subsidy support on stapled food, agricultural credit, and fertiliser were scaled back as donor and government support retreated. The 1990s saw donor efforts further redirected from agricultural development to emergency relief for internal conflicts as the Cold War ended. The Uruguay Round of General Agreement on Tariffs and Trade (GATT) led to commitments to remove nontariff barriers to trade and to reduce tariff barriers and agricultural subsidisation. New trade agreements and the creation of the World Trade Organisation (WTO) ushered in an era where developing countries will be dealing with a much more open world trading regime (Staatz & Eicher, 1998).

The withdrawal of the state has negatively affected investment in public goods such as agricultural research, education, extension, and infrastructure, thereby reducing agricultural productivity (Chang, 2009). More importantly, responding to changes in demand and competition and seizing the vacuum created by the withdrawal of parastatal entities, global firms ride on market liberalisation and industry-wide technological advance (information and communications, transport, and logistics) and drive industry-specific technological innovation (inventory management, storage, and processing) and cross-border investments in the food processing and retail sectors of their target markets in developing countries.

In the process, agro-commodity value chains experienced a profound transformation characterised by wider geographical reach (multinationalisation); value creation and distribution oriented towards differentiation; increased buyer-drivenness in governance; and structural and organisational change via the rise of vertical coordination and private standards (Gibbon, 2001a; Reardon et al., 2009; Reardon & Barrett, 2000). There is a growing number of complex contractual agreements and conventions replacing spot markets (Cook & Chaddad, 2000; Humphrey & Memedovic, 2006).

This has simultaneously created and limited opportunities for upgrading in agro-commodity value chains. On the one hand, modern agribusiness value chains theoretically offer greater upgrading opportunities than before because of several reasons: (1) they require higher processing, much of which is done close to the growing sites and global buyers may be willing to outsource some functions; (2) increasing product differentiation requires investment in innovation; (3) an increasing emphasis on agility in logistics and consumer expectations for freshness and other considerations; and (4) a shift to long-term contractual relationships to ensure continuous, reliable supply, thus raising the switching costs for buyers (Humphrey & Memedovic, 2006).

On the other hand, entry barriers and the risks of exclusion for developing-country firms have increased. Following the entry of global firms to replace the parastatal export marketing entities and state-backed international producer cartels, power has shifted from producers to either retailers/ merchandisers or international traders which have diversified downstream towards secondary processing (cocoa) or upstream towards production (coffee), and become more involved in export functions and services to end-users (Gibbon, 2001b). In the fresh vegetables value chain between Kenya and the UK, the UK supermarket chains are the lead firms which exercise a decisive influence over all stages, from the way crops are grown to their processing and storage (Dolan & Humphrey, 2000, 2004), although different forms of governance (market,

modular, relational, captive, and hierarchy) can exist between firms at different stages along the value chain, and evolve over time.[6]

1.3 Malaysian Palm Oil in the World Oils and Fats Market

Globally, there are 17 major oils and fats of plant and animal origin. In total, over 200 million tonnes of these oils and fats are produced annually, of which 76 million tonnes are exported. The share of vegetable oils, extracted from the crushing of oilseeds and oil crops, has increased in relation to animal fats, with the former accounting for 87% of world production and 96% of world exports in 2014 (compared with 69% and 70% in 1980) (Table 1.2). Four vegetable oils -- palm, soybean, rapeseed and sunflower oils – dominate the world market for oils and fats, accounting for 75% of world production and 86% of world exports in 2014 (Table 1.3). In the past decades, production of oilseeds and oil crops rose to provide for higher consumption of oils and fats and continuously growing demand for protein meals, both of which were primarily attributed to growing populations and rising incomes in developing countries. Increased production has also been driven by a shift in consumer preferences for vegetable oils and more recently, by the use of biofuels. In the coming decade to 2025, demand for vegetable oils is expected to slow due to a reduced growth in per capita food use in developing countries (at 1.5% per annum compared to 3.0% in 2006-2015) and only slight increases in biodiesel production from vegetable oils as biodiesel mandates have been gradually fulfilled in developed economies (OECD & FAO, 2016).

[6] For example, during the early stage of the value chain throughout the 1990s, as the supermarkets bypassed the wholesale markets and relinquished some functions and services related to value chain management to a limited number of UK importers in a relational form. During the 2000s, with the introduction of category management, each product category saw the consolidation of the value chain, and had a large part of its management transferred to a ‘category captain’, which is typically a leading importer with the capacity to coordinate suppliers from a number of other importers. This results in shift to modular governance between the supermarkets and the importers.

Table 1.2. World production of major oils and fats, 1980-2014.

('000 tonne)	*1980*	*Share*	*1990*	*2000*	*2010*	*2014*	*Share*
Soybean oil	13,321	23%	16,079	25,563	40,210	45,095	23%
Palm oil	4,804	8%	11,014	21,867	46,181	59,323	30%
Palm kernel oil	641	1%	1,454	2,698	5,116	6,560	3%
Rapeseed oil	3,537	6%	8,160	14,502	24,260	27,187	14%
Sunflower oil	5,036	9%	7,869	9,745	12,507	16,148	8%
Coconut oil	2,768	5%	3,387	3,261	3,604	3,018	2%
Cottonseed oil	3,044	5%	3,782	3,850	4,530	4,853	2%
Groundnut oil	2,588	5%	3,897	4,539	4,219	3,874	2%
Olive oil	1,788	3%	1,855	2,540	3,323	3,302	2%
Sesame oil	516	1%	612	705	884	783	0%
Corn oil	n.a.	n.a.	1,477	1,966	2,411	3,162	2%
Linseed oil	720	1%	653	705	593	629	0%
Castor oil	365	1%	438	497	627	645	0%
Butter	5,641	10%	6,500	5,967	7,188	7,952	4%
Lard	4,573	8%	5,509	6,739	7,967	8,463	4%
Fish oil	1,194	2%	1,378	1,411	887	899	0%
Tallow	6,376	11%	6,813	8,202	8,328	8,482	4%
Total vegetable oils	39,128	69%	60,677	92,438	148,465	174,579	87%
Total animal oils/fats	17,784	31%	20,200	22,319	24,370	25,796	13%
Total production	56,912	100%	80,877	114,757	172,835	200,375	100%

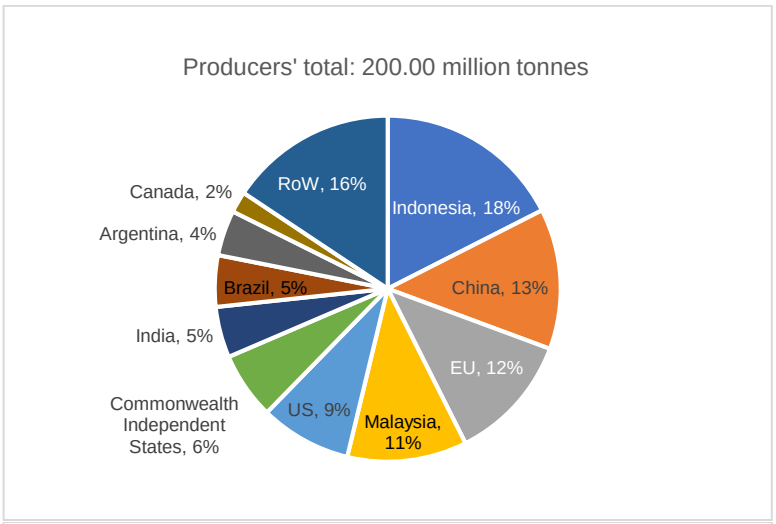
Source: Malaysian Oil Palm Statistics and *Oil World Annual*, various issues.

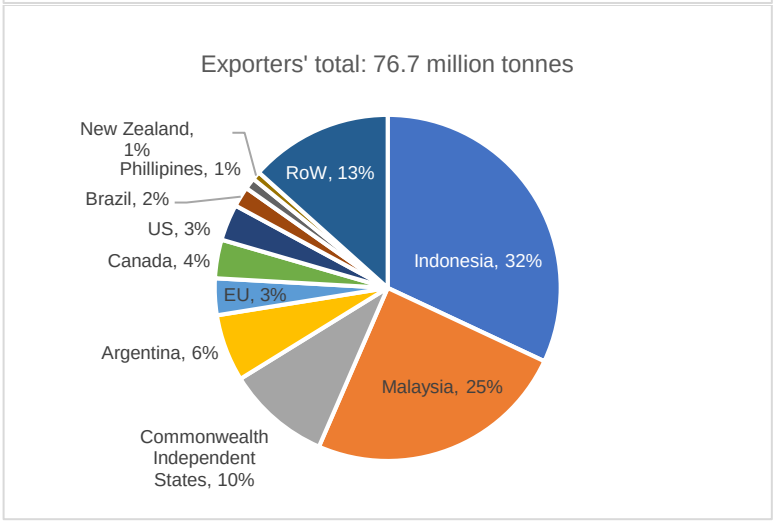
Table 1.3. World exports of major oils and fats, 1980-2014.

('000 tonne)	*1980*	*Share*	*1990*	*2000*	*2010*	*2014*	*Share*
Soybean oil	3,300	19%	3,294	6,771	10,175	9,729	13%
Palm oil	3,825	22%	8,207	15,019	36,493	43,596	57%
Palm kernel oil	377	2%	904	1,220	3,072	3,080	4%
Rapeseed oil	698	4%	1,614	1,783	3,433	3,968	5%
Sunflower oil	1,127	6%	2,126	3,054	4,784	8,162	11%
Coconut oil	1,209	7%	1,617	2,046	2,395	1,865	2%
Cottonseed oil	387	2%	302	196	155	171	0%
Groundnut oil	500	3%	318	235	210	245	0%
Olive oil	279	2%	287	496	759	933	1%
Sesame oil	7	0%	22	25	36	38	0%
Corn oil	n.a.	n.a.	360	768	639	685	1%
Linseed oil	342	2%	184	122	103	91	0%
Castor oil	188	1%	178	276	459	489	1%
Butter	1,183	7%	625	666	724	851	1%
Lard	564	3%	269	193	116	122	0%
Fish oil	798	5%	694	849	788	807	1%
Tallow	2,593	15%	2,071	2,215	2,135	1,592	2%
Total vegetable oils	12,239	70%	19,413	32,011	62,713	73,052	96%
Total animal oils/fats	5,138	30%	3,659	3,923	3,763	3,372	4%
Total exports	17,377	100%	23,072	35,934	66,476	76,424	100%

Source: Malaysian Oil Palm Statistics and *Oil World Annual*, various issues.

The five largest oils and fats producers through the noughties have been Indonesia (palm oil), China (soybean, cottonseed, peanut oils), the EU (rapeseed, sunflower oils), Malaysia (palm oil) and the US (soybean, cottonseed, sunflower oils) (Figure 1.3). Most countries in the world – including three of the five largest producers (China, the EU, and the US) – have net deficits in oils and fats which are met through imports. At present, only three countries are able to supply large volumes of oils on international markets: Indonesia, Malaysia, and Argentina (soybean oil) (Wong et al., 2012). The five largest importers of oils and fats since 2000 have been India, the EU, China, the US, and Pakistan.





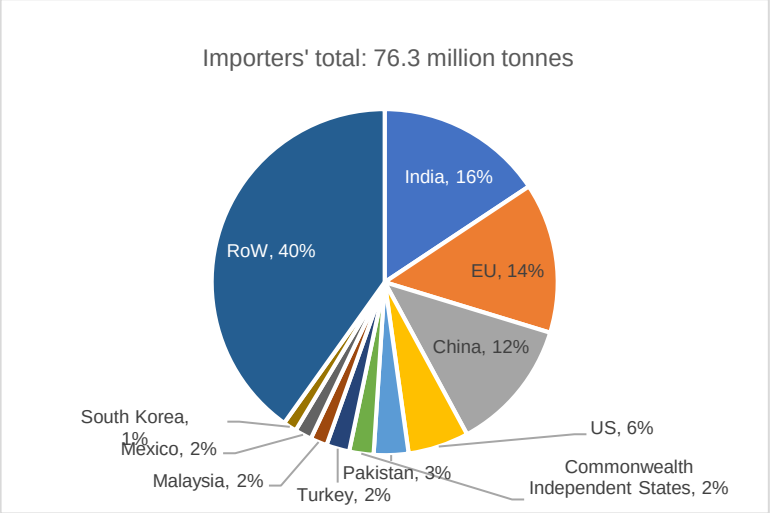


Figure 1.3. Major world producers, exporters and importers of oils and fats, 2014.

Source: Malaysian Oil Palm Statistics and *Oil World Annual*, 2014.

Historically, soybean oil was the largest vegetable oil by production volume, until it was overtaken by palm oil around 2005. In terms of export volume, palm oil has been the largest since at least 1980. Palm oil became the market leader because of its productivity, reliability in supply, cost of production and technical attributes.

The commercial oil palm is a perennial tree crop (*Elaeis guineensis* Jacq.) indigenous to West Africa. It grows optimally in areas between 7 degrees north and south from the Equator due to their climate and soil conditions (Moll, 1987). Among oilseeds and oil crops, oil palm has the highest oil yield (but a relatively low meal yield) – it produces approximately 10 times more oil than soybean and seven times more than rapeseed on a per hectare basis. In 2012, palm and palm kernel oil contributed to over a third of global vegetable oils production while oil palm utilised only 4% of total land used for oilseeds and oil crops. Oil palm is a perennial crop. Once it matures, an oil palm tree will be in production for 25 years. This makes it more difficult to adjust planting and production of oil palm in response to market conditions and prices, compared with annual crops (soybean, rapeseed and sunflower). However, palm oil supply is relatively predictable in the long term, and enjoys a cost advantage over oilseeds that need to be planted every year. In addition, palm oil and its by-products are versatile. They can be used as it is, or in fractionated forms for a wide range of food and non-food (fibre, fuel, and feed) purposes.[7] It is estimated that 71% of palm oil is used for food applications, followed by energy (17%), chemicals (8%) and other uses (4%) (MPOC, 2014).

[7] Palm oil has good oxidative stability and interesterification significantly modifies its crystallisation behaviour. It is also known as a good industrial frying medium because of its relatively low polyunsaturation and its low slip melting point (Nambiappan, 2013).

Up to World War II, the global palm oil industry was centred on Nigeria and Democratic Republic of the Congo. Production was mainly for domestic consumption while the surplus was exported to Europe and the US for use as soaps, candles and resins. Ensuing political upheavals damaged the industry while increased local consumption left little palm oil for exports (Corley & Tinker, 2016). Within Asia, oil palm was first introduced to the Dutch East Indies (now Indonesia) and later to British Malaya (now Peninsular Malaysia) in the 19th century, as an ornamental plant. Commercial plantings began under colonial rule in the 1910s, but were disrupted by World War II (Moll, 1987).

Malaysia overtook Nigeria as the world's largest palm oil producer in 1966. The country held on to that position until losing it in 2006 to Indonesia whose rapid ascent in global palm oil is fairly recent. Malaysia also lost its position as the world's largest palm oil exporter to Indonesia in 2012. In 2014, Malaysia accounted for 33% of world palm oil production and 40% of world exports, compared to Indonesia's 52% and 51%, respectively. Other major exporters and producers are Thailand, Papua New Guinea, Guatemala and Honduras (Table 1.4 and Table 1.5). Indonesia and Malaysia export most of their palm oil (88% for Malaysia and 72% for Indonesia).

Table 1.4. Major world palm oil producers, 1980-2014.

Country ('000 tonne)	*1980*	*Share*	*1990*	*2000*	*2010*	*2014*	*Share*
Indonesia	691	14%	2,413	7,050	22,400	30,800	52%
Malaysia	2,573	54%	6,091	10,842	16,994	19,667	33%
Thailand	n.a.	n.a.	226	525	1,360	1,930	3%
Colombia	74	2%	226	524	753	1,120	2%
Nigeria	433	9%	580	740	885	1,010	2%
Papua New Guinea	32	1%	145	336	488	530	1%
Ecuador	n.a.	n.a.	120	218	380	515	1%
Honduras	n.a.	n.a.	n.a.	101	275	450	1%
Cote d'Ivoire	n.a.	n.a.	270	278	345	420	1%
Guatemala	n.a.	n.a.	n.a.	65	182	420	1%
Brazil	n.a.	n.a.	n.a.	108	250	370	1%
Costa Rica	n.a.	n.a.	n.a.	137	227	210	0%
Venezuela	n.a.	n.a.	n.a.	70	75	52	0%
Rest of the World	1,001	21%	943	873	1,567	1,829	3%
Total	4,804	100%	11,014	21,867	46,181	59,323	100%

Source: Malaysian Oil Palm Statistics and *Oil World Annual*, various issues.

Table 1.5. Major world palm oil exporters, 1980-2014.

Country ('000 tonne)	*1980*	*Share*	*1990*	*2000*	*2010*	*2014*	*Share*
Indonesia	503	13%	1,163	4,139	16,450	22,080	51%
Malaysia	2,284	60%	5,727	9,081	16,664	17,306	40%
Thailand	n.a.	n.a.	n.a.	n.a.	133	290	1%
Papua New Guinea	36	1%	143	336	486	525	1%
Guatemala	n.a.	n.a.	n.a.	n.a.	154	390	1%
Honduras	n.a.	n.a.	n.a.	n.a.	156	318	1%
Cote d'Ivoire	n.a.	n.a.	156	72	201	261	1%
Colombia	n.a.	n.a.	n.a.	97	90	230	1%
Rest of the World *	1,002	26%	1,018	1,294	2,159	2,196	5%
Total	3,825	100%	8,207	15,019	36,493	43,596	100%

* Includes re-exporters such as Hong Kong and Singapore.

Source: Malaysian Oil Palm Statistics and *Oil World Annual*, various issues.

In contrast to its early Europe-centric trade, palm oil is imported by over 150 countries at present. The five largest importers in 2014 were India (18%), the European Union (17%), China (13%), Pakistan (5%) and the US (3%). Between 2010 and 2014, the market share of Malaysian palm oil significantly declined in seven out of its 10 traditional markets. Four experienced a simultaneous decrease in market share and export volume: China, Pakistan, the US and Turkey. The other three recorded a decline in market share despite a slight increase in export volume: the EU, Egypt and Myanmar. In comparison, Indonesia gained in both market share and absolute export volume in all these markets (Table 1.6).

Table 1.6. Market share of Malaysian and Indonesian palm oil in key export markets, 2010 and 2014.

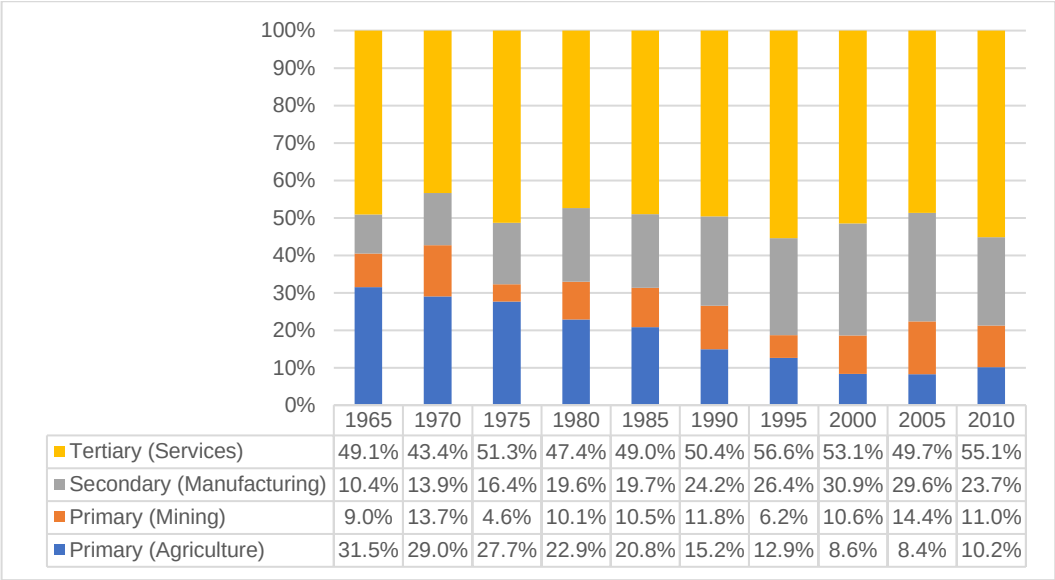
*Market ('000 tonne)**	*Malaysia*				*Indonesia*			
	2010	*Share*	*2014*	*Share*	*2010*	*Share*	*2014*	*Share*
China	3,455	59%	2,971	53%	2,332	40%	2,649	47%
EU	2,045	35%	2,079	28%	3,083	53%	4,061	55%
Pakistan	2,009	96%	846	35%	89	4%	1,585	65%
India	1,190	18%	3,073	39%	5,435	82%	4,758	60%
US	886	94%	751	63%	49	5%	420	35%
Turkey	264	64%	205	35%	146	36%	388	65%
Egypt	347	43%	350	40%	453	57%	530	60%
Vietnam	344	65%	593	87%	181	34%	76	11%
Bangladesh	184	17%	299	24%	880	83%	947	76%
Myanmar	178	48%	208	34%	145	39%	404	66%

* Crude and processed palm oil only.

Source: Malaysian Palm Oil Board.

1.4 Malaysian Palm Oil in the National Development Context

Malaysia came into being in 1963 as a federation comprising Peninsular Malaysia (Malaya), Singapore, Sabah and Sarawak (Singapore left the federation two years later). Malaya was the world's largest producer of rubber and tin during British colonial rule, and continued to be so when it became independent in 1957. For the next two decades, the economy specialised in the primary sectors and relied heavily on primary commodity exports, much like many other new nation states that were formed during that period. Since the late 1970s, however, Malaysia diversified its economic and export structure into the secondary and tertiary sectors through promotion of industrialisation. Between 1965 and 2010, the share of agriculture shrank from almost a third to a tenth of the economy, while that of manufacturing more than doubled to about a quarter (Figure 1.4).



	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Tertiary (Services)	49.1%	43.4%	51.3%	47.4%	49.0%	50.4%	56.6%	53.1%	49.7%	55.1%
Secondary (Manufacturing)	10.4%	13.9%	16.4%	19.6%	19.7%	24.2%	26.4%	30.9%	29.6%	23.7%
Primary (Mining)	9.0%	13.7%	4.6%	10.1%	10.5%	11.8%	6.2%	10.6%	14.4%	11.0%
Primary (Agriculture)	31.5%	29.0%	27.7%	22.9%	20.8%	15.2%	12.9%	8.6%	8.4%	10.2%

Figure 1.4. Gross domestic product by economic activity at current prices, 1965-2010.

Source: Malaysia Statistical Handbook, various issues.

An analysis of Malaysia's input-output tables for 1991, 2000, 2005 and 2010 reveals specific industry changes within the economy-wide structural change (the basis for aggregating and reclassifying the industries into 36 industries is explained in Annex 1). Measured by output at basic prices, within the primary sector, crude oil and natural gas (1) has been the single largest industry, accounting for approximately 5% of total output since 1991 (Table 1.7). Oil palm (2) has been the second largest industry, with its share of total output rising from 1.7% to 2.9% between 1991 and 2010.

Within the secondary sector, electric appliances and electronic components (21) is the largest industry. However, its share of total output declined from 12.1% to 9.6%. Oils and fats (9)

remains the second largest industry, with a significantly bigger share at 6.4% of total output in 2010 compared with 3.9% in 1991. The other major secondary industries are refined petroleum products (15) and chemical and pharmaceutical products (16). Within the tertiary sector, wholesale and retail trade (27) has been the largest industry, with a 9.6% of total output in 2010 (8.9% in 1991). This is followed by finance and insurance (30) and transport and communications (29). The share of finance and insurance (30) more than doubled between 1991 and 2010.

Table 1.7. Output of 36 industries at basic prices, 1991-2010.

Industry (% of total output)	*Industry code*	*% of total output*			
		1991	*2000*	*2005*	*2010*
Primary sector					
Rubber	1	1.0%	0.2%	0.4%	0.5%
Oil palm	2	1.7%	1.2%	1.4%	2.9%
Agriculture	3	1.6%	0.8%	0.5%	0.5%
Livestock and fishing	4	2.0%	1.3%	0.9%	1.2%
Forestry and logging	5	2.3%	1.6%	0.6%	1.1%
Crude oil and natural gas	6	4.5%	4.9%	5.7%	4.7%
Other mining and quarrying	7	0.5%	0.3%	0.3%	0.5%
Secondary sector					
Food, beverage and tobacco	8	3.7%	2.5%	2.6%	2.6%
Oils and fats	9	3.9%	3.1%	3.4%	6.4%
Textiles and leather	10	1.2%	1.0%	0.6%	0.3%
Apparels and footwear	11	1.1%	1.0%	0.4%	0.3%
Wood products	12	2.1%	1.4%	1.0%	0.9%
Paper products and furniture	13	0.9%	1.5%	1.6%	1.1%
Printing and publishing	14	0.7%	0.5%	0.4%	0.3%
Refined petroleum products	15	1.6%	3.6%	5.3%	5.0%
Chemicals and pharmaceuticals	16	2.8%	3.0%	4.5%	3.7%
Processed rubber products	17	2.0%	1.2%	1.3%	1.5%
Plastics and non-metallic mineral products	18	2.2%	2.6%	2.4%	2.3%
Metal products	19	3.5%	2.9%	4.2%	3.4%
Machinery	20	1.9%	9.8%	7.0%	2.7%
Electronic components and electrical appliances	21	12.1%	17.6%	16.6%	9.6%
Precision equipment	22	0.5%	0.6%	1.0%	0.4%
Motor vehicles and transport equipment	23	3.6%	2.0%	3.2%	2.4%
Recycling and other manufacturing	24	0.5%	0.5%	0.5%	0.6%
Tertiary sector					
Electricity, gas and water	25	1.8%	2.1%	2.2%	2.3%
Construction	26	8.1%	5.0%	3.8%	4.4%
Wholesale and retail	27	8.9%	6.0%	4.8%	9.6%
Hotels and restaurants	28	2.3%	2.4%	1.7%	2.3%
Transport and communications	29	5.6%	5.9%	7.4%	6.9%

Finance and insurance	30	3.2%	4.0%	4.6%	7.0%
Real estate	31	3.1%	2.5%	2.0%	1.8%
Business services	32	1.4%	1.8%	2.1%	3.1%
Private services	33	0.9%	0.8%	0.5%	1.1%
Education	34	2.0%	1.5%	1.4%	1.8%
Health	35	0.9%	0.8%	0.8%	1.0%
Government services	36	3.9%	2.3%	2.8%	3.8%
Total		100.0%	100.0%	100.0%	100.0%

Source: Calculations from *Malaysia Input-Output Tables*, various issues.

The composition of Malaysian merchandise exports has also changed. Manufactures accounted for only 6.6% of total Malaysian exports in 1970, but this rose over 70% in 2009. Corresponding to the growing importance of manufactures, the shares of mining and agricultural exports declined during the same period, from 30.2% and 63.2%, to 16.4% and 13.4% (Hill, 2012). At present, 10 major products consistently account for 80% of Malaysia's exports (Table 1.8). They are led by electronic components and electrical appliances, principally semiconductors, which typically make up more than a third of Malaysia's annual exports. Machinery, metal manufactures, and optical and scientific equipment account approximately for over 10% of total exports. However, resource-based exports in both crude and processed forms (more processed than crude by export value) remain key foreign exchange earners. These are liquefied natural gas, crude petroleum, refined petroleum products, chemicals, palm oil and rubber products. Together, these resource-based exports make up more than 30% of Malaysia's export earnings.

Table 1.8. Ten major export products by export value, 2008-2015.

Product (% of total exports)	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*
Electronics and electrical	38.5%	41.2%	39.1%	34.1%	32.9%	32.9%	33.4%	35.6%
Machinery, appliances and parts	3.2%	3.5%	3.4%	3.4%	3.6%	3.9%	3.9%	4.6%
Manufactures of metal	3.0%	2.6%	2.9%	3.1%	2.9%	3.8%	3.5%	4.5%
Optical and scientific equipment	2.3%	2.4%	2.9%	2.7%	3.3%	2.9%	3.1%	3.3%
Chemicals and Chemical Products	6.1%	6.0%	6.4%	6.8%	6.6%	6.6%	6.7%	7.1%
Refined petroleum	5.4%	4.5%	4.5%	5.3%	7.3%	9.1%	9.2%	7.0%
Liquefied natural gas	6.3%	5.6%	6.0%	7.2%	7.9%	8.2%	8.4%	6.0%
Palm oil	7.5%	7.0%	7.6%	9.3%	8.0%	6.4%	6.1%	5.8%
Crude petroleum	6.6%	4.6%	4.9%	4.7%	4.6%	4.4%	4.4%	3.3%
Rubber products	1.9%	2.3%	2.5%	2.6%	2.9%	2.6%	2.3%	2.6%
Top 10 sub-total	80.8%	79.6%	79.9%	79.2%	79.9%	80.8%	81.1%	80.0%

Source: Ministry of International Trade and Industry Report, various issues.

As one of the most open economies in the developing world, Malaysia has exploited the world economy and market. This openness is particularly visible in merchandise trade, labour and foreign direct investment (FDI). By the common indicators of openness, Malaysia is more open than China, South Korea and Thailand on trade policy and FDI, though it is not in the same league as Singapore (Hill, 2012) (Table 1.9). Malaysia's trade regime has featured low average tariffs, low dispersion of tariffs and limited resort to non-tariff barriers (with some historical exceptions in heavy industries such as automobiles which were characterised by strong presence of state owned interests), while its investment regime has been open to FDI in export-oriented manufactures with easy rules for profit repatriation and few restrictions.

Table 1.9. Indicators of openness of selected Asian economies.

	Malaysia	*China*	*South Korea*	*Singapore*	*Thailand*
Trade/GDP, 2008	212%	63%	107%	450%	150%
Average tariff, 2000-2004	7.6%	12.8%	9.1	0.2%	8.9%
FDI stock/GDP, 2008	38.0%	10.8%	10.2	136%	34.2%

Source: Hill (2012).

Structural transformation and openness contributed to strong growth in Malaysia. The Commission on Growth and Development identifies Malaysia as one of the only 13 economies in the world to have sustained growth of more than 7% for over 25 years since World War II (Commission on Growth and Development, 2008) (Table 1.10). Of the 13 economies, only six went on to achieve high income economy status based on the World Bank's classification (defined as those with a gross national income (GNI) per capita of US$12,476 or more in 2016). The six are Hong Kong, Japan, Malta, Singapore, South Korea and Taiwan – of which all but one are in East Asia. That few managed to make the transition from middle to high income illustrates the difficulty of the process.

Table 1.10. Gross national income per capita of high growth economies.

Economy	*High growth period (7% or more per annum)*	*GNI per capita at the start of high growth period (US$)*	*GNI per capita in 2015 (US$)*
Bostwana	1960-2005	210	6,460
Brazil	1950-1980	960	9,850
China	1961-2005	105	7,930
Hong Kong	1960-1997	3,100	41,000
Indonesia	1966-1997	200	3,440
Japan	1950-1983	3,500	38,840
Malaysia	1967-1997	790	10,570
Malta	1963-1994	1,100	23,930

Oman	1960-1999	950	16,910
Singapore	1967-2002	2,200	52,090
South Korea	1960-2001	1,100	27,450
Taiwan	1965-2002	1,500	22,267
Thailand	1960-1997	330	2,400

Source: World Bank.

Malaysia has been an upper middle income economy since 1992. Its high growth rates were disrupted by the 1997 Asian financial crisis; post-crisis growth momentum slowed to an average of 4.7% per annum between 2000 and 2016. In the aftermath of the 2007-2009 global financial crisis, Malaysia has been in search of a 'new economic model', both as a short-term rebalancing exercise and as a long-term agenda for structural change to avoid the so-called 'middle income trap' (NEAC, 2010; Hill, 2012). The evolution of the Malaysian palm oil sector is in many ways a microcosm that captures both achievements and challenges of the country's development.

Malaysia biogeographically transplanted three major crops from other parts of the world during colonial rule and became a leading world player in each of them (Wong, 2011). The crops were rubber from Brazil, cocoa from South America, and oil palm from West Africa. The planting of rubber was fuelled by the development of the auto industry in the 1950s coupled with the Korean War. However, synthetic alternatives caused the collapse of rubber prices in the 1960s and threatened the Malaya economy which relied on a single crop. The need for crop diversification became a major concern to the local coalition government led by the Alliance Party (later expanded and renamed as the National Front or Barisan Nasional) which had just taken over the economy from the British administrators. There were two other major structural issues: high rural unemployment and legions of landless peasant farmers. The social-political dimension of these issues was pressing. Peasant farmers and unemployed rural folk were predominantly the majority native ethnic group, the Malays.[8] Economically, the Malays had the highest poverty incidence and lagged behind others, especially the Chinese migrants who had chosen to settle permanently in Malaya and become its citizens.

Both the government and the industry thus recognised the opportunities for a large-scale switch to oil palm, whose planting was disrupted by the World War II years, in fulfilment of clear

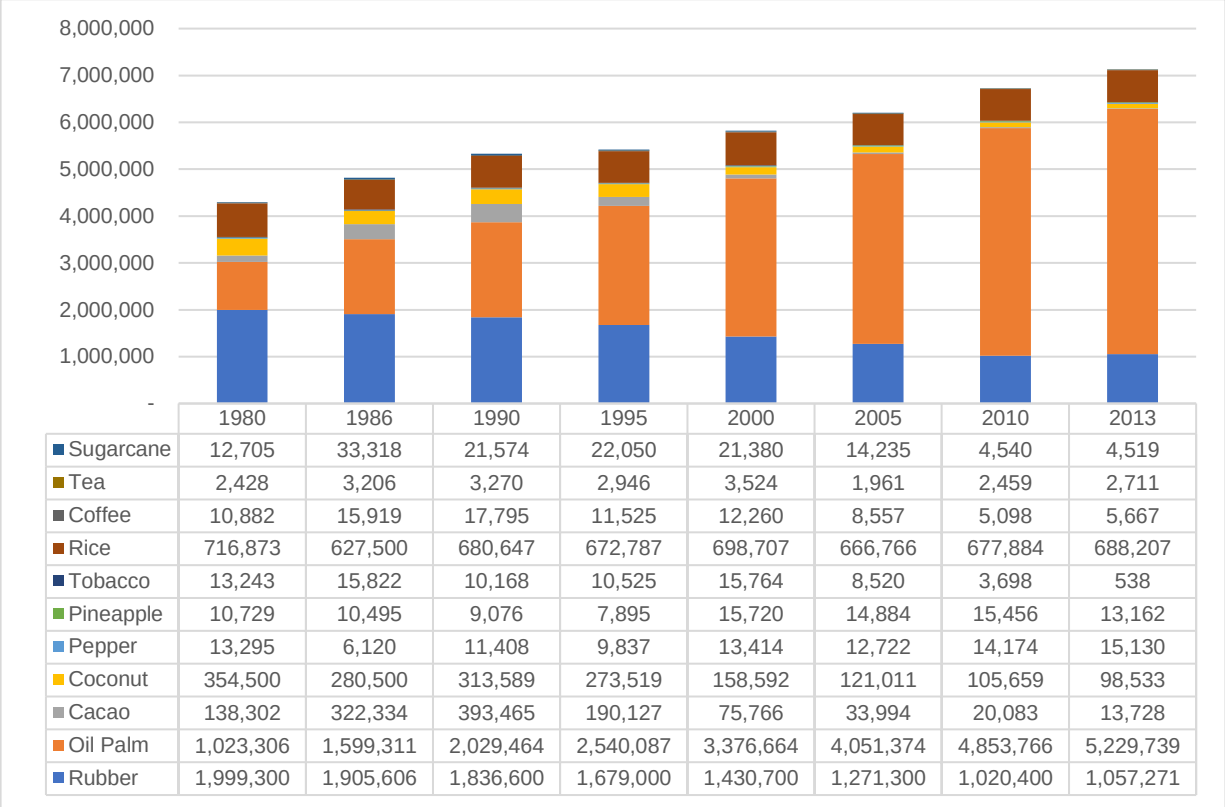
[8] In 2013, the Malays make up 49.7% of Malaysia's population of 30.2 million. This is followed by the Chinese (21.7%), various native peoples in Sabah and Sarawak (11.7%), the Indians (6.5%), and others (0.9%). Non-citizens make up the remaining 9.6% (DOSM, 2015). The Malays and the natives of Sabah and Sarawak are accorded a 'special position' in the Federal Constitution, which provides for quotas in civil service admission, public scholarships and public education. The Malays and the natives are collectively referred to as the *Bumiputeras*, which literally means 'sons of the oil'.

political and economic objectives. High yield characteristics of oil palm, Malaysia's agro-climatic suitability for the crop and the country's relatively good physical infrastructure for exports inherited from the colonial era were among the opportunities identified. As part of its crop diversification and poverty eradication measures, the government expanded oil palm cultivation on a large scale through state-sponsored land settlement schemes specifically targeted at the Malays in order to increase palm oil production. The Federal Land Development Authority (Felda) is the most important actor. It resettled landless peasant farmers to primary forest and unused land for oil palm cultivation. This move mirrored the earlier experience of land reform in countries such as the US and Sweden, in which unused public land was given away or sold at subsidised prices to settlers for land quality improvement (Chang, 2009).

Examples of successful land reforms that have effectively improved the poor people's accessibility to land and wellbeing in developing countries are very few, and Felda stands out as a rare example. The success of the Felda scheme can be explained by the sharing and devolution of powers and responsibilities in decision-making process, underpinned by an element of inclusiveness and involvement or integration of settler community, as well as political will to support pro-poor land governance reforms in long-term national development planning agenda (Barau and Said 2016). In return, Felda settlers have by and large voted for the United Malays National Organisation (Umno), the lynchpin Malay party in the ruling coalition, in general elections. At present, 54 representing a quarter of the 222 parliamentary seats are dominated by Felda settlers (Barrock & Tay, 2017). Their political power is enhanced by 'rural weightage' in Malaysian electoral constituency system, which favours rural voters over urban voters by making rural constituencies significantly smaller by voters' number than urban constituencies. Felda areas consistently overlap with electoral constituencies won by Umno (Khor, 2015; Mohamad, 2015). The Umno-dominated ruling coalition now stands as the longest-serving government in the world (Welsh, 2015).

It was within this context that oil palm became Malaysia's dominant crop. Total land use for all crops increased by 66% between 1980 and 2013, driven mostly by oil palm plantations which rose by 411% to 5.2 million hectares. By 2013, oil palm took up 73% of total crop land, compared with 24% in 1980 (Figure 1.5). Land use change for oil palm cultivation was likely linked to decreasing land use by other crops and conversion of logged-over forest (Wicke et al., 2011).[9] Land scarcity in Peninsular Malaysia drove expansion to Sabah from the 1970s and Sarawak from the late 1980s. Growth in palm plantation hectarage has slowed since the 2000s.

[9] Indonesia's forest covered land decreased by 40 million hectares (a 30% reduction in forest land) between 1975 and 2005. Its agricultural land increased from 38 million hectares to 48 million hectares,



	1980	1986	1990	1995	2000	2005	2010	2013
Sugarcane	12,705	33,318	21,574	22,050	21,380	14,235	4,540	4,519
Tea	2,428	3,206	3,270	2,946	3,524	1,961	2,459	2,711
Coffee	10,882	15,919	17,795	11,525	12,260	8,557	5,098	5,667
Rice	716,873	627,500	680,647	672,787	698,707	666,766	677,884	688,207
Tobacco	13,243	15,822	10,168	10,525	15,764	8,520	3,698	538
Pineapple	10,729	10,495	9,076	7,895	15,720	14,884	15,456	13,162
Pepper	13,295	6,120	11,408	9,837	13,414	12,722	14,174	15,130
Coconut	354,500	280,500	313,589	273,519	158,592	121,011	105,659	98,533
Cacao	138,302	322,334	393,465	190,127	75,766	33,994	20,083	13,728
Oil Palm	1,023,306	1,599,311	2,029,464	2,540,087	3,376,664	4,051,374	4,853,766	5,229,739
Rubber	1,999,300	1,905,606	1,836,600	1,679,000	1,430,700	1,271,300	1,020,400	1,057,271

Figure 1.5. Agricultural land under major crops, 1980-2013.

Source: Statistics on Commodities, various issues.

The agenda to uplift the Malays' socio-economic status gained further prominence in national policymaking the 1970s. In the aftermath of inter-ethnic clashes rooted in class divides and economic disparities, the New Economic Policy (NEP) was introduced to eliminate ethnic identification by economic function and to eradicate poverty. Affirmative action or positive discrimination permeated Malaysia's economic and industrial policies at all levels. When Malaysia embarked on nationalisation of 'strategic sectors' (the plantation, petroleum and banking industries) in the 1970s, state investment vehicles and trust agencies such as National Equity Corporation (Permodalan Nasional Bhd or PNB by its Malay acronym) and National Corporation (Perbadanan Nasional Bhd or Pernas by its Malay acronym) with mandates to increase corporate wealth on behalf of the *Bumiputeras* were used (Searle, 1999).[10] The

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half of which was driven by expansion in palm oil plantations. Malaysia's forest cover decreased by 5 million hectares during the same period (a 20% reduction in forest land) but the annual rate of forest cover loss since the 1980s has slowed down to between 0.01% and 1% (Wicke et al., 2011).

[10] This was in line with widespread decolonisation efforts during the 1960-1976 period in which host governments increasingly assumed control over their natural resources, including land, making it more difficult for foreign investors to become involved in the production of agricultural goods directly. Agriculture was second, after banking and insurance, among activities affected by a wave of nationalisations of foreign enterprises in developing countries, with 272 cases of expropriations

government promoted the appointment of *Bumiputera* managers on estates through Felda while private plantations, too, "bent to government pressure" by doing the same, resulting in a gradual fall in the number of non-*Bumiputera* managers (Rasiah, 2006).

However, the actual extent to which the NEP was implemented in the palm oil sector remains unclear and debatable, as is its effect on industrial development. For instance, in the late 1970s, incentives to promote palm oil refining and fractionation which were open to all previously were limited only to firms owned in part by *Bumiputeras* but these incentives were scrapped soon after. The application of *Bumiputera* ownership conditions on firms depending on their export-orientation also remained largely arbitrary (Rasiah, 2006). Lee (2007) suggests that 'ethnicisation' of Malaysia's industrial policy compromised industrial development with the exit of non-*Bumiputera* capital, which had the potential to strengthen Malaysia's technological capabilities and industrial base. But he cautions that criticism of the redistribution regime should be "tempered with acknowledgement of more harmful eventualities that could have transpired".

Notwithstanding possible contradictions and complementarities between the goals of pro-*Bumiputera* redistribution and industrial development, techno-economic and marketing concerns have largely dominated policy directions for the palm oil sector throughout the last several decades (Table 1.11). Malaysia became a leading producer and exporter in the world oils and fats market, one of the few niche areas in which the country can be considered a global leader. In recent years, Malaysia has to deal with declining competitiveness (stagnating productivity, rising production costs, and scarcity of suitable land for oil palm cultivation) in an environment characterised by new entrants and increased socio-environmental expectations of palm oil importing countries.

Table 1.11. Policy concerns and directions for the palm oil sector, 1960s-2010s.

Period	*Concern Identified*	*Policy Direction*
1960s	Collapse of rubber prices Unused land High rural unemployment Small farmers' inability to switch crops Ethnic tensions rooted in class divides	Increase in palm oil production Integration of small farmers and unemployed rural population
1970s	Small domestic market for ISI Reliance on agriculture and mining Single product for palm oil exports Plantation sector dominated by foreign interests	Promotion of exports Promotion of refineries (forward linkages) Nationalisation of plantation ownership and control

(compared to 349 cases in banking and insurance) out of an overall total of 1,369 nationalisations. In South and East Asia, nearly half of all expropriations took place in agriculture (UNCTC, 1978).

1980s	Refining overcapacity and inefficiency Anti-palm oil campaign on health and nutrition grounds Export markets concentrated in Europe	Promotion of basic oleochemicals and specialty fats (forward linkages) Market promotion for palm oil products Rationalisation of refining sector
1990s	Insufficient feedstock Labour and land shortage Rising costs of production Heavily imported inputs, equipment and machinery Inadequate infrastructure in East Malaysia	Internationalisation of upstream production Promotion of byproducts from biomass (forward and lateral linkages) Promotion of pre-upstream activities (backward linkages) Infrastructure improvement in Sabah and Sarawak
2000s	Rising competition from Indonesia and others Dependence on foreign labour Increased pressure for sustainability (private standards) Growers' productivity gaps	Internationalisation of downstream presence Promotion of specialty products (e.g. phytonutrients and biofuel) Maintaining and widening market access through PTAs Promotion of mechanisation
2010s	Declining competitiveness Loss of GSP status with EU Slower demand growth Shift towards 2-tiered market (certified versus non-certified)	Innovation for increasing product and business competitiveness Bilateral cooperation with Indonesia Promotion of domestic consumption Continuous inclusion and productivity improvement of small firms and smallholders

1.5 Institutional Framework of the Malaysian Palm Oil Sector

At present oil palm is cultivated by three types of producers: plantation firms, organised smallholders (typically with four to seven hectares, organised through government schemes), and independent smallholders (with 40.5 hectares or less, not part of government schemes). Palm hectarage under government schemes has stagnated from the 1990s. Except for Felda, government schemes have become less important. The share for independent smallholders, numbering over 175,000, doubled between 1980 and 2014. Industrial-scale plantation firms have always been dominant in the production system as a colonial legacy. Their share, in the form of over 4,450 plantation estates, increased from 52% to 62% (Figure 1.6).

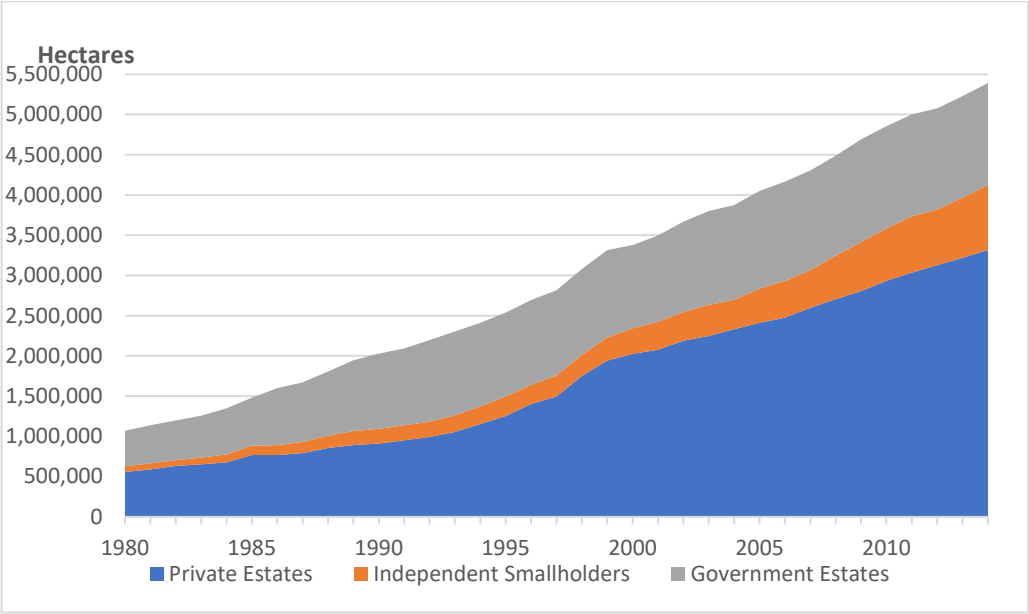

Figure 1.6. Palm plantation hectarage by producer type, 1980-2014.

Source: Malaysian Oil Palm Statistics, various issues.

Little has been written about how key industry actors are organised and linked in the institutional framework through which the actors interact and the role of the state is exercised. Fold (1994, 1998) and Fold and Whitfield (2012) focus on regulation, which is only one of the many important ways through which industrial policy is pursued in the Malaysian palm oil sector. Within the production systems, actors within the Malaysian palm oil sector are commonly differentiated by the function they perform within the value chains (Table 1.12). For instance, upstream producers are those who grow oil palm for its fruits. They include plantation firms, government schemes through which smallholders are organised, and the so-called independent smallholders who fall outside the schemes. Midstream and downstream processors extract crude palm oil and palm kernel oil from palm fruits, which are then refined and processed for various products.

Table 1.12. Main actors in the palm oil sector.

Type	*Key Actors*	*Representation on the Board of MPOB*
Upstream producers	Federal Land Development Authority (Felda)	Direct
	Plantation firms	Indirect through MPOA, MEOA, SOPPOA, EMPA
	Smallholders (organised and independent)	Indirect through Felda (organised) and NASH (independent)
Midstream & downstream processors	Millers	Indirect through POMA
	Crushers	Indirect through PORAM
	Refiners	Indirect through PORAM
	Oleochemical producers	Indirect through MOMG
	Specialty fats producers	Indirect through PORAM
	Biodiesel producers	

Government agencies	Ministry of Plantation Industries and Commodities (MPIC)	Direct
	Malaysian Palm Oil Board (MPOB)	Direct
	Malaysian Palm Oil Council (MPOC)	
	Malaysian Industrial Development Authority (MIDA)	
	Ministry of International Trade and Industry (MITI)	Direct
	Ministry of Finance (MOF)	Direct
	State Governments of Sabah and Sarawak	Direct
Industry groups & associations	Roundtable on Sustainable Palm Oil (RSPO)	
	Malaysian Palm Oil Association (MPOA)	Direct
	Malaysian Estate Owners Association (MEOA)	Direct
	National Organisation of Smallholders (NASH)	Direct
	Palm Oil Millers Association (POMA)	Direct
	Palm Oil Refineries Association of Malaysia (PORAM)	Direct
	Malaysian Oleochemical Manufacturers Group (MOMG)	Direct
	Sarawak Oil Palm Plantation Owners Association (SOPPOA)	Direct
	East Malaysia Planters Association (EMPA)	Direct
	Malaysian Biodiesel Association (MBA)	
Input & equipment suppliers	Seed providers	
	Fertiliser producers	
	Agrochemical producers	
	Equipment and machinery makers	
Manufacturers & retailers	Manufacturers of food and non-food consumer goods	
	Retailers	
Traders	Traders and exporters of palm oil, palm-based products	
	Importers and distributors of inputs, machinery and parts	
	Dealers of palm fruits	
Transport & logistics operators	Warehousing and storage providers	
	Shipping lines	
	Land freight operators (truck)	
Financiers	Commercial and development banks	
	Investors	
	Brokers	
Research institutions	Public universities	
	Private research laboratories and firms	
Stakeholder groups	Civil society organisations	
	Labour unions and smallholder cooperatives	

The upstream producers and the midstream and downstream producers share several common characteristics: 1) a long history of existence; 2) well organised through a range of industry associations (or through government schemes in the case of smallholders); 3) have substantial business interests and operations domestically; and 4) locally owned. Some firms perform a range of functions (being more vertically integrated than others); they usually hold membership in more than one industry association. The non-producer and non-processor actors are less organised and have low formal representation. The reasons for this vary. In trading for instance, the larger plantation firms are already performing trading functions for inputs (for own use and external sales) and for palm oil products in export markets, and their representation exists through other industry association. The remaining, so-called independent traders are far less integrated (with limited production assets) and many in number. They also vary in size and in

scope of products and markets, although most can be characterised as locally owned small and medium sized enterprises (SMEs).

Others choose to organise themselves on an industry-wide basis, instead of by functions within the value chains. These include three important actors: suppliers of inputs (e.g. agrochemicals, fertilisers, equipment and machinery; manufacturers who are industrial users of palm-based derivatives for making food and non-food finished products; and retailers who carry such consumer products. They exist mostly as locally incorporated subsidiaries of foreign lead firms, and have limited operations in Malaysia (often in corporate, marketing and distribution functions since production facilities could be located elsewhere based on their global strategy). Many of them are part of the Roundtable on Sustainable Palm Oil (RSPO), a not-for-profit private-led initiative that was created to address rising sustainability concerns in palm oil value chains.[11] RSPO has developed a certification system for sustainable palm oil based on a set of socio-environmental criteria. It now has 2,500 members worldwide representing different segments of the value chains (upstream producers, midstream and downstream processors, consumer goods manufacturers, retailers, banks/ investors and socio-environmental non-governmental organisations).

The state is typically associated with the role of regulation through institutions such as government agencies. In practice, however, the state exercises multiple roles for industrial development through different institutional channels (Table 1.13).[12] The roles are: (1) regulator/ promoter, by setting tariffs and production levels for certain activities, and by providing promotion and marketing services; (2) producer, by participating directly in economic activity; (3) consumer, by ensuring a market for products and services through procurement programmes; (4) financier, by influencing credit markets and promoting financial resources for industrial activities and projects; and (5) innovator, by undertaking R&D for improving technologies and processes. Strong informal relationships exist among state institutions, firms and individuals. They are likely important channels but are outside the ambit of this study. Conflicts between the multiple roles and institutions arise from time to time, for instance when state-owned producers

[11] RSPO was established in 2004 with its secretariat based in Kuala Lumpur. The 10 founding members included World Wide Fund for Nature (WWF), major consumer goods manufacturers and retailers (Unilever (Netherlands-UK), Migros (Switzerland), AarhusKarlshamn (Sweden-Denmark), The Body Shop (UK)) as well as oil palm growers and processors.

[12] This follows the approach by Peres and Primi (2009) which divides state interventions in support of industrial development by different roles. However, they have identified only four: regulator, producer, consumer and financial agent and investor. In the case of Malaysia's palm oil industry, the state's role as a consumer is somewhat limited since the bulk of the products are for exports.

are perceived to be receiving preferential treatment in regulation, financing and other forms of assistance.

Table 1.13. Roles of the state as exercised through its formal institutional channels.

Channel	*Regulator/ Promoter*	*Producer*	*Consumer*	*Financier*	*Innovator*
Government agencies & public/ quasi-public institutions	MITI, MOF, MPIC, MPOB, MPOC			MPOB, development finance institutions	MPOB, public universities, research institutes
State-owned plantation firms		Sime Darby, Felda Global Ventures, Boustead Plantations, TH Plantations	Sime Darby, Felda Global Ventures, Boustead Plantations, TH Plantations		Sime Darby, Felda Global Ventures
Government smallholder schemes		Felda, Federal Land Consolidation and Rehabilitation Authority (Felcra), Rubber Industry Smallholder Development Authority (Risda)			

The first formal institutional channel is government agencies and public or quasi-public institutions. The palm oil sector is regulated by a host of federal and state government agencies with different functions and mandates at the macroeconomic, sectoral and industry levels.[13] Other public inst itutions exist for roles beyond regulation. Research institutes such as the Malaysian Agricultural Research and Development Institute (MARDI) and public universities such as Universiti Pertanian Malaysia or Agriculture University of Malaysia (UPM by its Malay name), which has since been renamed Universiti Putra Malaysia) serve the role as innovator by working closely with the private sector. Development finance institutions serve the role as

[13] At the macroeconomic management level, Malaysia has a three-tiered planning process covering the long- (10 years and above), medium- (5 years), and short-term (annual) planning horizons (EPU, 2004). Past long-term plans include Vision 2020 (1991-2020); Outline Perspective Plans (OPPs) (1997-1990, 1991-2000, and 2001-2010). They spell out the broad strategies and goals. The last OPP ended in 2010 which some see as an implicit acknowledgement of increased difficulty for long-term planning in a rapidly changing economic environment. Medium-term Malaysia Plans are formulated by the Economic Planning Unit (EPU) within the Prime Minister's Department to operationalise the OPPs and its successor, ETP. Growth targets and public sector allocations are provided to help the private sector determine their investments. The country is now in its 11th Malaysia Plan covering the 2016-2010 period. Short-term planning is done through annual budgets.

financier. One particularly important institution is Bank Industri & Teknologi Malaysia which provides financing for industrialisation and export-oriented industries (Gustafsson, 2007).

The palm oil sector is one of the few in Malaysia with an 'industry steward' in the form of the Malaysian Palm Oil Board (MPOB), which straddles the roles of regulator, innovator and financier. It is a statutory body under the Ministry of Plantation Industries and Commodities (MPIC), which is responsible for development of commodities and commercial agriculture. MPOB was established in 2000 by merging the Palm Oil Registration and Licensing Authority (PORLA) and the Palm Oil Research Institute of Malaysia (PORIM). PORLA was inaugurated in 1977 to regulate, coordinate and promote all activities within the palm oil sector through registration, licensing and enforcement, and industry dialogues. For instance, the replanting subsidy scheme (which helps smallholders and estates replace mature, less productive palm trees) has been implemented in consultation with the private sector to coincide with periods of glut and low prices to also reduce supply (Rasiah, 2006). When local firms became more internationalised, the ban on exports of planting materials was relaxed to benefit Malaysian-owned plantations abroad while duty-free crude palm oil export rights were granted to local firms with refineries abroad. PORIM was established in 1979 with the objectives of conducting R&D (Moll, 1987).[14] MPOB has absorbed these functions and more importantly, retained its predecessors' historical characteristics of having members of both the government and industry within the organisation (while top management and internal divisions are made up of civil servants).

The board of MPOB, sitting at the apex of the organisation's governance structure, has permanent representation from selected government agencies and industry associations representing different producer groups (Table 1.12). The composition is indicative of the level of importance assigned to different actors from the government's perspective. A glaring exclusion is the RSPO, although it has been a regular participant at government dialogue and engagement sessions with the private sector. The challenge for public-private collaboration is whether it can embrace civil society organisations and evolve into a more inclusive multi-stakeholder partnership.

A quasi-public institution that is closely linked to the MPOB is the Malaysian Palm Oil Council (MPOC). It was first set up as a private firm in 1990 (as the Malaysian Palm Oil Promotion Council) to undertake public relations and market promotion of palm oil in the export markets, by

[14] PORIM was set up with after strong industry lobby from oil palm growers, with support from MARDI and UPM to take over R&D function from MARDI's oil palm branch (Rasiah, 2006). For a history of PORIM, see (Global South-South Development Academy, 2001).

organising trade missions and exhibitions as well as distributing information on nutritional aspects of palm oil (Simeh & Tengku Ahmad, 2001).

At the ministry level, the key ones other than MPIC are the Ministry of International Trade and Industry (MITI) and the Ministry of Finance (MOF). MITI is the principal ministry charged with a general oversight of industrial development in primary through tertiary sectors (agriculture, manufacturing and services). The ministry's Industrial Master Plans (IMPs) outlines sectoral strategies as well as the priority areas of activities within key industries in each sector as targeted by the government. Currently, the third IMP, covering the 2006-2020 period, is in operation.

In addition, MITI, through its Malaysian Industrial Development Authority (MIDA), assists foreign and local companies with their investment in the manufacturing and services sectors and implementation of their investment projects. Another MITI agency, the Malaysia External Trade Development Corporation (MATRADE), promotes Malaysia's export of manufactured, semi-manufactured goods and professional services. MOF provides the necessary fiscal incentives and expenditure allocations that support industrial development, in addition to handling tax administration through the Customs Department and the Inland Revenue Board.

The second institutional channel is government schemes which organise smallholders and serve mainly the role of producer. Together, these schemes hold about a quarter of total oil palm hectarage in Malaysia. Among them, Felda has the largest oil palm hectarage in the country (13% of total national hectarage in 2014). Since 1990, Felda ceased settler intake due to high programme costs and labour shortages. It undertook corporation of management, and took on a profit-making dimension in addition to its original objectives (Fold, 2000; Khor, Saravanamuttu, & Augustin, 2015). Other government schemes include the Federal Land Consolidation and Rehabilitation Authority (Felcra), Rubber Industry Smallholder Development Authority (RISDA) and much smaller schemes at the state level.

The third channel is plantation firms in which the state is a substantial or majority shareholder. Of the 20 largest plantation firms in Malaysia by palm hectarage, seven are majority owned by state capital through various investment vehicles such as PNB, Felda, Pilgrims Fund Board (LTH), Retirement Fund Incorporated (KWAP), Armed Forces Fund Board (LTAT) and Employees Provident Fund (EPF). These firms include Felda Global Ventures, Sime Darby, Boustead Plantations, TH Plantations, IJM Plantations, Kulim (Malaysia) and TDM.

Even in other plantation firms that are majority owned by private capital, state capital is prevalent, often holding substantial shareholdings exceeding 5%. The prevalence of state

capital follows nationalisation of plantation interests dating back to the 1970s. Malaysia then had become a significant producer and exporter of crude PO, but production and exports were largely controlled by a small number of primarily British firms (Pletcher, 1990; Searle, 1999). The government required foreign owned plantation firms to spin off their Malaysian holdings as subsidiaries domiciled in Malaysia and used PNB, the government's principal *Bumiputera* trust agency, to purchase majority ownership in these subsidiaries on the stock market (Pletcher, 1990; Rock & Sheridan, 2007). The process was largely achieved through negotiation but at times became hostile, as seen in the 'dawn raid' by PNB to gain control of Guthrie Corporation in 1981 (Yacob & White, 2010). Guthrie was the leading plantation firm in Malaysia which was under British ownership and which was listed on the London Stock Exchange then. It was subsequently merged with Sime Darby. Through nationalisation, Malaysia was able to inherit sector-specific knowledge from the firms. Some state-owned firms play the role as innovator either through in-house R&D or when they commercialise technologies jointly developed by MPOB, public universities and research institutes. They also serve as consumers of raw materials, mostly palm fruits and crude palm oil, for production of processed products.

1.6 Structure of the Dissertation

Given the scope of the issues at stake, tensions between the breadth and depth of research were real. Finding the best fit requires judgements which are not necessarily agreeable to all. This dissertation opts for the three- essay format. What it lacks in depth in some parts, it is hoped that the dissertation more than makes up for it by producing a more holistic picture of the key economic, policy and social questions associated with agro-commodity value chain upgrading – which are often explored in isolation from each other. Section 1 provides contextual and background information to the approaches and findings of the three essays. The three essays appear in Sections 2 through 4. The last section integrates the issues from the essays and discusses the implications of issues and trends in agro-commodity value chain upgrading for development.

The first essay examines the fundamental question of whether upgrading in agro-commodity value chains differs from the trajectory of vertical specialisation as espoused by researchers and practitioners and if so, how and why. The case study points to linkage development in the Malaysian palm oil sector due to a combination of state policies and firm-specific actions since the 1970s. With newly attained midstream and downstream capabilities, the sector began to produce and export higher value added goods and services. Sectoral linkage development accelerated when a handful of local lead firms became increasingly vertically integrated and internationalised. The trajectory can be explained by the unique production characteristics,

sectoral dynamics and historical settings of agro-commodity value chains. The findings suggest that vertical specialisation is less applicable across all GVC types than thought, and that development policy and research should delve more into hindrances to linkage development in similar additive value chains.

The second essay systematically studies Malaysia's industrial policy for its palm oil sector through three distinct stages of development. While policies that seek to improve macroeconomic conditions, infrastructure, business climate and human capital are important for resource-based industrialisation (RBI), the more targeted and aggressive measures (such as alteration of internal terms of trade against traditional primary imports and export facilitation) are critical, though their importance gradually declines over time. The Malaysian experience also shows that local instead of foreign firms drove the initial phase of RBI. The limited evidence suggests that nationality of firms remains relevant for RBI due to local specificity and trade distortions in relation to resources as well as embeddedness of local firms. Public action matters for indigenous innovation efforts. As RBI advances to a more mature phase, industrial policy must evolve from direct provision of innovation services to linking the various actors within the sector and inducing commensurable private investment in innovation.

The third essay investigates economic and social outcomes from upgrading in Malaysia's palm oil sector since 2000. Measured by changes in the labour shares for the industries within the sector, social upgrading is detected in most cases between 2000 and 2010, even in the scenario of economic downgrading in which gross value added (GVA) as a share of output declined. High returns accruing to capital owners (including smallholders) and skilled labour held steady and even improved in at least half the industries. In contrast, the wages and work conditions for low-skilled labour, concentrated in primary production and made up overwhelmingly of migrant workers, showed slower progress. Such differences partly reflect the actors' position and the skill content of their work in the value chain. They also reflect the lack of political representation and institutional arrangements affecting labour rights and bargaining power for migrant workers. It demonstrates that economic upgrading does not automatically lead to social upgrading for all, and that a rethinking on who constitutes the vulnerable groups along the value chain is needed in view of new production realities.

2 Vertical Specialisation or Linkage Development in Agro-Commodity Value Chain Upgrading? Evidence from the Malaysian Palm Oil Sector

2.1 Introduction

In recent times, global value chain (GVC) as a new form of industrial organisation has fuelled cautious optimism regarding developing countries' position in the global economy. As production becomes fragmented, aided by technological innovations and trade liberalisation, a country is posited as being involved in a specific stage of production using imported inputs before passing the good, be it intermediate or final, onto another (Hummels et al., 2001). A country upgrades thereon by graduating to another stage of production offering better returns. Variations of the notion of vertical specialisation have since been adopted by and promulgated in the international policy and development discourse.

Surprisingly, the proposition tends to treat all GVCs as the same and does not consider the possibility that vertical specialisation may be unsuited for all value chain types, be it as a strategy for insertion or upgrading. This essay (Essay 1) assesses development of the Malaysian palm oil sector from the 1970s to the present to test the validity of vertical specialisation in agro-commodity value chains. It finds little evidence for strict vertical specialisation in the case of Malaysian palm oil, which is often cited as a relatively successful example of industrial upgrading (See, for example, Chandra (2006); Global South-South Development Academy (2001); UNECA (2016)). Instead, it shows that linkage development at the sectoral level and vertical integration at the firm level through a combination of state policies and firm actions have driven the sector's development. The evidence is analysed for drawing out unique production characteristics, sectoral dynamics and historical settings of agro-commodity value chains that explain their upgrading trajectories. A better understanding of these factors is important for developing countries, especially least developed countries (LDCs), which are deeply embedded in agro-commodity value chains and derive over 60% of their total goods export earnings from commodities (UNCTAD, 2015).

Section 2.2 reviews the concepts of upgrading. It highlights that vertical specialisation leading to upgrading in agro-commodity value chains remains speculative, and indicates a need to differentiate between resource-based and non-resource-based manufactured goods in existing value chain taxonomy. Section 2.3 explains the methods and data for the case study, which relies not only on industry database and existing research, but also on interviews with firm and

government representatives as well as site visits. Section 2.4 presents a picture of sectoral upgrading characterised by productivity gains, emergence of new industries and products, increased linkage effects and improved manufacturing value added. It analyses the considerations that drive linkage development. Section 2.5 examines firm-level upgrading to explain the rise of vertical integration and internationalisation of local lead firms. Despite the benefits associated with linkage development, few processing activities are based in developing countries. The last section concludes the essay with both theoretical and practical implications for research and policy.

2.2 Vertical Specialisation and Value Chain Taxonomy

Links of value chains are “repositories for rents” arising from unequal access to resources and from differential productivity of factors, including knowledge and skills (Kaplinsky, 2000). Economic upgrading – commonly referred to as ‘moving up the value chain’ – is defined as “development of capabilities in targeted areas of value accretion, in order to maintain or increase incomes in the face of rising competitive pressures” (Humphrey & Schmitz, 2002; Kaplinsky, 2005). Numerous case studies have focused on restructuring of international production networks by lead firms, as well as the extent, nature and determinants of upgrading in products including toys, garments, beverages, computers and automobiles (see, for example, Gereffi (1999); Kishimoto (2003); Nolan (1999); Ruigrok & van Tulder (1995); Sturgeon et al. (2008)).

Five types of upgrading – product, process, functional, channel and intersectoral – have been identified (Humphrey & Schmitz, 2002; Frederick & Staritz, 2012). Process upgrading improves efficiency through reorganised production systems or better technology. Product upgrading shifts production to more sophisticated product lines with increased unit values. Functional upgrading focuses on acquisition of new functions to increase the skill content of activities. Channel upgrading involves diversification to new buyers or geographic and product markets. Intersectoral upgrading signifies a move into a different value chain, using old and new competences.

The GVC literature offers little answer on the permutation of upgrading types and how the combination shapes upgrading trajectories over time for a country’s economic activity and the firms within. Some seminal works from the economic geography and international trade streams provide useful conceptualisation (as well as measurement) of fragmentation of production and vertical specialisation (See, for example, Helpman and Krugman (1985); Feenstra (1998); Baldone et al. (2001); Jones and Kierzkowski (2005)). Arndt and Kierzkowski (2001) stress that

"the international division of labour now matches factor intensities of components with factor abundance of locations". Hummels et al. (2001) argue that global production has become "a vertical trading chain that stretches many countries, with each country specialising in particular stages of a good's production sequence". Vertical specialisation can thus be described as a phenomenon where firms slice up production and divide it across different locations abroad (offshoring), with or without ownership links. Parts and components or intermediate goods cross borders to be transformed into final products and more elaborate intermediate goods going back to the same country or ending up in other countries.

Gereffi (1999) remains one of the few that explicitly incorporates vertical specialisation into long-term upgrading trajectories. From the 1960s through the 1990s, East Asian firms progressed from low-cost, labour-intensive assembly through original equipment manufacturing (OEM) and original design manufacturing (ODM) before finally reaching original brand manufacturing (OBM). Later, the firms offshored manufacturing while retaining and deepening skill-intensive functions such as trading and logistics. The trajectory can be described as *successive* vertical specialisation, or one form of vertical specialisation after another.

A familiar refrain in international development these days is that countries should target specific functions and activities in which they have a comparative advantage within a GVC rather than an entire sector. Once inserted into the value chains, they can deepen their capabilities, achieve specialisation and derive benefits from scale. With accumulated capabilities, countries can migrate to processes, products or functions with higher domestic value added, and develop new specialisation. This kind of discourse is encapsulated in a joint statement by the Organisation for Economic Cooperation and Development, World Trade Organisation and United Nations Conference on Trade and Development:

> In a world of GVCs… [governments] can nevertheless encourage firms to join an existing global value chain, which may have low entry barriers and enable firms to realise export success relatively quickly and at low cost. …*rather than being obliged to develop vertically integrated industries (producing both intermediates and final products), firms can become export-competitive by specialising in specific activities and tasks* (emphasis added). For example, China specialised in the assembly of final products in the electronics industry and has become the largest exporter of ICT products; other countries specialised in the assembly of intermediates (e.g. sub-systems for motor vehicles in Mexico), the production of parts and components, or ICT services, e.g. India (OECD, WTO, & UNCTAD, 2013).

Such characterisation of upgrading escalates the unit of analysis from firms to countries. It also overlooks the fact that the logic of successive vertical specialisation was derived largely from evidence in GVCs for non-resource-based manufactured goods. The prevailing taxonomy of value chains revolves around two dimensions: the type of the 'driver' (buyer-driven versus producer-driven) and the governance patterns (arms-length, quasi-hierarchical and intra-firm) (Gereffi, 1994; Gereffi et al., 2005). The taxonomy is useful for highlighting the dynamics between lead firms and their suppliers in upgrading considerations. Yet, it does not consider the inherent sectoral and production differences across value chains.

Kaplinsky and Morris (2015) argue that, beyond the conventional taxonomy, value chains can be distinguished between those that are "vertically specialised" and "additive" in nature. In vertically specialised chains, production activities can be undertaken in parallel and processing loss or degradation is minimal, thus increasing possibilities for the various stages of production to be "sliced up" and dispersed geographically. In contrast, additive chains involve sequentially adding value to raw inputs (which make up a large proportion of total value of the final product). Coupled with potentially large processing losses, this feature makes fragmentation and parallel execution of production less feasible (Kaplinsky & Morris, 2015). While GVCs for manufacturing and services become increasingly vertically specialised, resource-based sectors tend to dominate additive chains. The implication is that, while successive vertical specialisation is appropriate for upgrading in vertical specialised chains, it is likely that additive chains require a different upgrading pathway.

Sectoral linkage development occurs when investment is made in input-supplying activities (backward linkages) or in output-using activities (forward linkages) (Hirschman, 2013). It may take place within a single firm or across multiple firms within the sector. When linkage development takes place intra-firm – a firm expanding its business into different stages along the value chain – it becomes vertical integration. Vertical integration reduces contracting friction from a transaction cost perspective, and may provide scale and scope economies while extending market power (Coase, 1937; Stigler, 1951; Williamson, 1971). Hirschman who coined the concept of linkages argues that it is difficult to establish backward and forward linkage industries around agricultural and industrial raw materials (Hirschman, 2013).[15]

[15] Hirschman's original reasoning was that food production is consumed and agricultural commodities are exported with minimal processing. He later revised his position to suggest that the limited linkages effects are due to a high degree of technological "strangeness" or "alienness" of the new economic activities in relation to the ongoing ones (primary industries are unfamiliar with technology used in input and processing industries). When processing industries are established around growing sites, the

2.3 Methods and Data

This essay employs a case study design suited to the purpose of GVC research. The GVC framework takes an industry-centric view that highlights the linkages between firms and other economic actors from the local to the global levels of analysis (CGCC, n.d.). The case study uses a mixed-methods approach, combining descriptive statistics on sectoral and firm performance with the reporting of primary research in the form of notes from interviews with 25 firm and non-firm actors related to the Malaysian palm oil industry. Data analysis was performed on two levels (sectoral and firm) and is presented as such. The sectoral data were obtained mainly from the annual *Malaysian Oil Palm Statistics* (from 1980) published by the Malaysian Palm Oil Board (MPOB), and *Oil World Annual* (from 1987) produced by the Hamburg-based ISTA Mielke GmbH. Malaysia's input-output tables were used for calculating changes in linkage effects that have occurred in Malaysia's palm oil sector. The data on firms were compiled from annual reports published for financial years 2014/2015 by 20 firms with the largest reported palm plantation hectarages, of which all but two are public listed companies in Malaysia.

Semi-structured interviews were subsequently conducted to explore the key issues raised in the descriptive statistics. Confidentiality was granted to ensure that the subjects were at ease with expressing their opinions. A total of 25 interviewees were interviewed in the states of Selangor, Johore and Pahang in Peninsular Malaysia between March and August 2015. They comprised 12 senior executives overseeing strategy and management at their firms, seven government officials with regulatory and planning responsibilities, and six industry analysts and trade association officials. Two firm interviews were accompanied by field visits to oil palm cultivation and processing sites. Purposive sampling was used in that the interview subjects were chosen 'with purpose' for their relevant experience and opinions. The list of interviewees was constructed based on discussion with key informants in government and industry. The criteria for selecting the interviewees were that they were practitioners, experts or regulators who had industry and policy experience and knowledge; that they were willing to answer a list of preliminary questions (Annex 1); and that they were available for further interviews in person.

2.4 Sectoral Upgrading

With an economic life of about 25 years, oil palm trees produce fig-sized fruits in bunches weighing 20 to 30 kilogrammes. Three main products are derived from processing of the fruits:

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existence of forward linkages has depended more on compelling technical characteristics of the product than on entrepreneurial choice (Hirschman, 2013).

palm oil from the mesocarp; palm kernel oil from the kernel; and residual kernel cake from milling and crushing. Over 70% of palm oil is used for edible purposes given its flexible attributes suitable for food applications. Palm kernel oil, a heavily saturated lauric oil, is mostly used for non-edible uses. Both palm oil and palm kernel oil can be processed into liquid olein and solid stearin fractions, which can be further processed into a range of products. The residual cake is used as animal feed, paper and fertiliser.[16] Table 2.1 shows the key products and segments in the simplified palm oil value chains. A detailed schematic with product listing and explanation on the main processes can be found in Annex 2.

Table 2.1. Products and segments in simplified palm oil value chains.

Stage	*Key segment*	*Segment description*	*Product*
Upstream	Input supply	Produce and distribute goods that planters use for their production activities	Machinery/ equipment Agrochemicals Fertilisers Seeds and planting materials
	Plantation	Grow and harvest fresh fruit bunches (FFBs)	FFBs
	Milling & crushing (primary processing)	Process FFBs into crude palm oil (CPO) and crude palm palm kernel oil (CPKO)	CPO CPKO
	Waste and Residue Management	Convert biomass wastes and residues from primary processing into further uses (e.g. animal feed and energy generation)	Palm kernel cake (PKC) Empty fruit bunches Palm kernel shell Palm oil mill effluent
Midstream	Trading	Trade palm oil and palm-based products from CPO, CPKO, PKC onwards on domestic and international markets	Services
	Transport & logistics	Coordinate transportation, storage and delivery of traded goods	Services
	Basic refining (secondary processing)	Refine and fractionate crude products into a wide range of basic processed palm oil (PPO) and processed palm kernel oil (PPKO) products	Main PPOs: refined, bleached, deodorised (RBD) palm oil; RBD palm olein; RBD palm stearin Main PPKOs: RBD palm kernel oil; RBD palm kernel olein; RBD palm kernel stearin Palm fatty acid distillates and palm kernel fatty acid distillates (by-products from refining processes)

[16] The processing of 70 tonnes of FFB produces 15 tonnes of CPO, 2 tonnes of CPKO and 4 tonnes of palm kernel shell. The biomass from processing includes 50 tonnes of palm oil mill effluent, 9 tonnes of fibre, 15 tonnes of empty fruit bunches, 13 tonnes of frond and 8 tonnes of trunk (Hassan & Abd-Aziz, 2012).

Downstream	Further refining (secondary processing)	Further process PPO and PPKO into intermediate or finished products	Edible oils Specialty fats Oleochemicals Biofuel Phytonutrients
	Food & non-food manufacturing	Produce consumer goods using palm oil derivatives as functional ingredients or processing aids	Food products Personal and household care products
	Distribution & retail	Sales of goods for household consumption	

Source: Interviews, various publications.

Various upgrading types were present at the sectoral level. As a result of process upgrading, yields for crude palm oil (CPO) and crude palm kernel oil (CPKO), measured as tonnes of CPO and CPKO per hectare per year respectively, almost doubled between 1975 and 2014 (Figure 2.1). The improved CPO yield, from 1.96 to 3.65 tonnes, reflects improvements in production efficiency (larger quantity of fruits), processing efficiency (higher oil extraction out of fruits), and the quality of inputs (better seeds). The improved CPKO yield, from 0.17 to 0.40 tonnes, indicates better recovery rates of palm kernel from the milling of palm fruits as well as greater processing efficiency.

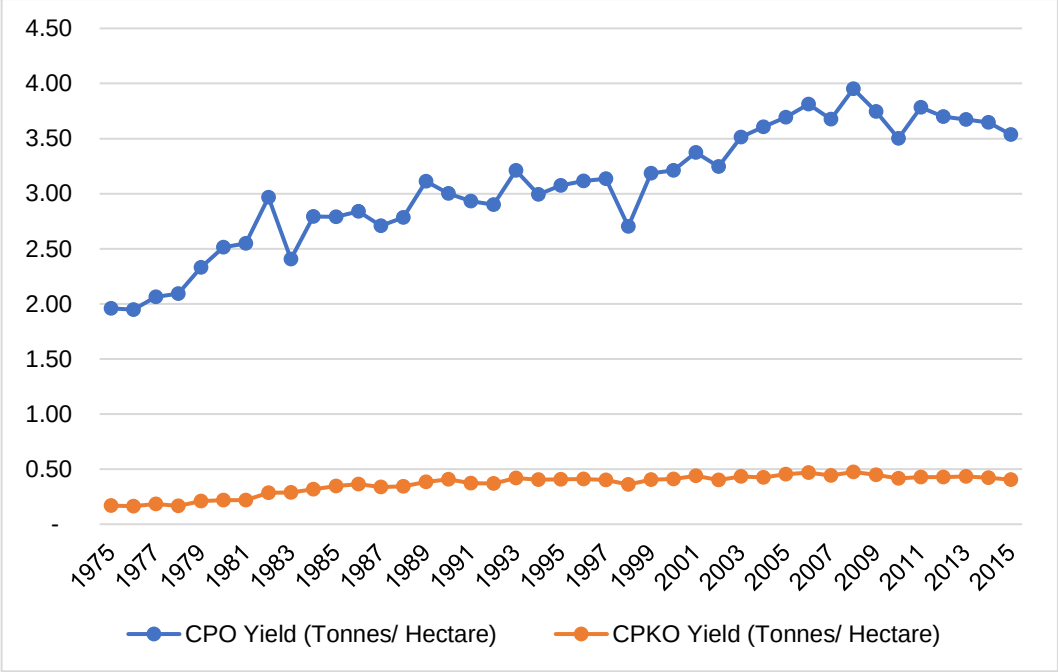

Figure 2.1. CPO and CPKO yields, 1975-2014.

Source: Malaysia Economic Statistics Time Series, 2015.

The improved seeds in the form of the high-yield Tenera variety also reflected product upgrading. They emerged from intensified selection and breeding efforts by both private and public entities in the 1960s (Corley & Tinker, 2016). The seeds' strategic importance to industry

competitiveness is attested by a government ban on seed exports since the early 1970s. The ban was only relaxed in 2013 to allow seeds exports to overseas plantations that are more than 70% owned by Malaysian interest.

Functional upgrading was most evident in the emergence of palm oil refining and downstream activities. Initially, Malaysia had only one single palm oil product for exports: CPO. *In situ* production of CPO close to plantations is always a necessity. Once harvested, palm fruits must be milled within 24 hours to avoid fruit bruising which affects palm oil quality. Most mills are hence located adjacent to plantations and owned by plantation operators. Only two foreign-owned refineries existed in Malaysia to cater for domestic market in the 1960s (Martin, 2003).

Earlier, groups of oil palm growers had attempted to establish cooperatively owned refining plants and to coordinate marketing and shipment. Large plantation firms, which were controlled mostly by British, refused to take part and led to failure of the initiative. According to one major industry figure, the firms "neither wanted nor dared to offend Unilever, by far their largest customer, who at that time was opposed to the establishment of an independent refining industry in Malaysia" (Fold, 1998).

In arguing against the establishment of refining plans in Malaysia, palm oil buyers used the comparative advantage argument that processing was capital-intensive but Malaysia had an abundance of labour, and that Malaysia had neither the indigenous technological and marketing capabilities nor the facilities and procedures for handling and shipping. There were also concerns with product quality deterioration during shipping (Gopal, 2001). The one major deterrent was likely to be cascaded tariff structures in industrialised economies which accorded heavy effective protection to domestic processing industries (Athukorala, 1998; Helleiner, 1973).[17]

From the early 1970s, the Malaysian government nationalised plantation interests through negotiated transfers and hostile takeovers (Pletcher, 1990; Rock & Sheridan, 2007; Yacob &

[17] That tariffs and other trade barriers in major markets tend to escalate with the level of a product's processing is not disputed. What is less clear-cut is whether tariffs are the main reason working against the efforts of commodity-dependent countries to increase domestic processing. One should take into account of the Generalised System of Preferences (GSP) and the Lome IV Convention preferences received by some developing countries (including the least developed countries), as Safadi and Yeats (1994) did with their study on commodity exports from Sub-Saharan Africa. Other constraints include high capital and skill requirements, transport costs that escalate with processing, and high entry barriers associated with the market power of a few large oligopolistic firms (World Bank, 1996).

White, 2010). It also introduced a number of horizontal and sectoral policy measures including: i) higher export duties on raw materials (through a graduated system that awards duty exemption to processed products based on their degree of processing); ii) incentives (mostly tax measures) for investment and export promotion; and iii) export credit financing and insurance (Gopal, 2001; Gustafsson, 2007; Jomo et al., 2003).

Public research institutes were created to intensify research and development in areas such as agronomics, processing, and downstream products. Technologies were developed in collaboration with private firms for commercialisation. Among this was a continuous sterile process in milling that reduced setup costs by 15% and the number of operators required by more than a third. Tools and machinery for harvesting palm fruits, infield transportation of palm fruits, and collection and separation of loose fruits were created to increase mechanisation (MPOB, 2010b). This led to the emergence of a great number of small and medium-sized enterprises producing and distributing equipment and parts in the input segment (fertilisers, agrochemicals and heavy machinery such as tractors remain largely imported).

The policy measures were not without problems, which were most visible in relation to trade measures. The export duty structure increased domestic supply and widened world and domestic CPO price differentials, enabling refiners and processors to make profit at the expense of plantation firms.[18] Price distortions attracted massive investment into the refining sector and introduced competition that led to the use of new technologies and more efficient production methods. But it also created an overcapacity that continues to this day. The trade measures also led to the 'Singapore cocktail' throughout the 1980s, in which palm oil products were exported in the processed form to benefit from Malaysian tax exemption, only to be blended again in Singapore and sold as CPO to international markets to avoid higher import tariffs on processed products (Moll, 1987; Rossell, 2001). The rampant practice created potential reputational risk for Malaysian exporters because while the reconstituted CPO was known as Malaysian palm oil to global buyers, they could not guarantee its quality (USITC, 2003, 1987). This has not been fully resolved, given Singapore's role as an important transhipment port. However, the problem is believed to have largely dissipated since the 1990s, as buyers knew their suppliers better and used only those that they trusted.

[18] Using gross margins of domestic versus European processors from 1980 to 1994 for dynamic competitiveness analysis, Gopal (2001) estimates that Malaysian refiners were uncompetitive and enjoyed excess profit due to policies in the 1980s but became just as competitive as their European counterparts by the 1990s.

Notwithstanding the unintended consequences of those policy measures, their introduction through the 1970s is widely recognised as a turning point that set off midstream and downstream industries for Malaysian palm oil. Prior to 1974, Malaysia was refining and fractionating about 90,000 tonnes of CPO, or less than 10% of the country's total CPO production. Malaysia began to export different types of processed palm oil (PPO) in 1975. By the early 1980s, PPO overtook CPO as the main palm oil export product. Of Malaysia's total palm oil and palm-based product exports, the share of crude products (CPO and CPKO) was reduced to a fifth in 2014, from 100% in the 1960s (Figure 2.2). The share of processed products (PPO and processed palm kernel oil or PPKO) meanwhile grew to over half of total palm oil export volume from virtually nothing. Malaysia's market share in the global PPO market grew from 2% in 1971 to reach a record high of 78% in 1982, before moderating to 54% in 1995. The gains were made at the expense of mostly processors based in the EU (Table 2.2. Malaysian PPO in the world PPO and processed oils market, 1971-1995.Table 2.2). Increased PPO supply from Malaysia also helped cement the position of palm oil in as a key oils and fats product, with PPO accounting for 15% of world processed oils in 1995 compared with a 3% global share in 1971.

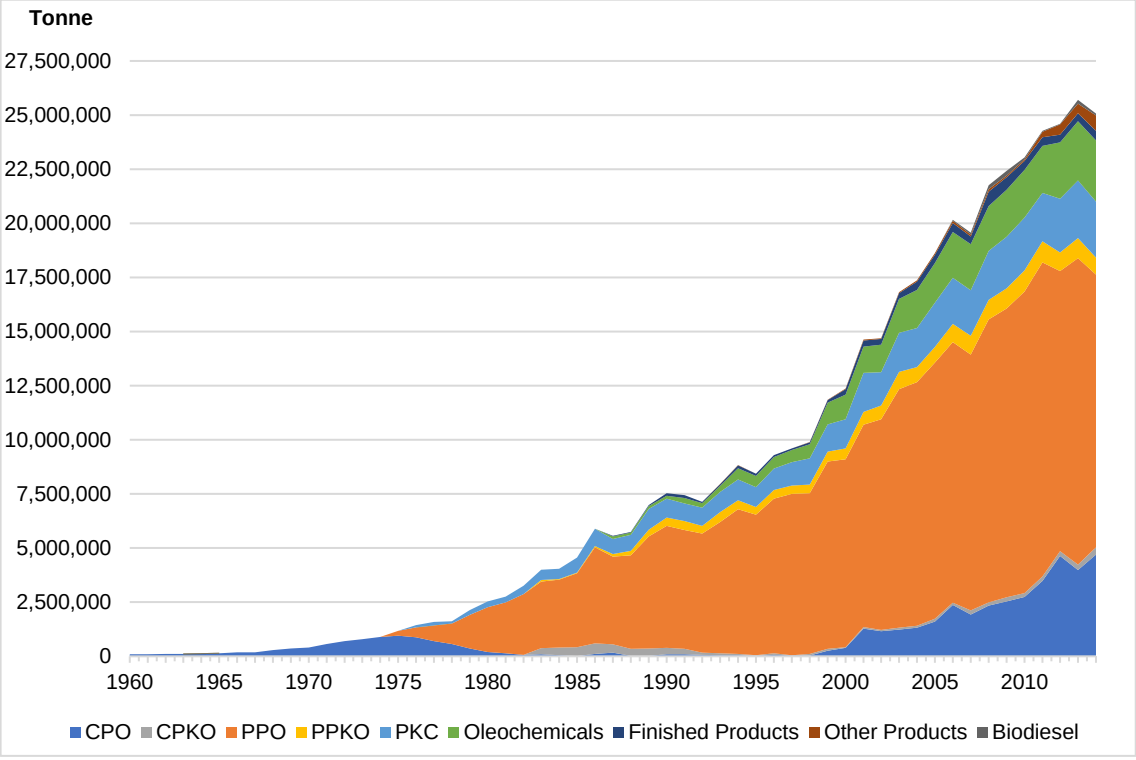

Figure 2.2. Palm oil and palm-based product exports, 1960-2014.

Source: Malaysian Oil Palm Statistics, various issues.

Table 2.2. Malaysian PPO in the world PPO and processed oils market, 1971-1995.

('000 tonne)	*1971*	*1975*	*1980*	*1985*	*1990*	*1995*
Malaysia	26	265	2,432	3,681	6,476	7,788
European Union	645	741	585	477	959	1,080
Rest of the world	546	985	432	1,224	1,669	3,327
World PPO total	1,217	1,991	3,449	5,382	9,104	12,195
World processed oils total	37,954	40,598	50,498	60,593	72,859	83,544
World PPO as % of world processed oils	3.2%	4.9%	6.8%	8.9%	12.5%	14.6%

Source: Adapted from Gopal (2001).

Development of processed and downstream products continued, most significantly with the creation of the oleochemicals industry, driven partly by foreign direct investment (FDI) since the 1980s. As of 2014, Malaysia accounted for 20% of global basic oleochemicals production, making it the world's largest producer (MIDA, 2015). The government has since targeted refined oleochemicals, production of biofuel by blending palm oil with fossil fuel, and commercial energy generation from palm biomass. Higher-value oleochemicals and other finished products, which emerged only from the 1980s, contributed to 13% of total export volume but 20% of total export value. Coinciding with greater product profile that could cater to different uses, Malaysia undertook channel upgrading. It expanded exports into new markets in populous emerging economies instead of serving only traditional markets in Europe.

Linkage Effects and Value Added

By applying linkage analysis to 36 industries in Malaysia between 1991 and 2010 (see notes in Annex 1), the study confirms the presence of 'key industries' within the palm oil sector, defined as those with strong backward and forward linkages. The explanation notes for calculating the linkage effects using the Sensitivity of Dispersion and the Power of Dispersion Indices, and their coefficients of variation are provided in Annex 3. The complete results are ranked and presented in Annex 4. Annex 5 explains the derivation of net foreign exchange earnings from the exports of goods and services for various industries.

Briefly, the Power of Dispersion Index measures total backward linkage of an industry. An industry has significant backward linkages (greater than 1) when its production of output requires substantial intermediate inputs from other industries. The Sensitivity of Dispersion Index measures total forward linkage of an industry. An industry has significant forward linkages (greater than 1) when it supplies significant amounts of outputs to other industries in their production. Key industries are those with strong backward and forward linkages. The coefficients of variation measure the extent to which the linkage effects are spread over all industries.

With regards to backward linkages, the primary industries generally have weak linkages (below 1) for all periods considered (Table 2.3). The use of inputs from others is low because these industries make direct substantial use of natural resources in their production. The exception here is livestock and fishing (4), mainly because of its extensive use of inputs such as animal feeds. The tertiary industries, too, have moderate backward linkages. Construction (26) and hotels and restaurants (28) consistently have strong demand for inputs. However, their relatively high backward coefficients of variation suggest that they draw upon a narrow range of industries.[19]

Table 2.3. Power and Sensitivity of Dispersion Indices for 36 industries, 1991-2010.

Industry	*Code*	*1991*		*2000*		*2005*		*2010*	
		Backward	*Forward*	*Backward*	*Forward*	*Backward*	*Forward*	*Backward*	*Forward*
Rubber	1	0.747	0.976	0.728	0.784	0.754	0.587	0.888	0.636
Oil palm	2	0.742	1.052	0.859	1.080	0.826	1.027	0.761	1.148
Agriculture	3	0.842	0.880	0.846	0.859	0.884	0.769	0.718	0.654
Livestock and fishing	4	1.254	0.997	1.303	0.986	0.967	0.920	1.044	0.684
Forestry and logging	5	0.754	1.094	0.797	1.196	0.684	0.822	1.217	1.460
Crude oil and natural gas	6	0.744	1.516	0.720	1.281	0.706	1.421	0.684	1.329
Other mining and quarrying	7	0.969	0.782	0.958	0.742	1.086	0.615	0.763	0.742
Food, beverage and tobacco	8	1.221	1.158	1.197	1.168	1.099	0.932	1.063	0.893
Oils and fats	9	1.790	1.309	1.956	1.528	1.483	1.160	1.527	1.271
Textiles and leather	10	0.961	0.860	1.050	0.880	1.101	0.832	1.052	0.721
Apparels and footwear	11	0.895	0.710	1.048	0.741	0.946	0.573	0.922	0.625
Wood products	12	1.305	0.846	1.231	0.804	1.056	0.695	1.439	0.806
Paper products and furniture	13	1.069	0.894	1.094	1.035	1.086	0.954	1.198	0.793
Printing and publishing	14	0.917	0.863	1.073	0.762	0.992	0.714	0.993	0.687
Refined petroleum products	15	1.323	1.075	1.064	1.467	1.124	1.994	0.988	1.367
Chemicals and pharmaceuticals	16	0.985	1.114	1.183	1.310	1.069	1.235	1.119	1.533
Processed rubber products	17	1.218	0.788	1.125	0.861	1.366	1.142	1.403	1.033
Plastics and non-metallic mineral products	18	1.070	1.064	1.032	1.050	1.044	1.001	1.155	1.018
Metal products	19	1.099	1.187	0.990	1.188	1.070	1.266	1.008	1.252
Machinery	20	0.978	0.795	0.815	0.862	0.834	0.885	0.823	0.692

[19] In the case of construction, its strongest backward linkages are with plastics and non-metallic products as well as metal products (both of which are key construction materials). For hotels and restaurants, the strongest linkage is with oils and fats, which supplies cooking fats for food preparation.

Electric appliances and electronic components	21	0.906	1.065	0.864	0.969	0.973	1.432	0.778	0.676
Precision equipment	22	0.976	0.688	0.914	0.700	0.900	0.650	0.856	0.609
Motor vehicles and transport equipment	23	0.960	0.974	1.036	0.949	1.048	0.818	1.014	0.806
Recycling and other manufacturing	24	0.934	0.754	1.048	0.757	0.795	0.698	0.899	0.677
Electricity, gas and water	25	1.002	1.164	0.932	1.344	1.103	1.175	0.901	1.312
Construction	26	1.092	0.924	1.089	0.865	1.040	1.039	1.133	0.862
Wholesale and retail	27	0.908	2.225	0.818	1.965	0.805	1.591	0.908	2.174
Hotels and restaurants	28	1.189	0.904	1.156	0.927	1.149	0.793	1.158	0.759
Transport and communications	29	0.988	1.511	0.983	1.439	1.178	1.968	1.104	1.824
Finance and insurance	30	0.899	0.907	0.826	0.799	1.034	1.658	1.063	2.271
Real estate	31	0.747	0.983	0.789	0.904	0.872	0.871	0.920	0.873
Business services	32	0.948	1.114	0.886	1.020	0.795	0.936	0.955	1.368
Private services	33	0.842	0.738	1.003	0.740	1.208	0.913	0.979	0.665
Education	34	0.804	0.684	0.795	0.667	0.820	0.560	0.735	0.597
Health	35	0.894	0.679	0.845	0.666	1.060	0.710	0.902	0.602
Government services	36	1.028	0.726	0.947	0.703	1.041	0.645	0.932	0.581

Note: Shaded area denotes key industry for the year.

Source: Calculations from *Malaysia Input-Output Tables*, various issues.

In contrast, the industries in the secondary sector, especially resource-based manufacturing industries, have strong backward linkages (exceeding 1). In most years, resource-based manufacturing industries dominate the top five industries in terms of backward linkage strength. The exact industries vary from year to year but they typically include food, beverage and tobacco (8), oils and fats (9), wood products (12), paper products and furniture (13), refined petroleum products (15), chemicals and pharmaceuticals (16), and processed rubber products (17). The prominence of these industries points to the high use of local inputs in the form of raw materials such as petroleum, oil palm, timber and rubber. Three non-resource-based manufacturing industries – machinery (20), electric appliances and electronic components (21), and precision equipment (22) – have backward linkages below 1 for all years. This is due to their high import requirements for production.

Oil and fats (9) consistently ranks first with the highest backward linkage among all 36 industries for the periods under study, although the linkage has weakened slightly between 1991 and 2010. Its high backward linkage is accompanied by a relatively low backward coefficient of variation.

This means oils and fats (9) is a significant absorber of intermediate inputs provided by a relatively broad range of other industries. As expected, oil and fats (9) has the highest linkage with oil palm (2) whose outputs are the main inputs for milling, crushing and refining industries. The backward linkage of chemicals and pharmaceuticals (16) further strengthened between 1991 and 2010. Chemicals and pharmaceuticals (16) has the highest linkage with oils and fats (9). A key product group for chemical and pharmaceuticals (16) is oleochemicals made with palm oil derivatives supplied by oils and fats (the other key product group is petrochemicals made with petroleum derivatives).

The strength of backward linkages for secondary industries can be further understood by their net foreign exchange earnings. Net foreign exchange earnings represent foreign earnings accruing to an industry or an economy with full consideration of its import requirement. The higher an industry's net foreign exchange earnings are as a share of its export earnings, the lower is its import requirement and the greater amount of local inputs goes into production of the industry's output. Net foreign exchange earnings for the major Malaysian exporting industries are shown in Table 2.4. For all the periods under study, resource-based manufacturing industries generally have a higher-than-average ratio of net foreign exchange earnings to export earnings, implying that they have relatively low import requirements than non-resource-based manufacturing industries. This should not be taken to mean that high local content is necessarily the appropriate goal for all industries, or that resource-based manufacturing is 'superior' to non-resource-based manufacturing. Rather, it indicates that where primary resources are available locally, there is a greater scope for capturing more gains from these primary industries through linkage development. Furthermore, high local content does not equal exclusive use of local content in production. Imports are inevitable even for resource-based manufactures and should be facilitated especially the inputs are not available locally.

Table 2.4. Net foreign exchange earnings of major exporting industries, 1991-2010.

(% of export earnings)	*Code*	*1991*	*2000*	*2005*	*2010*
Crude oil and natural gas	6	95.36%	87.26%	92.71%	89.72%
Oils and fats	9	89.94%	89.90%	87.24%	92.96%
Refined petroleum products	15	76.97%	47.70%	32.26%	68.98%
Chemicals and pharmaceuticals	16	50.90%	62.03%	61.61%	52.93%
Processed rubber products	17	87.11%	71.65%	63.66%	54.16%
Metal products	19	40.88%	10.34%	26.45%	20.00%
Machinery	20	46.20%	31.03%	47.71%	46.73%
Electric appliances and electronic components	21	37.57%	36.02%	36.39%	46.01%
Precision equipment	22	39.41%	50.41%	45.97%	43.37%
Share of total export earnings (36 industries)		62.63%	47.87%	54.93%	60.09%

Source: Calculations from *Malaysia Input-Output Tables*, various issues.

As for forward linkages, most primary industries demonstrate strong linkages (exceeding 1). It indicates that they are significant suppliers of inputs for use by other industries in their production. Four out of seven industries have seen their forward linkages increase between 1991 and 2000. Among them is oil palm (2), which ranks first among all 36 industries in terms of forward linkage strength in all years but one.

The secondary industries' forward linkages are less pronounced than their backward linkages. This is because many products are for final consumption (such as food, beverage, tobacco, apparels and footwear) with some exceptions. These include oils and fats (9); refined petroleum products (15); plastics and non-metallic mineral products (18); and metal products (19). For these industries, however, their forward linkages tend to fluctuate depending on demand and production in other industries.

Historically, oils and fats (9) has extremely strong forward linkage with chemicals and pharmaceuticals (16), wholesale and retail (27), and hotels and restaurants (28). This translates into a high forward coefficient of variation. In 2010, the forward linkage for oils and fats (9) dropped to slightly below 1. This possibly indicates an increase in the amount of outputs from oils and fats (9) being exported, instead of being used for further domestic value adding. It partly reflected the move to retain market share in the face of increasing competition from Indonesia. But it also signalled a new business reality for major Malaysian-owned firm which had acquired refining and manufacturing operations in key markets such as Europe and China. The exports of less processed oils and fats were necessary to provide them with feedstocks. For chemicals and pharmaceuticals (16), its forward linkage has strengthened between 1991 and 2010, indicating increased supply of its outputs as inputs for other industries' production.

The previously moderate forward linkages for industries in the tertiary sector have strengthened in general. Since 2005, industries with forward linkages exceeding 1 include utilities (25), transport and communications (29), finance and insurance (30), and business services (32). Furthermore, they have relatively low forward coefficients of variation, indicating their nature as providers of services to a broad range of industries.

In the spirit of Rasmussen (1957) and Boucher (1976), the Malaysian economy had seven 'key industries' in 1991, 2000 and 2010. In 2005, it had 11 'key industries'. In most of the periods under study, oils and fats (9) as well as chemicals and pharmaceuticals (16) – both of which represent industries which are secondary in nature extending from oil palm (2) – feature among the key industries. The high Power of Sensitivity and Dispersion of Sensitivity Indices for the two industries indicate that they have greater linkages than the average of all industries. Chemicals

and pharmaceuticals (16) saw its indices strengthen between 1991 and 2005, providing further evidence of downstream linkage development.

Strong linkage development in the Malaysian palm oil sector contributed significantly to the country's value added performance. Malaysia's manufacturing value added grew twice as fast as its agricultural value added between 1995 and 2010 (Table 2.5). Palm oil was instrumental not just for driving agricultural value added growth (compared with other crops). Among manufactured goods, oils and fats (almost entirely palm oil) was the second fastest growing segment after industrial chemicals (of which palm oil is a key input, as is petroleum). Oil and fats was also an important contributor to value added in absolute terms.

Table 2.5. Agricultural and manufacturing value added, 1995-2010.

Commodity	*% of total value added in 1987 prices*				*Average annual growth rate*
	1995	*2000*	*2005*	*2010**	
Industrial commodities	68.5%	59.1%	61.5%	56.4%	1.9%
Oil palm	24.7%	31.4%	36.7%	36.6%	5.9%
Forestry and logging	24.2%	16.4%	14.0%	10.0%	-2.7%
Rubber	12.4%	10.0%	10.5%	9.3%	1.2%
Cocoa	7.2%	1.3%	0.4%	0.5%	-13.5%
Food commodities	31.5%	40.9%	38.5%	43.6%	5.5%
Fisheries	11.5%	13.4%	11.1%	14.1%	4.6%
Livestock	5.6%	8.1%	9.7%	9.0%	6.6%
Paddy (rice)	3.0%	3.2%	2.9%	3.6%	4.4%
Other agriculture	11.4%	16.2%	14.8%	16.9%	6.0%
Total agricultural value added	100.0%	100.0%	100.0%	100.0%	3.2%

Industry	*% of total value added in 1987 prices*				*Average annual growth rate*
	1995	*2000*	*2005*	*2010**	
Resource-based	48.3%	41.9%	43.7%	42.3%	5.4%
Agro-based	*24.7%*	*20.2%*	*20.5%*	*19.5%*	*4.7%*
Oils and fats	2.7%	3.8%	4.4%	4.9%	10.8%
Other food processing, beverages & tobacco	7.8%	6.0%	5.8%	5.6%	4.0%
Wood products including furniture	6.7%	4.4%	3.6%	3.3%	1.5%
Paper & paper products, printing and publishing	4.2%	3.4%	3.2%	2.9%	3.7%
Rubber processing & products	3.4%	2.7%	3.5%	2.8%	5.0%
Non-agro-based	*23.6%*	*21.7%*	*23.1%*	*22.8%*	*6.1%*
Industrial chemicals including fertilisers & plastic products	5.7%	10.1%	G	12.6%	12.1%

Petroleum products including crude oil refineries & coal	11.3%	6.7%	6.4%	6.6%	2.6%
Non-metallic mineral products	6.6%	5.0%	4.5%	3.6%	2.2%
Non-resource-based	49.4%	56.3%	*54.2%*	*55.4%*	7.2%
Textiles, wearing, apparel & leather	5.1%	3.5%	2.2%	1.8%	-0.9%
Basic metal industry industry	1.1%	0.9%	0.8%	0.7%	3.5%
Metal products	3.4%	4.3%	4.9%	5.8%	10.1%
Manufacture of machinery except electrical	5.9%	4.6%	4.2%	3.1%	1.8%
Electronics	22.8%	29.5%	28.0%	29.4%	8.2%
Electrical machinery	1.8%	2.6%	1.2%	1.0%	2.2%
Transport equipment	9.2%	11.0%	12.9%	13.7%	9.2%
Others	2.3%	1.7%	2.1%	2.2%	6.0%
Total manufacturing value added	100.0%	100.0%	100.0%	100.0%	6.3%

* Estimates.

Source: Eighth and Ninth Malaysia Plans.

The Drive for Linkage Development

Interviewees for the study acknowledged that Malaysia's palm oil sector benefited from an existing base of large-scale industrial agriculture dating back to the colonial era. Heavy British investments in rubber plantations and tin mines turned British Malaya into a specialised economy and one of the most profitable colonies. In the 1950s, European firms controlled 60% of British Malaya's tin output and 93% of its plantation hectarage (Gomez & Jomo, 1999). Foreign control persisted post-independence (British Malaya became independent in 1957, and merged with Sabah, Sarawak and Singapore to form the Federation of Malaysia in 1963). In 1974, the 3 largest firms of British agency house origin (Sime Darby, Guthrie and Harrisons & Crosfield) controlled 30% of plantation hectarage in Malaysia (Searle, 1999). With waves of nationalisation, the Malaysian interests inherited expertise, knowledge and network resources that were useful for driving subsequent expansion. This feature affirms path dependence and is not one that can be easily replicated. It also points to the usefulness of prior manufacturing experience in industrial development. As Amsden (2001) notes, Malayan manufacturing activity existed in food processing, textiles and machinery under British colonialism and émigré Chinese. By the 1950s, local producers were already exporting to South East Asia.

Notwithstanding the prewar manufacturing experience, there was a broad consensus among the interviewees that linkage development specifically in the oil palm sector was made possible by conscious state and firm efforts. This started with a deliberate increase in upstream oil palm

production at the onset. While palm oil has unique product attributes that it suitable for versatile applications – a key advantage over its competitors – it is first and foremost a highly substitutable bulk commodity. As with most bulk commodities, supply availability and reliability are important for palm oil to compete with other established oils and fats.

In addition, for successful development of downstream industries, achieving scale economies in upstream production was critical for ensuring an adequate, consistent feedstock volume. This was because Malaysia could rely only on a single feedstock, unlike incumbent European refiners who had a choice of abundant feedstocks given the region's position as the leading destination market.

Yet, the palm oil sector did not concentrate solely on its traditional activity of growing oil palm and providing crude products, as advocates of vertical specialisation would dictate. Neither did it abandon oil palm cultivation when it moved into other areas and activities along the palm oil value chain. Rather, oil palm cultivation, an essentially upstream activity, was used as the foundation for developing linkages. As reasonably demonstrated by the case of the Malaysian palm oil sector, linkage development is desirable and feasible when it comes to upgrading in GVCs for agricultural commodities, but must first overcome the barriers and constraints (domestic, external, natural, and artificial) that could prevent linkage development. Several reasons account for the desirability and feasibility of linkage development in agro-commodity value chains.

First, agro-commodity GVCs bear certain unique production characteristics that differentiate them from value chains for regular manufactures (there is even heterogeneity among those). Primary agriculture has relatively high location specificity that is tied to unalterable natural factors such as land and agro-climatic conditions. Because agricultural commodities are subject to decay and spoilage, they generally require at least some degree of post-harvest preparation, transformation, preservation or handling close to growing sites to ensure quality (freshness and agility) and safety for intermediate use and final consumption. Due to the 'bulkiness' (high weight-to-value ratio) of agricultural commodities and transport costs, adjacent processing is often an economically sound decision.

The potential volume loss in processing and transportation is also high, making it less likely for value-adding activities to be more dispersed geographically than necessary. For example, when soybean and sunflower oil is processed through continuous production without interruption, the processing loss is 5.5%. The processing loss increases to 6.2% with batch production, in which the oil is created state by stage over a series of workstations. Palm oil has a processing loss of

1.1%, which contributes to its cost advantage (Nambiappan, 2013). Losses also unavoidably occur during the transportation of bulk cargo, both dry and liquid. Relatedly, the process of adding value in agro-commodity value chains involves working on the primary input through a series of consecutive stages (as long as the primary input remains a key part of the product). This contradicts what is observed about vertically specialised chains which are generally found among manufactured goods (especially the complex ones), thus affirming the point about the difficulty with parallel execution in additive chains made by (Kaplinsky & Morris, 2015).

Moreover, upgrading types are often intertwined in agro-commodity production. For example, the introduction of new processes often generates new categories of products (such as organics and 'sustainable' products) (Ponte & Ewert, 2009). Scope economies is relatively limited within primary production, especially for bulk commodities. Therefore product upgrading will ultimately require more differentiation by degree of processing and value-adding. This necessitates acquisition of secondary capabilities in processing and manufacturing that were not already in place, which by definition is functional upgrading.

Second, the sectoral dynamics of agro-commodity GVCs are such that their prices are cyclically prone to booms and busts as well as external shocks. Compared with manufactured goods, significant time lags exist between production decisions and realisation of outputs in GVCs for agro-commodities. Risk and uncertainty also emanate from biological cycles and other uncontrollable factors. Supply adjustment in response to sudden changes in demand and external volatility is therefore complicated. Furthermore, with increased financialisation of the commodity markets and rising popularity of commodity futures as an asset class, the price of an individual commodity is no longer determined solely by supply and demand (Tang & Xiong, 2012).[20]

For producers of agricultural commodities, processed products can be a hedge against volatile commodity prices. Processed products are not immune to price fluctuations but their quantum of price decline (especially for specialty products) is less than that of raw commodities during a commodity down cycle. Additionally, lower feedstock prices reduce production costs of processed products (feedstock is usually the largest cost component) and mitigate the negative earnings impact. A similar observation was made in the oil and gas sector during the 2015 price

[20] The total value of various commodity index-related instruments purchased by institutional investors increased from an estimated US$15 billion in 2003 to at least US$200 billion in mid-2008. Price comovements between various commodities have increased after 2004, reflecting the aggregate risk appetite for financial assets and the investment behaviour of diversified commodity index investors (Tang & Xiong, 2012).

downswing. Executives of major oil and gas firms acknowledged that integrated firms (those which combined upstream activities of finding and developing oilfields with downstream functions of refining crude and selling petroleum products) produced better returns than those which focused only on upstream business (Stacey & Crooks, 2016).[21]

Third, one cannot overlook the historical settings of agro-commodity GVCs in discussions about the appropriate GVC strategy. Vertical specialisation is positioned not just as an upgrading strategy (in the sense of how countries and firms can improve their participation in GVCs post-GVC integration); it has also marketed as an entry strategy for developing countries to insert themselves into international production networks in the first place. However, most developing countries are already deeply integrated into GVCs for agricultural commodities and mineral resources as a legacy of colonial rule to supply goods to the growing populations and industries of their home countries (Clarke et al., 2013; Jones & Khanna, 2006; Thomas, 1999; Wilkins, 2001). Primary products such as minerals, fuel and agricultural produce are important in the export structure of developing countries, with very few, if any, processing activities (UNCTAD, 2009). The relevant strategy for developing countries is thus to ensure continuous participation in such GVCs and to make the most out of their inherent position in production and trade of raw materials.

Fourth, given land use constraints, specialisation in upstream production is also not desirable from an ecological perspective (due to sustainability pressure that is caused by increased land use), nor is it viable from an economic viewpoint. Arable land and water are critical inputs for agro-commodity production but their supply is finite. Because of this, expansion in upstream production will run into limits even with technological change, productivity gains and, in a more extreme scenario, displacement of other crops by monoculture – as seen in the case of Malaysia's oil palm. For reasons related to agro-commodity production characteristics and sectoral dynamics, it is equally unlikely that developing countries can specialise in midstream and downstream activities without some kind of position in upstream production (unless upstream supplies are readily available, within reach and are not too costly in terms of transportation and processing loss).

[21] Another benefit, as Rex Tillerson, then chief executive of ExxonMobil puts it, is that vertical integration "captures the highest value for every molecule that flows through our facilities" (Stacey & Crooks, 2016).

2.5 Firm Upgrading

Malaysia's palm oil sector revolves around the plantation firms, of which the 20 largest by palm plantation hectarage are listed in Table 2.6. They accounted for over two million hectares or 40% of total palm plantation hectarage in Malaysia in 2014, and held an additional 850,000 hectares outside Malaysia. These firms derive a significant portion of their revenue and profit from palm-based business. Except for Tradewinds Plantation (headquartered in Malaysia but not listed) and Wilmar International (headquartered and listed in Singapore) [22], all are headquartered and listed in Malaysia.

Table 2.6. 20 largest palm-based firms: Plantation hectarage, yield, revenue and ownership, 2014/2015.

	Firm	*Palm plantation hectarage*	*Outside Malaysia*	*CPO yield*	*Palm-based revenue*		*Ownership/ control type*
					Million US$	*Of total revenue*	
1	Felda Group	750,093	7.5%	3.98	3,413	81.5%	State
2	Sime Darby	605,046	49.0%	4.4	2,628	23.5%	State
3	Wilmar International	238,287	76.0%	N.A.	26,824	62.3%	Local private
4	Kuala Lumpur Kepong	207,622	56.2%	4.9	3,383	96.8%	Local private
5	IOI Corporation	178,768	11.3%	5.2	2,949	99.2%	Local private
6	Tradewinds Plantation	132,940	N.A.	N.A.	307	42.9%	Local private
7	Genting Plantations	119,900	50.6%	5.1	325	77.4%	Local private
8	Boustead Plantations	65,680	0.0%	3.9	157	99.8%	State
9	Sarawak Oil Palms	63,377	0.0%	4.2	735	99.9%	Local private
10	TH Plantations	60,417	0.0%	4.2	125	99.8%	State
11	IJM Plantations	58,900	57.2%	5.3	171	100.0%	State
12	Rimbunan Sawit	57,182	0.0%	N.A.	61	99.0%	Local private
13	TSH Resources	53,200	67.3%	N.A.	243	88.5%	Local private
14	Kulim (Malaysia)	47,194	0.2%	4.6	196	69.9%	State
15	TDM	45,389	29.3%	3.2	67	67.9%	State
16	United Plantations	45,095	21.2%	5.25	257	99.8%	Foreign private
17	Hap Seng Plantations	35,538	0.0%	5.0	127	100.0%	Local private
18	Sarawak Plantation	33,367	0.0%	2.4	99	99.6%	Local private
19	BLD Plantation	27,600	0.0%	N.A.	399	100.0%	Local private
20	United Malacca	22,411	0.0%	4.1	55	100.0%	Foreign private

Source: Annual reports, 2014/2015 (2012 for Tradewinds Plantation).

[22] Wilmar International completed a merger with the Malaysian-controlled PPB Oil Palms in 2007. The exercise saw the family of Robert Kuok Hock Nien, a Malaysian of Chinese descent, emerge as the largest shareholder of Wilmar International. Kuok who currently owns a third of Wilmar International has been named regularly by *Forbes* magazine as South East Asia's richest man. Tradewinds was originally a vehicle set up by state-owned National Corporation (Perbadanan Nasional Bhd or Pernas) to acquire foreign-owned plantation, mining and property interests. In the late 1990s, it was sold to Syed Mokhtar Al-Bukhary, known to be the richest Malay businessman, which was later merged with a competitor and taken private.

Thirteen out of the 20 firms are controlled by private local and foreign capital. However, state capital is more prevalent than it appears. Statutory bodies and government investment arms have substantial shareholdings exceeding 5% in all private controlled firms except the Singapore-listed Wilmar International, which is out of reach for Malaysian state capital that is accustomed to investing domestically for reasons related to risk appetite and investment capability. Information on market capitalisation and substantial shareholders of the 20 firms is in Annex 6.

Five firms have existed since before World War II and have decades of experience in plantation operations. The five firms are Sime Darby, Kuala Lumpur Kepong, Kulim (Malaysia), United Plantations and United Malacca. Sime Darby is the product of merger of three stated-owned companies (Sime Darby, Guthrie and Golden Hope) in 2007. Sime Darby, Kuala Lumpur Kepong, Guthrie, Golden Hope and Kulim (Malaysia) were originally British-owned firms. The other 15 firms emerged mostly in the 1970s through establishment of new plantations and swaps or acquisitions of existing plantations, just as oil palm became lucrative. A brief history of the plantation firms is in Annex 7.

The conventional wisdom is that industrial-scale plantation is more productive than smallholders due to the latter's poor management skills and lack of scale. Smallholders produce 1.8 tonnes of CPO per hectare per year, about a third of plantation firms' yield of 5.3 tonnes (NEAC, 2010)[23]. However, data on the 20 largest firms suggest that significant variance exists within industrial-scale plantation too. While most recorded CPO yields above the 2014 national average of 3.65 tonnes, only five (controlled by local private capital) managed to produce five tonnes and above. One firm achieved a yield as low as 2.42 tonnes. The two firms with the largest palm plantation hectarage – Felda and Sime Darby (both state-owned) – reported yields closer to four tonnes.

All 20 firms include plantation and milling or crushing operations as part of their business. Only six have derived a substantial share of their palm-based revenues from beyond palm fruits and CPO sales, signifying the vertically integrated nature of their business. In addition, a high proportion of their revenues comes from international sales, indicating their ability as tier-1 suppliers to sell straight to global buyers (Table 2.7).

[23] In FFB yield terms, oil palm smallholders are estimated to produce 10 tonnes of FFB per hectare per year, 15 tonnes short of the 25 tonnes produced by plantation firms. In oil extraction rate terms (reflecting quality of fruits and speed of harvest and collection), smallholders' FFB produces CPO that is 18% of the weight of the fruits, compared to plantation firms' 21%.

Table 2.7. 20 largest palm-based firms: Level of vertical integration, 2014/2015.

	Firm	*Non-upstream revenue*		*Activity in value chain segment (through subsidiaries, joint ventures or associates)*													
		Million US$	*Of palm-based total*	*Input supply*	*Plantation*	*Milling & crushing*	*Biomass energy*	*Export trading*	*Transport & logistics*	*Refining*	*Edible oils*	*Specialty fats*	*Oleo-chemicals*	*Biodiesel*	*Marketing/ distribution*	*R&D*	*Technical/ advisory services*
1	Felda Group	2,101	61.6%	●	●	●	●	●	●	●	●		●	●	●	●	●
2	Sime Darby	N.A.	N.A.	●	●	●	●	●	●	●	●	●	●	●	●	●	●
3	Wilmar International	26,753	99.7%	●	●	●		●	●	●	●	●	●	●	●	●	●
4	Kuala Lumpur Kepong	1,597	47.2%	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5	IOI Corporation	2,902	98.4%	●	●	●	●	●	●	●		●	●	●	●	●	●
6	Tradewinds Plantation	N.A.	N.A.		●	●		●									
7	Genting Plantations	26	8.0%	●	●	●		●	●	●	●	●	●	●	●	●	●
8	Boustead Plantations	0	0.0%	●	●	●											●
9	Sarawak Oil Palms	0	0.0%	●	●	●			●	●				●	●	●	●
10	TH Plantations	0	0.0%	●	●	●	●	●	●	●		●	●	●	●	●	●
11	IJM Plantations	0	0.1%		●	●											
12	Rimbunan Sawit	0	0.1%	●	●	●			●								●
13	TSH Resources	1	0.3%	●	●	●	●	●	●	●		●	●	●	●	●	●
14	Kulim (Malaysia)	0	0.0%	●	●	●			●						●	●	●
15	TDM	0	0.0%		●	●											
16	United Plantations	160	62.4%		●	●		●									
17	Hap Seng Plantations	0	0.0%		●	●											
18	Sarawak Plantation	0	0.0%	●	●	●											●
19	BLD Plantation	0	0.0%	●	●	●				●				●	●	●	●
20	United Malacca	0	0.0%		●	●											

Source: Interviews, annual reports, company websites.

All six firms had served as suppliers to foreign buyers for much of their operating history. Previously, the intermediary buyers were processors and traders concentrated in Europe. Leveraging on the processing function, the six firms have taken on the trading function and now supply diverse products directly to end-buyers further down the value chain, namely lead firms in food and non-food manufacturing including, but not limited to, Mars (US), Nestlé (Switzerland), Cadbury (UK), Kraft Foods (US), Kellogg's (US), Ferrero (Italy), Hershey (US), Unilever (UK-Netherlands), Procter & Gamble (US), Colgate-Palmolive (US), Johnson & Johnson (US) and L'Occitane (France).

The six firms are Felda (through Felda Global Ventures), Sime Darby, Wilmar International, Kuala Lumpur Kepong, IOI Corporation and United Plantations. The degree of vertical integration varies for the six firms, with some much stronger than others in midstream and downstream segments. Nonetheless, their wider product and service profiles, capabilities beyond upstream production, and ability to supply to global markets reflect a mix of process, product, functional and channel upgrading in varying degrees that suited each firm's strategic motives.

- Felda is the world's largest CPO producer, with an annual output of 3.1 million tonnes or over 5% of the world total. But it also has a strong presence in manufactured fats as well as bulk installations and storage. Some 40% of Malaysia's palm oil products for exports passes through Felda's bulk facilities.

- Sime Darby is the world's largest producer of certified sustainable palm oil (CSPO) with an annual output of 2.4 million tonnes that accounts for 22% of the global CSPO total. Almost all of Sime Darby's plantations and mills are certified by the Roundtable on Sustainable Palm Oil (RSPO) which sets the widely used standards for environmental and social sustainability in palm oil supply chains. Sime Darby is also involved in manufacturing, marketing and distribution of oils and fats, oleochemicals and biodiesel.

- Wilmar International's particular strength is in processing and trading of palm oil from external sources. It merchandises some 24.6 million tonnes of palm and palm kernel oil, accounting for almost 40% of global palm oil trade. It is also the world's largest producer of branded consumer pack cooking oils, with a dominant market share in Indonesia and China. Unlike the other five firms that specialise on only palm oil, Wilmar International also ventures into other oilseeds, grains and sugar as well. It owns a fleet of liquid bulk vessels and dry vessels that partly meet its own shipping requirements.

- Kuala Lumpur Kepong has diversified into resource-based manufacturing since the 1990s. It focuses on basic oleochemicals such as fatty acids, glycerine, fatty alcohols and esters. In recent years, it has also ventured further downstream into specialty products such as soap and detergent intermediates, biodiesel and surfactants. Kuala Lumpur Kepong ventured into branding and retailing of body and home care products when it acquired Crabtree & Evelyn in 2009 before disposing it in 2012 to focus on its plantation and oleochemical business which offered significant higher returns.

- IOI Corporation has consistently ranked among the most productive plantation firms in Malaysia, with its two dedicated research and biotechnology centres focusing on best agronomic practices and high-yield planting materials. Its oleochemicals business is mainly in the manufacturing and sales of fatty acids, glycerine, soap noodles and fatty esters. It also supplies specialty oils and fats that are required for food processing applications.

- United Plantations is controlled by a Danish family and makes and distributes cooking oils, edible oils, specialty fats and soap products. United Plantations was the first among Malaysia-based plantation firms to invest in domestic palm oil refining (in as early as 1971). It sells the bulk of its products through a long-standing working relationship to AarhusKarlshamn AB (AAK) and remains a niche supplier of specialty oils and fats. The Swedish-Danish owned AAK is the world's largest supplier of speciality and semi-specialty oils and fats (with a market share of over 50% in China alone).

The six firms' ability to take on processing, marketing and trading functions is not an insignificant achievement given that such functions in many agro-commodity chains are dominated by international trading houses who can procure continuously specific volumes and quality mixes, which "no individual supplier or country-specific association of suppliers has the capacity to perform" (Gibbon, 2001b). Entry barriers to the trading function are particularly high: a deep pocket for working capital (necessary because of the high volumes traded); knowledge of markets for trade-related services like logistics, storage, processing, insurance and financial services; the ability to command a broad coverage of supply sources across commodities; and intangibles like reputation (ibid). The ABCD quartet of companies – Archer Daniels Midland (ADM) (US), Bunge (US), Cargill (US), and Luis Dreyfus (Netherlands) – account for between 75% and 90% of the global grain trade, and collectively made US$350 billion in revenue before commodity prices fell since 2014 (Lawrence, 2011; Meyer, 2013; Schneyer, 2011).

Wilmar International has been able to swiftly expand its trading function to account for over 40% of global palm oil, largely because it recognised the importance of strategic alliances very early on. Wilmar International entered into processing joint ventures with ADM in China since the early 2000s. When Wilmar International undertook the merger exercise in 2006, ADM transferred its holdings in the joint ventures in exchange for shares in Wilmar International. ADM became the second largest shareholder and has been steadily increasing its shareholdings in Wilmar International since. For ADM, investing in Wilmar represented an opportunity to gain a foothold in palm oil processing and trading business, in addition to its own premier position in the processing and trade of soybeans, corn and wheat. For Wilmar International, the move deepened its strategic alliance with ADM to expand its global footprint and to further diversify its processing business to other oilseeds and grains. Wilmar International is at present the largest crusher of soybean and producer of soybean oil and soybean meal in China, and has expanded its marketing and sales partnerships with ADM to multiple locations in Europe.

For the other 14 firms, signs of upgrading are unclear. They remain focused on upstream production and act as tier-2 suppliers to either the integrated firms or independent refiners and dealers. Their products are limited to palm fruits and crude products, mainly CPO. Given that their sales are for domestic markets, these tier-2 suppliers tend to have a high concentration of large buyers. It is common for many of these firms to derive more than 75% of their revenues (in one extreme case, up to 95%) from two to three customers. By comparison, the integrated firms have a much less concentrated customer base (no single customer accounts for more than 10% of revenue). This partly reflects large volume effects but is mainly due to the integrated firms' ability to export to foreign lead firms. Because the integrated firms could obtain supplies internally and from a wide pool of smaller plantation firms and growers, they did not play a role in technology diffusion (with the exception of Felda, due to the explicit mandate to assist the smallholders organised under its scheme).

Many plantations firms, including the integrated firms, pursued cross-border horizontal integration in upstream oil palm cultivation beginning in the early 1990s. Labour and land shortages had pushed up production costs in Malaysia, driving local capital to Indonesia for expansion given its geographical and cultural proximity.[24] Consequently, Malaysian interests

[24] In the 1980s, Indonesia's policy objective was to replace Malaysia as the world's largest palm oil producer. Previously state-run plantations and extensive new concessions were privatised and awarded to large Indonesian firms. The Indonesian government also opened the sector to foreign investors but reversed the policy when foreign interest was deemed to have become too dominant (McCarthy & Cramb, 2009). After the Asian Financial Crisis, when Indonesia reopened its markets to FDI, Malaysian and Singaporean interests re-entered Indonesia and took over plantations from large indebted Indonesian

control 25% to 50% of Indonesia's oil palm plantations (Adnan, 2009; Pemandu, 2010; Varkkey, 2016). Upstream expansion has since spread further afield. Most of the 20 largest firms own plantations outside Malaysia, of which 86% is in Indonesia, 10% in Oceania and Asia (Papua New Guinea, Solomon Islands, Cambodia, the Philippines) and 4% in Africa (Liberia, Republic of Congo, Uganda).

What separates the integrated firms from their peers is that they did not strive for scale economies through upstream horizontal integration *per se*. They also widened their product and service offerings for greater scope economies. This was achieved by expanding into refining and downstream production, and by acquiring capabilities in marketing, logistics and other new functions.

Convergence of Linkage Development and Vertical Integration

Notwithstanding the prominence of the integrated firms at present, they were not the pioneers which initiated linkage development. Linkage development in Malaysia's palm oil sector took off with non-plantation firms making initial investments in the nascent domestic refining industry. These were mainly local investors with trading experience and background, plus some overseas refiners and manufacturers which used palm oil for their operations. Because their feedstock supply base was external, they were known as independent refiners.

In theory, linkage development at the sectoral level may involve multiple firms instead of taking place within a single firm. This was at least true during the initial phase with the establishment of the refining industry. However, once the integrated firms (which focused on plantation business up until then) entered the refining and processing space from the 1980s, they achieved a dominant position swiftly and altered the industry structure. It marked the beginning of a convergence between sectoral linkage development and firm-level vertical integration. The integrated firms not only processed palm oil from their own production but also sourced aggressively for primary and crude products from tier-2 suppliers, dealers and sometimes smallholders. This intensified competition for feedstock among independent refiners. While efficiency and competitiveness improved at the sectoral level, the outcome is different for firms. The surviving independent refiners and processors grew extremely competitive and efficient to be among the market and technology leaders; others suspend operations when CPO supplies

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firms (Varkkey, 2016). Policy reversal may yet happen again, with Indonesia seeking to limit foreign ownership in natural resource sectors, including plantations (Taylor & Supriatna, 2014).

become tight or exit the market altogether. Independent refiners have since become much less important than before, and process a far smaller volume than the integrated firms.

When targeting the oleochemicals industry in the 1980s, the Malaysian government in its first 10-year Industrial Master Plan (1986-1995) noted that the key strategy to develop the downstream palm oil segments was to “encourage foreign investment in the oleochemicals industry. This is necessary because 90% of the market is in the developed countries and these markets are held by a few large international producers, and therefore their participation is highly desirable” (UNIDO & Malaysia, 1985). The focus to attract FDI was a recognition that foreign proprietary technology played a more important role in driving the oleochemicals industry than the basic refining industry largely because the technology for the former was less ‘off-the-shelf’ and because tacit knowledge transfer was required.

Notably, the development of the oleochemicals industry was spurred by entry and investment of Japanese in joint ventures with local firms. Many key oleochemicals firms in Malaysia remain JVs involve foreign partners (Table 2.8). These foreign partners are mostly manufacturers of palm oil derivatives as functional ingredients or processing aids (for use in manufacturing of food and non-food consumer goods). The joint ventures were not necessarily indicative of their willingness to outsource the processing functions. Rather, with the refining industry having been established, it became strategically important for the oleochemicals firms to have a presence in Malaysia’s palm oil sector. Foreign oleochemicals firms previously worked closely with refiners and processors located outside Malaysia. As local firms took on processing and refining functions, the foreign oleochemicals firms needed to form partnerships with these entities instead. Strategic partnerships with local and foreign firms often came with licensing agreements and these were important for transfers of production technology and knowledge which local firms would otherwise have difficulties accessing. Technology transfers took place at the management level, since co-ownership made it more likely to have Malaysian nationals in managerial positions.

Table 2.8. Key oleochemicals firms.

Name	*Ownership Type*	*Owner(s)*
Emery Oleochemicals (M)	JV with foreign partner(s)	Sime Darby (50%), PTT Global Chemical (Thailand) (50%)
Fatty Chemical (M)	JV with foreign partner(s)	Kao Corporation (Japan) (70%), IOI Corporation (30%)
FPG Oleochemicals	JV with foreign partner(s)	Felda (50%), Procter & Gamble (US) (50%)

Iffco (M)	Foreign	IFFCO (UAE) (100%)
IOI Acidchem	Local	IOI Corporation (100%)
Natural Oleochemicals	Local	Wilmar International (91%), National Land Finance Co-operative Society (9%)
Pacific Oleochemicals	Foreign	Lam Soon (Singapore) (100%)
Palm-Oleo	JV with foreign partner(s)	Kuala Lumpur Kepong (80%), Mitsui & Co., Miyoshi Oil & Fat Co., Asahi Denka Kyogo K.K. (Japan, 20% in total)
Southern Acids (M)	Local	Various, principally Southern Palm Industries (31%) and Pilgrims Fund Board (13%)

Source: Malaysian Oleochemical Manufacturers Group.

In contrast, retailers are not actively involved in coordination and production aspects of global palm oil value chains. This is because palm oil is used in a small quantity in a wide range of products and has low visibility to most consumers for a long time. Palm oil rarely appears as a final consumer product in most markets, except in some developing countries where palm oil is a common edible fat in daily home use. Due to intensified campaigns against palm oil, retailers' reputational risk of being associated with products containing palm oil has increased. But retailers source a huge number of product lines and lack specialist knowledge of palm oil products and processes to coordinate upgrading effectively.

Interviews with firms suggest that two reasons may explain why most plantation firms opted out of vertical integration despite its potential benefits. *First*, firm-level upgrading presupposes the presence of entrepreneurial drive and strategic intent, which is not always the case. Many plantation firms remained reluctant to adopt more sophisticated business models, which require new capabilities and higher risk exposure.

Second, a more consolidated industry structure further downstream has narrowed the window for vertical integration for other plantation firms. Refining margins were high through the 1980s due to price distortions created by policies. Intense competition due to the rise of the integrated firms led to feedstock shortage and overcapacity, resulting in a collapse in refining margins. On a per tonne basis, gross profits are the highest in the upstream segment, the lowest midstream, and moderately high downstream (
Table 2.9). Given the margin differentials across the value chain, plantation firms see no incentive to venture into refining, which is a crucial first step for vertical integration. This is further complicated by the high investment and technical requirements for higher-margin products further downstream.

Table 2.9. Estimates of gross profit margins for selected palm oil products, 2014.

MYR per tonne	FFB (Plantation)*	CPO (Local delivered) (Milling)	RBD PO (FOB) (Refining)	Fatty Acids (FOB) (Manufacturing)	Cocoa Butter Equivalents (FOB) (Manufacturing)
Price	480	2,384	2,502	3,877	6,722
Gross margin	240–432	238–358	50–75	310–582	672–1,070
Gross margin (%)	50–90%	10–15%	2–3%	8–15%	10–16%

* Assumes 20% oil extraction rate.

Source: Interviews.

Historically, the integrated firms were in a better position to pursue vertical integration. Even before vertical integration, these were local lead firms which had a first-mover advantage in upstream production and were already in possession of some of the largest and oldest oil palm plantations in the country. This advantage manifests in many forms. For one, it provides the firms with ample internal feedstock, which makes production planning easier. Internal feedstock proves useful for mitigating supply risk, improving quality assurance, and reducing the need to compete for raw materials on the open market.

Given linkage development in the processing industries, the palm oil sector requires more inputs and skills that are supplied locally. This offers opportunities for development of domestic capabilities for future upgrading. The immediate prospects for firm collaboration and learning, however, are not distributed evenly among local firms. They tend to favour larger firms. To the extent that economies of scale are obtainable, foreign firms often seek out low-cost producers and processors, which typically have large-scale operations and are in position to ensure continuous, large-volume supply. For the foreign firms, working with a small number of large suppliers lowers the costs for coordination as well as ensuring consistent quality (Humphrey & Memedovic, 2006; Reardon et al., 2009). Incidentally, the pressure from the foreign firms to meet performance standards and capability requirements has often been the greatest for local lead firms that qualified as tier-1 suppliers.

With operations dating back to as early as the turn of the 20th century, the integrated firms had extensive experience of working as tier-1 suppliers to global buyers and export markets as explained. During the establishment of the refining industry, global buyers did not provide as much active technical or financial support for vertical integration as they did later on with the development of the oleochemicals industry. Nonetheless, the foreign linkages were useful network and knowledge resources for identification and assimilation of new technology, which were mostly embodied capital goods originating from the advanced economies.

The foreign linkages also stimulated local lead firms' adoption of international quality standards and practices as well as imitation of foreign lead firms' management and marketing techniques and strategies (much of this was unintended knowledge leakage rather than active knowledge transfer). Employment of skilled and managerial workforce, both local and expatriate, further enhanced competitiveness and innovativeness at local lead firms.

Internationalisation

For the integrated firms (except United Plantations), vertical integration led to cross-border horizontal integration once again, this time in the midstream and downstream segments. Given that these segments are mostly located in industrialised economies, this wave of cross-border horizontal integration was characterised by mergers and acquisitions, joint ventures and greenfield investments beyond developing countries. As Indonesia overtook Malaysia as the leading producer of palm oil, internationalisation strategy became important for maintaining growth momentum of Malaysians firms which were driven by four motives: resource seeking, market seeking, efficiency seeking, and strategic asset or capability seeking (Md Nor, 2012).

Resource-seeking motives arise from the need to invest abroad to acquire specific resources at a lower cost than could be obtained or inadequate in the home country to support industrialisation. These usually include physical resources such as minerals, raw materials and land in the case of resource-intensive industries, as well as supplies of low-cost labour in the case of manufacturing of labour-intensive intermediate or final products. Firms also invest in a particular country or region to supply goods and services to the adjacent markets, either to protect existing markets or to exploit new markets. In addition, internationalisation allows firms to benefit from economies of scale and scope and risk diversification from the common governance of their activities, thus providing for efficiency gains. Strategic asset-seeking motives lead firms to acquire the assets of foreign corporations as a way to enhance their international competitiveness (Dunning & Lundan, 2008).

The investment development path theory, which states that the extent and nature of outward direct investment (ODI) changes with increasing economic development, explains how the different motives come into play (Dunning & Lundan, 2008; Dunning & Narula, 1996). The early forms of internationalisation of business and overseas direct investment (ODI) are usually inspired by resource-seeking motives motivated by the search for raw materials and primary products. This pattern follows the previous resource-based investments of the UK, Europe, the US and more recently Japan to drive domestic industrial development. The investments tend to be limited to specific locations with short physical distance, and a particular type of activity

initially. As countries develop, their ODI evolves towards more complex forms of investments associated with expanding geographic distribution, in order to serve the complex motives.

Since the 2000s, the integrated firms have followed their strategies of moving further downstream. This coincided with a time when European firms began to intensify disposal of oleochemicals and processing assets having gradually lost their competitiveness to Malaysian firms. As part of Unilever's rationalisation exercise to divest non-core business in 2002, it sold Unimills BV in the Netherlands (then the second largest refinery in Europe specialising in margarine) to Golden Hope, which was later merged with Sime Darby. A year later, IOI Corporation acquired Unilever's oils and fats division, Loders Croklaan BV, a leading specialty fats manufacturer with facilities in the Netherlands, the US, Canada and Egypt, for US$220 million. It remains the largest strategic asset acquisition by a Malaysian palm oil firm to date (Md Nor, 2012). In 2006, Kuala Lumpur Kepong acquired Dr W Kolb Holding, a specialty fats manufacturer based in Germany for US$107 million. In recent years, Kuala Lumpur Kepong has also been acquiring various oleochemicals assets from Croda, a British specialty chemicals firm.

Md Nor (2012) estimates that the integrated firms collectively spent more than US$600 million to acquire foreign assets between 1994 and 2010, of which almost 95% was spent in developed countries. The five firms have since established themselves as homegrown TNCs with substantial international sales, assets and vertically integrated operations across multiple countries (Table 2.10), unlike their peers with regionalised operations only in plantation business.

Table 2.10. Transnational operations of integrated firms.

Firm	*Transnational presence*
Felda	Operations in 13 countries. Estates in Malaysia and Indonesia. 71 mills, 5 crushing plants, 7 refineries, 4 bulk installations and 1 oleochemical plant (through JV) in Malaysia. 8 refining and processing facilities (mostly through JB) in China, Pakistan, Indonesia, Thailand, Turkey,US and Canada. Distribution and sales offices in the Philippines, Cambodia, Myanmar, France and Spain.
Sime Darby	Operations in 20 countries. Over 200 estates in Malaysia, Indonesia, Liberia, Papua New Guinea and Solomon Islands. Refineries and marketing offices in Malaysia, Indonesia, Singapore, Thailand, Vietnam, China, South Africa, Germany, Netherlands, US, India, UK, Brazil, South Korea, Japan, and Solomon Islands.
Wilmar International	Operations in over 50 countries. Estates in Indonesia, Malaysia and Africa.

	210 refineries and manufacturing plants (oleochemicals, specialty fats and biodiesel) in Indonesia, Malaysia, India, China, Bangladesh, Vietnam, Europe, Russia, Ukraine, Africa and others. Distribution offices in over 50 countries.
Kuala Lumpur Kepong	Estates in Malaysia, Indonesia and Liberia. Refineries and manufacturing facilities (oleochemicals) in Malaysia, China and Europe.
IOI Corporation	Operations in 14 countries. 90 estates and 15 mills in Malaysia and Indonesia. 11 manufacturing (oleochemicals and specialty oils and fats) facilities in US, Canada, Netherlands, China and Malaysia. Regional sales and procurement office in the US, Brazil, the Netherlands, Italy, Poland, Russia, Ireland, Egypt, Ghana, Burkina Faso, Indonesia, China and Malaysia.

Source: Annual reports.

Felda is the least internationalised and vertically integrated among the five firms, going by its portion of palm-based revenue derived from non-upstream segments, foreign revenue and foreign assets. In recent years, it has been playing catch up with its peers. One major move made by Felda was to acquire a 37% stake in Indonesia's PT Eagle High Plantations Tbk, a subsidiary of the Rajawali Group. The US$500 million acquisition gives Felda access to more than 320,000 hectares of plantation landbank in Indonesia (New Straits Times, 2016). The acquisition is possibly more for seeking resources than strategic assets or capability. However, Felda has been making efforts in that direction starting with asset purchase from Twin River Technologies, a US-based specialty fats and products manufacturer, in 2007.

Size growth for the integrated firms through vertical integration and internationalisation also reflects the 'cascade effects' in global business (Nolan et al., 2008). As northern lead firms pursued mergers in their core businesses and de-mergers in their non-core businesses, consolidation and concentration became a norm in a wide range of industries since the 1980s (Nolan, 2001). Agribusiness industries have been among the most takeover-intensive industries; the aggregate value of global food industry M&As for example doubled to over US$200 billion in 2007 from 2005 (Dicken, 2011). In the process, intense pressures developed for local lead firms (tier-1 suppliers) to northern lead firms to merge as well as acquire and develop leading global positions. The pressure of consolidation, in turn, may well be transmitted to their tier-2 supplier networks and beyond. Concentration has indeed increased at multiple points in agro-commodity value chains, including in the case of the Malaysian palm oil.

Overall, the Malaysian palm oil sector experienced linkage development (though more forward than backward). The country is now present within midstream and downstream segments of the global palm oil value chain in which it previously had little or no presence (Figure 2.3). The

representation is through a number of SMEs specialising in different segments across the value chain, and a handful of local lead firms that are vertically integrated.

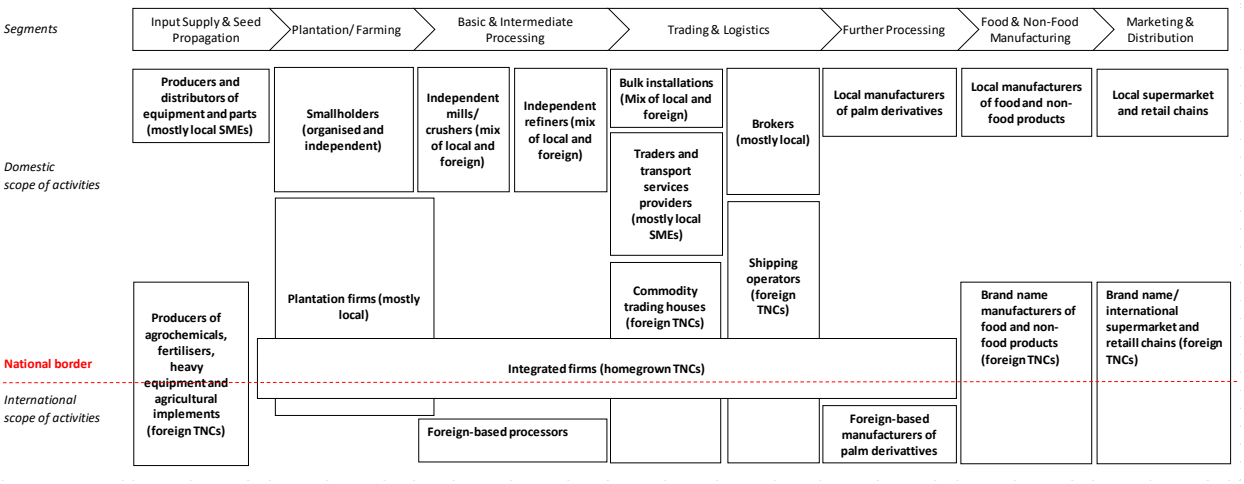

Figure 2.3. Malaysia within global palm oil value chains.

2.6 Conclusion

From a concentration on oil palm cultivation, Malaysia's palm oil value chain developed strong linkages into downstream manufacturing of various processed products and oleochemicals (for use in production of food and non-food consumer goods), R&D, and marketing and trading; and moderate linkages into input supplies (mostly seeds). Downstream activities became key industries with strong backward and forward linkages, and contributed to growth in manufacturing value added, industrialisation, and foreign exchange earnings. The drive for linkage development could be explained by 'additive' production processes which are prone to processing losses and difficult to execute in parallel; the quest for higher value added and less price volatility; and eco-historical settings in which countries' are already 'specialised' primary producers but further expansion is limited by available of land and water. Sectoral linkage development accelerated when it converged with vertical integration at local lead firms with substantial upstream assets, which assumed more functions along the value chain. Cross-border horizontal integration (upstream business in developing countries, downstream in industrialised economies) was pursued concurrently in search of resources, markets, efficiency gains and strategic assets. The local lead firms have since become home-grown TNCs in their own right.

This essay has demonstrated that upgrading in agro-commodity GVCs will require linkage development at the sectoral level and possibly vertical integration at some firms. The logic is

likely to be just as applicable to value chains for mineral or hard commodities which share 'additive' production characteristics and similar sectoral and price dynamics. The principal implication is that vertical specialisation as the upgrading high road is less generalisable than previously thought, and must not be over-extended across value chain types. For a start, a distinction should be made between resource-based manufactured goods and non-resource-based manufactured goods. Vertical specialisation may be suited for the latter, especially where production of components and intermediate goods can be more easily divided and executed in parallel before final assembly, as seen in the case of automobiles and consumer electronics. Incidentally, even for non-resourced-based manufactured goods, fragmentation is not without limits. Firms decrease marginal costs of production through offshoring but incur higher fixed and variable costs that correspond to all the service links needed to maintain the production. There is therefore an optimal level of fragmentation; some value chains have in fact consolidated instead of expanding continuously following the global financial crisis (De Backer & Miroudot, 2012).

From this, a more sober approach to vertical specialisation is needed in policy and research on GVCs. There is likely little disagreement over the broad importance of policy measures such as the development of transportation infrastructure for trade facilitation, or investment in human capital; they are important for both scenarios of linkage development and vertical specialisation. However, significant differences exist elsewhere. The type of policy advice and technical expertise typically provided to developing countries – for instance, to continuously lower tariffs on imported inputs on the assumption that it will automatically induce manufacturing investment and help developing countries specialise and achieve scale quickly – affects allocation of financial resources and other assistance from international organisations ranging from multilateral development banks to aid agencies. At best, it does not help with the much-needed upgrading in agro-commodity value chains. At worst, it diverts resources away from tackling obstacles to upgrading in these value chains, including agricultural tariffs which are several times the level of those in manufacturing, common in industrialised economies, and distort international agricultural trade and production (Josling, 2013).

Despite the potential benefits associated with linkage development, very few resource-rich developing countries have successfully made the transition to more linkage development and greater processing (Hausmann et al., 2008). Further research will be needed to identify the type and nature of internal and external barriers (technological, economic, policy, market) that explain this phenomenon, and how international organisations can help developing countries, especially the LDCs, to overcome the barriers.

3 The Role of Ownership and Firm Innovation in Resource-Based Industrialisation: The Malaysian Experience

3.1 Introduction

Industrial activities have a critical role in economic growth.[25] The importance of manufacturing, particularly at relatively low income per capita levels, has been established in the work of (Kaldor, 1966, 1967). However, countries seldom leapfrog into manufacturing. With a chequered track record, resource-based industrialisation (RBI) is accepted as a viable albeit difficult industrial strategy. RBI is often associated with industrial policy which can mean different things but at the minimum implies government intervention or 'non-neutrality' in the economy that affects industry (Naudé, 2010). Most countries have *de facto* industrial policy and will continue to do so; even in the US, the state has been extremely proactive in developing and commercialising new technologies from the Internet to Apple products (Mazzucato, 2014; Peres & Primi, 2009).

Industrial policy is thus not a question of if, but how. This essay (Essay 2) examines the evolution of Malaysian industrial policy for the country's palm oil sector through three broad stages of development. It aims to distil practical considerations for improving policy efficacy and minimising the policy learning costs and risks in RBI. The key policy measures, in the form of either market-based intervention or public inputs for factor and product markets, as well as their notable outcomes during each stage of development are identified. From this, the essay highlights two critical factors which arguably enabled RBI in Malaysia's palm oil sector and continue to shape its present-day development. Local firms played an equally, if not more, important role as foreign firms; while public action in research and development led to swift diffusion of technology and knowledge. Further interpretation and analysis of the evidence brings to the fore the nationality of firm ownership and the sources of indigenous innovation efforts as issues that warrant more explicit attention in policy-making.

The essay is organised as follows. Section 3.2 situates the research within a theoretical framework that connects RBI and industrial policy through their common focus on increasing linkage effects and technology intensity for higher productivity and value added. Section 3.3 explains the methods and data, as well as the taxonomy of industrial policy for analysing the

[25] Following the general practice in the economics literature, the term industry refers to manufacturing while 'industrial' is taken to denote 'manufacturing-related'.

policy measures in the Malaysian palm oil sector. Section 3.4 maps the key measures and analyses their outcomes. Section 3.5 examines the role of firm ownership in the Malaysian experience, and revisits the theoretical reasoning which appropriately attached much importance to this issue but is largely ignored these days. Section 3.6 traces indigenous innovation efforts to public action and offers some insights into its usefulness for driving RBI historically and its inadequacies during the later stage of RBI. The final section summarises the main findings and discusses their implications.

3.2 Industrialisation and Intervention

Industries are important due to higher productivity (in terms of output per worker) in manufacturing than in agriculture or services, superior technical change and learning effects, and greater scope for specialisation and externalities (Thirlwall, 2015; Weiss & Jalilian, 2016). The case for industrial development is further reinforced by some stylised facts: rapidly growing countries since the Second World War (the European periphery from the 1950s, and East Asia since the 1960s) are those with large manufacturing industries; and growth accelerations are associated with structural changes in the direction of manufacturing (Rodrik, 2007).

A misreading of these facts has often inadvertently led to dismissal of natural and agricultural resources as unimportant or worse, a curse for growth. One reason the contribution of mining and agriculture to the economy is understated is that their value added is only considered in relation to production of crops and livestock and extraction of minerals. All forms of off-farm and off-site processing and further value adding, as is the production of inputs and equipment, are captured in the manufacturing sector. However, once the interdependence and linkages between economic sectors are fully considered, a country's resources can be "augmented through material growth (in the sense of machinery and industry) and intellectual capital (skills, learning and knowledge accumulation)" (Sampath, 2014). It usually involves processing and beneficiation of natural and agricultural resources (Auty, 1986). RBI can therefore be understood as a strategy to establish industrial activities within and from the primary commodity sector, in order to improve productivity and value added in the economy.

Industrial strategy is typically differentiated by market orientation. The inward-looking import substitution industrialisation (ISI) seeks to produce imported goods through protection of domestic markets and strong public sector involvement (in infrastructure investment and export promotion). In the outward-looking export-oriented industrialisation (EOI), firms and governments promote exports and production of goods that are demanded in international markets. However, Nixson (2005, 2016) argues a rigid dichotomy presents a false conflict

between ISI and EOI. While the transition from ISI to EOI is most difficult, some economies historically successfully used the capabilities gained during the ISI period to develop export capabilities.[26]

Another way to conceptualise an industrial strategy is to simply consider what countries can produce, and what it takes for them to make a breakthrough into international production and trade. Broadly, there are four product categories of manufactures, with different potential for technology diffusion (ranging from widely available and/or easily absorbed on an end, to internal or proprietary to transnational corporations or TNCs and/or difficult to absorb on the other end) and factor intensities (natural resources, labour, capital and skills) (Athukorala, 1998; Helleiner, 1973, 1995).

Category 1 is resource-based manufacturing which involves further local processing of materials previously exported in raw state. Local raw materials (natural and agricultural resources) usually make up the bulk of value of processed materials. The technology is often widely diffused and accessible. Category 2 is light consumer goods such as clothing, toys, shoes and foodstuff. The technology used is extremely widely diffused and available, and has intensive use of low-skilled labour. Category 3 is production and assembly of components and intermediate goods within vertically tightly coordinated production systems. The technology used is mostly proprietary and internal to TNCs but has intensive use of low-skilled labour. Category 4 is technologically advanced, differentiated final products such as motor vehicles, radios, televisions, computers and phones. Technology for these goods originates almost exclusively from advanced economies. When setting up production facilities, firms consider labour cost to be less important than availability of high-quality operator and technical skills (Athukorala, 1998).

Light manufactured goods (Category 2) and low- to medium-technology component production and assembly (Category 3) were the most promising areas when present-day newly industrialised economies pursued EOI in the 1960s. As production activities became fragmented, the labour-intensive activities were shifted to low-wage locations to the extent that these activities could be separated from other stages of production (Krugman, 1995). Both categories are generally more import intensive (especially in Category 3). The use of local inputs is extremely limited because substitution of inputs with locally produced inputs of

[26] Furthermore, the shift away from ISI was not always an autonomous policy choice in response to the ‘failures’ of ISI, but was imposed as part macroeconomic and industrial restructuring requirements under structural adjustment programmes. These reforms – by reducing inflation, liberalising trade, privatising state-owned companies, and deregulating markets – ended ISI policies in Latin America, Eastern Europe and Sub-Saharan Africa (Noorbakhsh & Paloni, 1999).

secondary quality may lead to significant market losses, and corrective costs for defects are prohibitive (Keesing & Lall, 1992).[27]

With oil windfalls derived from high commodity prices in the 1970s, many resource-abundant developing countries pursued RBI (Category 2) more actively for domestic physical and human capital accumulation (Stauffer, 1988). Potential benefits include economic diversification into manufacturing, reducing dependence on primary commodities, and capturing a higher share of value added from production to raise export revenues (Radetzki, 1977; Roemer, 1979; Auty, 1986, 2001). Yeats (1991) analyses 48 commodities for the 1965-1987 period and finds that processed goods have greater price stability than their primary equivalent in two-thirds of the cases, with long-term price increases detected in half the cases.

Early RBI efforts have produced mixed results (Jomo & Rock, 1998; Auty, 1986; Morris et al., 2012; Paz, 2014; Wall, 1987). Three problems were common: overambitious strategy design, inefficient implementation, and inadequate markets. Many RBI projects came under strain during commodity price downswings as fixed capital charges for new projects could not be met. Some favoured scale economies as rapidly as possible but output surplus could not be absorbed domestically and internationally. Resource rents were sometimes consumed rather than reinvested in productivity enhancing investments (Walker, 2001).

Success with RBI is positively correlated to a country's size (in population, GDP or area terms) and bargaining power. Large countries have more opportunity for procuring local content, are able to absorb a significant portion of new production, and have greater leverage on TNCs in technical, financial and marketing negotiations (Auty, 1986). Additionally, the economic impact of resource processing projects will be muted in a large economy, lessening inflationary ripple effects from resource-based sectors to non-resource-based ones. Citing Bostwana's joint venture with De Beers' for global supply of rough diamonds, Kaplan (2016) posits that to the extent that a country has a near monopoly over a resource that cannot be obtained elsewhere, it will have considerable bargaining power as to further usage of that resource.

Notwithstanding the advantages that come with natural endowments, their realisation depends on each country's choice on how to capitalise on them. Exploitation of resources and geographical conditions inevitably concerns industrial policy. Critics argue that government

[27] Limits to the use of local inputs (even if they meet quality requirements) can also be due to the nature of global strategies of TNCs and international buying groups. The input structure and specifications of production are usually determined by such lead firms, and they may insist on specific sources of inputs.

failure is just as prevalent as market failure because government does not possess perfect information to make good decisions. Government intervention may also create rents that lead to rent-seeking, corruption and investment decisions that distort efficient allocation of resources. To its proponents, industrial policy is justified when activities or sectors have large opportunities for productivity-enhancing collective action and competitiveness on world markets (See, for, example, (Chang, 1996, 2011, 1999; Stiglitz et al., 2013; Cimoli et al., 2009; Hausmann & Rodrik, 2003; Rodrik, 2004, 2008; Harrison & Rodríguez-Clare, 2009). Based on the logic of "wrong prices, right direction", future benefits will exceed the present costs of protection or distortion (Amsden, 1989; Amsden & Chu, 2003).

To be sure, the private sector is the main economic actor and structural change occurs largely through firm actions in market conditions. However, it is not helpful to stress either the state or the market to the exclusion of the other (Nolan, 1993, 1995; Chan & Clark, 1994). While the state cannot create and sustain industrial productivity and economic competitiveness by fiat, it can play a role to "try to anticipate structural change, facilitating it by removing obstacles and correcting for market failures" (Syrquin, 2008). Counterfactuals and difficulties in isolating specific interventions of interest introduce ambiguity in empirical tests of the impact of industrial policy, but the fact that South Korea and Taiwan had an active policy and grew rapidly suggests an association (Weiss, 2016). More recently, studies have focused on the features and content of 'functional' industrial policy (Evans, 1995; Rodrik, 2004; Hausmann & Rodrik, 2006).

3.3 Methods and Data

Case studies have long been used in a variety of disciplines for detailed contextual analysis of real-life phenomenon or events and conditions and their relationships (Yin, 2009). This essay presents evidence about the relevance and 'content' of industrial policy in Malaysia's palm oil sector in several ways that differentiate it from previous studies. First, much research on public interventions in Malaysia's palm oil sector has covered the period from the 1960s through the 1980s (Pletcher, 1990; Lall, 1995; Gopal, 2001; Jomo et al., 2003; Rasiah, 2006). The essay includes the more recent phase through the 2010s to provide an up-to-date analysis. Second, such endeavour will benefit from an analytical framework grounded in a systematic taxonomy of policy measures, which are linked to stages of development to account for change in policy measures.

Notwithstanding a lack of consensus over what counts as industrial policy and what does not, efforts have been made to classify and conceptualise industrial policy, for example by policy domain or by level of sector specificity (non-targeted/ horizontal and targeted/ vertical) (Pack &

Saggi, 2006; Peres & Primi, 2009; Warwick, 2013). Two issues arise from this. One, without some kind of delimitation, industrial policy analysis potentially includes everything from monetary to environmental policy. Furthermore, even policies that are ostensibly 'purely' horizontal may have non-neutral effects (Warwick, 2013). As such, this essay adopts a narrower definition of industrial policy by Weiss (2015) as initiatives which have a direct impact on manufacturing and which fall under the bureaucratic purview of ministries of industry and sector. Guided by the definition, Weiss' taxonomy distinguishes policy measures by market areas for intervention (product versus factor markets) and policy mechanisms (market- versus non-market-based means) (Table 3.1).

Table 3.1. Taxonomy of industrial policy

Areas in which incentives are shifted and support is provided	*Means through which incentives are shifted and support is provided*
1. Product market	1. Market-based interventions
2. Capital market	- Operate through pricing links
3. Land market	- Impact costs, prices and taxes
4. Labour market	- E.g. subsidies, taxes, import tariffs
5. Technology	2. Public inputs and non-market-based interventions
	- Goods or services which firms cannot provide or secure adequately
	- Usually cannot be marketed or involve significant external benefits
	- E.g. R&D, training, procurement policy, national champions, nationalisation

Source: Based on Weiss (2015).

Interviews were the main method for data collection. A total of 25 semi-structured, face-to-face interviews were conducted with senior-level firm executives (12), government officials (7) and analysts and industry group officials (6). The interviews took place between March and August 2015. Industry-level data was sourced from official publications produced by, among others, the Malaysian Palm Oil Board (MPOB), Malaysian Industrial Development Authority (MIDA), Ministry of International Trade and Industry (MITI), and Department of Statistics Malaysia (DOSM). Firm-level data was extracted from *Palm Oil Directory* and *Malaysia Agribusiness Directory*. These are business directories for trade purposes, with basic company information such as address, line of business, product offerings, and contact details. Other data sources include annual reports for 2014 and 2015, government reports, and academic publications.

3.4 Industrial Policy in Three Stages

Early development of Malaysia's palm oil sector is well documented (See, for example, (Martin, 2003, 2006; Yaacob, 2011; Corley & Tinker, 2016; Henson, 2012). The World Economic

Forum's Global Competitiveness Index since 2007 has adapted (Porter, 1990) theory of competitive advantage and stages of development. In the factor-driven stage, countries compete based on their factor endowments – primarily unskilled labour and natural resources. In the investment-driven stage, efficiency in producing standard products and services becomes the dominant source of competitive advantage. Economies concentrate on manufacturing and on outsourced service exports. In the innovation-driven stage, countries can produce innovative products and services at the global technology frontier using the most advanced methods. Firms based in these economies compete using unique strategies that are global in scope, and invest strongly in advanced skills, technology and innovative capacity (Schwab et al., 2006).

Malaysia's palm oil sector underwent the factor-driven stage from the early 1960s through mid-1970s. This period was characterised by a rapid increase in oil palm cultivation by making use of abundant land (either new or existing agricultural land grown with other crops) and unskilled labour (mainly peasant farmers organised into smallholder schemes). The investment-driven stage from the late 1970s through mid-2000s saw rapid linkage development into new areas of manufacturing and services. Scale expansion and efficiency drive allowed major improvements in productivity, while internationalisation of operations was sought. The ongoing transition to the innovation-driven phase started from mid-2000s onward.

Factor-Driven Stage, Early 1960s through Mid-1970s

During this stage, industrial policy was targeted at increasing oil palm cultivation, a labour- and land-intensive activity (Table 3.2). Public inputs in land and capital markets and technology were channelled through Felda and other government schemes with funding from the World Bank. Felda settlers numbered 11,577 in 1967 and grew to reach 106,510, located mostly in Peninsular Malaysia, by 1987 (Lee & Bahrin, 2006). Typically, each settler's household was allocated a 4-hectare plot of land and received the land title over time under a loan repayment scheme. A package approach was taken in which settlers were provided with skill training and technical assistance through agricultural extension services, in addition to housing, complementary facilities and social services (Khor et al., 2015).

Table 3.2. Selected policy measures during the factor-driven stage.

Period	*1960s*	*1970s*
	Market-Based Interventions	
Product Market	Refiners given 'pioneer status' and corporate tax exemptions on profits Exporters of processed PO and PKO given tax reliefs on income Export duty on all palm oil exports, with exemption for processed PO exports	Graduated export duty, export surcharge and windfall based on CPO prices for price stabilisation Differentiated rates of export duty exemptions for processed PO based on degree of processing Tax reliefs for further downstream processing (instead of basic refining) Tax reliefs for export insurance premiums and marketing expenses abroad (advertising, market research, offices and warehouses)
Capital Market		Loan guarantees and preferential rates for investments in PO processing at commercial and development banks
	Public Inputs	
Product Market		Export credit financing with preferential rates for shipments of PO Export credit insurance for exporters Financial and technical assistance for smallholders to switch crops
Land Market	Provision of unused land for peasant farmers under state smallholder schemes	Acquisition of foreign interests in plantation
Capital Market		Upgrading/ construction of ports and bulk installations to handle processed PO exports Investments in transport networks from mills and refineries to bulk installations
Labour Market	Training and social services for peasant farmers	Specialised education institutes to produce agro-industrial engineers and agribusiness graduates
Technology	Agricultural extension for peasant farmers Agricultural research focusing on breed selection	Ban on exports of seeds Research on agronomics and field production and processing technologies Introduction of standards for indigenous and imported technologies

To deal with product market constraints, market-based interventions were used to increase the relative profitability of processing activities vis-à-vis trade in raw materials. The Investment Incentives Act of 1968 was the most relevant in analysing development of the palm oil refining industry in Malaysia. Under the Act, 'pioneer status' was granted to industrial activities that had not been undertaken in Malaysia but were beneficial for economic development (Gopal, 2001). Refiners that qualified for 'pioneer status' enjoyed generous tax incentives, including exemptions from corporate tax on profits (40% then) for two years and subject to extension. Firms without the 'pioneer status' could obtain tax credits ranging from 25% to 100% of capital expenditure on taxable income.

In addition, export duty was introduced for all palm oil products, but export duty exemption was granted for processed PO exports. The duty structure was later modified into a graduated

system in which duty payable gradually decreased with an increase in the number of processing stages (Gopal, 2001). The duty structure involved no government subsidy, as it made it possible for refiners and processors to make profit at the expense of crude palm oil producers (plantation firms). Loans and guarantees were also provided by development finance institutions for investments in new production facilities.

Amid a search for new export markets to absorb the palm oil products, export facilitation was done through both market-based interventions and public inputs. Exporters were given loans, export insurance and guarantees under the Export Credit Refinancing (ECR) scheme. Under the ECR scheme, exporters were offered short-term loans at below market rates for pre-shipment expenses and post-shipment credit extended to overseas buyers by commercial banks, which obtained the necessary funds from development finance institutions such as the Export-Import Bank of Malaysia (Gustafsson, 2007). Tax reliefs were also provided to firms for export insurance premiums and marketing expenses incurred abroad for advertising, market research, warehousing and keeping offices.

In anticipation of skills needed for agricultural modernisation and RBI, the College of Agriculture Malaysia was merged with the Faculty of Agriculture, University of Malaya (both were established during the British colonial era) to form the Agriculture University of Malaysia or UPM. The purpose was to produce graduates in the areas of agricultural sciences and economics, agro-industrial engineering, and agribusiness management. On the R&D front, the Department of Agriculture (DOA), together with the Oil Palm Genetics Laboratory (OPGL) formed by private plantation firms, formed an exchange programme in plant breeding with West African economies from which the commercial oil palm originated. Much was this was built on British Malayan agricultural policies and institutions that were originally intended for rubber plantings.

Investment-Driven Stage, Late 1970s through Mid-2000s

The investment-driven phase started since the late 1970s with increased capital investments in refining and manufacturing of higher value added products using crude palm oil. Building on existing activities in oil palm cultivation, IP measures focused on acquisition, mastery and diffusion of technologies available on global markets (Table 3.3). Various investment incentives and export duty structure attracted mostly local firms with manufacturing and trading background to venture into palm oil refining.

Table 3.3. Selected policy measures during the investment-driven stage.

Period	*1980s*	*1990s*	*2000s*
		Market-Based Interventions	
Product Market	Export duty for crude and semi-processed PKO, with exemption for fully refined and fractionated PKO products Export duty raised on crude palm stearin to tackle 'cocktailing' Tax reliefs for branding and marketing	Tax reliefs and special funds to invest overseas in sectors that were no longer domestically competitive (oil palm plantation was identified as one)	Abolition of export duties on processed PO products to encourage competition Duty-free CPO export quota for large Malaysian firms with refineries overseas Replanting schemes for independent smallholders
Capital Market	Tax reliefs for construction/ expansion of physical storage and production facilities	Tax reliefs and industrial adjustment fund for refineries in need of restructuring Tax reliefs for relocating facilities with eligible production technologies and expertise to Malaysia	
Labour Market	Tax reliefs for training expenses		
Technology	Tax reliefs for R&D expenses (including R&D facility construction/ expansion) Technology transfer for commercialisation		
		Public Inputs	
Product Market	Licensing of palm oil-related activities Specification/ enforcement of quality standards Collection and dissemination of industry statistics and market information Commodity futures for hedging and price discovery International promotion to counter anti-palm oil campaign (trade fairs, media)	Credit facility for developing countries to buy palm oil from Malaysian exporters Barter trade using palm oil as payment for goods and services Corporatisation of management at state smallholder schemes Rationalisation of industry representation and government entities for palm oil	Industry-level dialogues for users' feedback and assistance in palm oil applications through overseas offices Certification systems as an alternative to RSPO Rationalisation of state-owned interests in palm oil industry Biodiesel blending mandate for product development and stock management Assistance to organise independent smallholders' cooperatives
Land Market	Land for building and expanding export infrastructure	Bilateral negotiation with Indonesia to facilitate land acquisition	
Capital Market	Allowing 100% foreign ownership in manufacturing (with conditions)		Rural infrastructure investments in East Malaysia to facilitate palm oil industrial cluster development Discounted equipment for smallholders
Labour Market	Easing entry of migrant workers		Training for independent smallholders to meet requirements under certification systems
Technology	Research on nutrition, product development and international marketing		Research on tools for mechanisation and precision agriculture

Price distortions led to overcapacity in the palm oil refining segment. Throughout the 1980s, generous incentives were withdrawn and industrial adjustment funds were provided for rationalisation in the segment. Market-based interventions began to target oleochemicals. The main feedstock for oleochemicals is crude palm kernel oil (which is extracted from the kernel as opposed to crude palm oil which is milled from the flesh). An export duty for crude and semi-processed palm kernel oil was introduced. Exemptions were accorded to fully refined and fractionated palm kernel oil products (oleochemicals), akin to the preferential treatment granted to processed palm oil earlier.

Compared with palm oil refining, the technology for oleochemicals production was not as readily available on the markets, and marketing experience for the products was more limited among local firms. At the same time, Malaysia recorded massive current account and fiscal deficits as a result of commodity shocks and huge public expenditure in development of heavy industries. To attract FDI, the manufacturing licensing regime in Malaysia shifted to a more liberalised investment environment. The increased emphasis was on industrial development and economic growth, instead of inter-ethnic redistribution (Lee, 2007). The Investment Coordination Act of 1975, enacted originally to increase *Bumiputera* involvement at the enterprise level, was amended to ease restrictions on foreign ownership, equity requirements and employment of expatriates. The Promotion of Investment Act of 1986 further strengthened incentives to foreign investors. Tax reliefs were provided for expenses incurred in a number of areas, including marketing, construction and expansion of eligible production facilities, training and R&D.

Public inputs during this period focused on functioning of product markets and R&D. Through licensing and regulation of all activities in the palm oil sector, PORLA collects vital industry statistics and market information on production, stock, prices and trade. The various statistics and information are disseminated on a daily, quarterly and annual basis to monitor industry performance and to help producers make decisions. PORLA also specifies and enforces product standards for quality control. Enforcement is conducted through regular inspection, spot checks, routine sampling and testing at the point of export. Meanwhile, PORIM was made the principal R&D agency for undertaking research in a variety of areas. Initially, it focused on agronomics, mainly in the areas of improving the quality of planting and breeding materials. For instance, traditional palms grew too tall and made harvesting difficult. PORIM developed a dwarf oil palm breed (PS1) with slower height increment and longer economic lifespan. To date, PORIM has developed a total of 13 breed varieties, with different characteristics such as higher unsaturated oil content (PS2), higher kernel content (PS3), thinner shell (thus more flesh for higher oil content) (PS5), larger fruits (PS6), higher vitamin E content (PS8) and longer stalk

(PS10) (MPOB, 2010a). These breeds were adopted by and leased to plantation firms for seed production.

PORIM expanded its research into new areas such as field production techniques, chemistry of extraction, processing technologies, end-use of oil, development of new products and uses from various parts of oil palm including the biomass from processing (most notably biodiesel). During the 1980s, when palm and coconut oils emerged to threaten the dominance of soybean oil in international markets, the American soybean industry launched campaigns against the so-called 'unhealthy tropical grease' and lobbied for legislation against imports (Nordin et al., 2010). PORIM, together with local and foreign research institutes, increased its research on the nutritional aspects of palm oil, and has released much scientific evidence that palm oil is a satisfactory dietary source of fats. MPOC was soon established to promote palm oil internationally through means such as trade fairs, marketing events and industry publications. It now has regional offices in major oils and fats markets such as the US, Europe (Belgium), Pakistan, India and China where industry engagement events are held to gather industry feedback, promote business networking and assist in palm oil application.

One important development was the establishment of the Kuala Lumpur Commodity Exchange (now Malaysia Derivatives Exchange) in 1980. Since the 1950s, raw palm oil was sold through a pooling arrangement (the Malayan Palm Oil Pool) that was managed by the London-based Joint Selling Committee. The committee was controlled by large plantation firms owned by British interest and was responsible for quoting prices and approving sales for all contracts. This presented difficulty for crude palm oil producers who wanted to venture into refining as they had to sell and buy back their palm oil from the pool, before they could use it as raw materials for processing (Martin, 2006). A founding member of the pool (United Plantations) eventually exercised its right to dissolve the pool to facilitate its establishment of refineries in Malaysia for supplying to Asian markets. With the dissolution of the pool, the centre of sales negotiations began to shift to Kuala Lumpur (ibid). Commodity futures for palm oil, rubber and tin were introduced for hedging, competitive trading, and better pricing of commodities produced in the country. The Crude Palm Oil Futures (FCPO) has since become the global price benchmark for the palm oil sector (the other futures ceased trading due to lack of industry interest).

As local labour entered the emerging manufacturing and services sectors and urbanisation accelerated, labour shortages in rural plantations were resolved with increased imports of migrant workers since the early 1980s. By 1984, the Ministry of Human Resources estimated that above 500,000 migrant workers, mostly in plantations and construction, were present in the

national labour force of 5.9 million. The policy continued well into the 1990s, with more migrant labour being used to meet general labour shortages in manufacturing and services sectors.

From the 1990s, measures were taken to encourage state- and private-owned firms to venture abroad, especially to neighbouring developing countries (Carney & Dieleman, 2011; Goh & Wong, 2011). This was to foster the creation of successful Malaysian multinationals or 'national champions' that could occupy strategic positions within regional and global production networks (Goh & Wong, 2011). Tax reliefs and special funds were provided to assist firms invest overseas in industries that were longer domestically competitive (oil palm plantation was identified was one such industry). This included a tax abatement on income earned abroad and a tax deduction for 'pre-operating expenses' (Carney & Dieleman, 2011; Rasiah et al., 2010; Zin, 1999).

For the palm oil sector, internationalisation of plantations was not facilitated through market-based interventions alone, but also through public inputs in the form of government-to-government (G2G) arrangements due to the unprecedented size of land that was involved (Varkkey, 2016). The government introduced an explicit policy to promote outward FDI and had negotiated investment guarantees with 64 countries in the 1990s (Rasiah et al., 2010). For example, as part of an Indonesian-Malaysian bilateral investment treaty in 1997, the Indonesian government pledged to specially allocate 1.5 million hectares of land to Malaysian developers for oil palm development (Casson, 2002). Investments abroad were not limited to plantations. Some of the largest plantation firms which had established domestic presence in processed and manufactured palm oil products also began to invest abroad (especially Europe, China and India) in the midstream and downstream segments. In addition to tax reliefs extended to firms investing abroad, further tax reliefs were introduced to encourage firms that have invested abroad to relocate some of high-tech production facilities and technologies to Malaysia.

Export facilitation in the 1990s also saw increased state involvement through bilateral payment arrangements (BPAs). BPAs promote trade by minimising foreign exchange reserve constraints and converting trade-related commercial risk into sovereign risk, with central banks or monetary authorities guaranteeing payments in domestic currencies to their respective exporters. One key BPA was the Palm Oil Credit & Payment Arrangement (POCPA), which provides a two-year credit facility for countries to buy palm oil from Malaysian exporters. It has been extensively used since its inception in 1992; an estimated 5% of Malaysia's palm oil exports fell under POCPA in 2000 (Gustafsson, 2007). Malaysia also pursued barter trade at the highest political level with countries such as Russia, China and India, using palm oil as payment for their goods and services. The public-private coordination mechanism strengthened throughout the 1990s.

Rationalisation occurred among government agencies (merger of PORLA and PORIM into MPOB, and restructuring of MPOPC into MPOC) and industry associations (MPOA was the product of merger involving four major plantations associations then).

Since the 2000s, with a well-established refining industry, there has been relaxation of export restrictions on raw materials trade. Duty exemptions were extended to all processed palm oil products, after which the differentiated export duties were abolished altogether to encourage competition. The government also rationalised its direct economic interests in the palm oil sector by merging several of the state-owned plantation firms (Sime Darby, Guthrie and Golden Hope) into one of the world's largest plantation firms, and by restructuring its main smallholder scheme (Felda). As of 2015, the enlarged Sime Darby produces about 4% of the world's CPO output annually, operates on a land bank of 1 million hectares across 5 countries, and has midstream and downstream operations in 17 countries. Felda's assets and businesses were also restructured continuously following corporatisation of management since the 1990s, culminating in the listing of Felda Global Ventures (FGV) in 2012 on Malaysia's stock exchange. FGV now holds Felda's key processing and logistics assets.

MPOB also introduced a certification system based on codes of practices for keg segments within the palm oil sector, namely nurseries; estates and smallholdings; mills; crushers; refineries; handling, transport and storage; and bulking installations. The move can be interpreted as an attempt by public governance to regain some ground lost to emerging private governance (RSPO). Since its introduction in 2004, the private-led RSPO achieved remarkable industry acceptance within a short span of time. RSPO-certified palm oil now accounts for 18% of global palm oil. Implementing RSPO principles and criteria, however, is costly and burdensome to small firms and smallholders. MPOB's certification was to present a credible and most-effective alternative to ensure that small firms and smallholders are not excluded when the markets shift towards certified sustainable palm oil.

To address productivity gaps between organised and independent smallholders and between small firms and large-scale plantation firms, various programmes were introduced. For instance, the Sustainable Palm Oil Cluster (SPOC) programme was to organise independent smallholders into groups by region. These groups were given training by MPOB's extension officers to meet its Certification of Good Agricultural Practice (GAP) and codes of practice. Assistance was provided to help independent smallholders organise cooperatives as a means to lower production costs through bulk purchase of inputs and services. Subsidies for replanting to remove unproductive trees and discounted equipment were also provided. To reduce dependency on fossil fuels and to stabilise palm oil prices, the government announced a

mandate to blend diesel with 5% palm methyl ester (B5) for domestic consumption (gradually raised to 10%). The biodiesel technology was developed and tested by MPOB over two decades before it was transferred to private firms.

Transition to Innovation-Driven Stage, Mid-2000s Onward

Despite decades of relatively successful RBI, Malaysia appears not to have built sufficient barriers to entry. Its model could be copied with relative ease. Indonesia overtook Malaysia as the largest producer and exporter of palm oil, although it must be noted that Malaysian firms through their outward investments have been heavily involved in Indonesia's rapid ascent in global palm oil. As supplies steadily rose while demand growth slowed in the oils and fats markets (especially since 2014, prompting some to suggest the decade-long commodity boom might have come to an end), the competitiveness of Malaysian palm oil has come under immense pressure.

Since Malaysia and Indonesia are close competitors in the same market, a change in policy in one country affects the other. Understandably, Malaysia's policy stance becomes increasingly reactionary to Indonesia's actions (Table 3.4). For example, after Indonesia introduced the Indonesian Sustainable Palm Oil standards in 2011, Malaysia introduced the Malaysian Sustainable Palm Oil standards several years later. Indonesia has since October 2011 drastically widened the gap between the export taxes for CPO and PPO (similar to the move taken by Malaysia decades ago) to encourage more downstream investments and production. In response, to defend its market share, Malaysia lowered its CPO export duty in 2013 for the first time since it was introduced in the 1970s, and reduced or eliminated export duties for other processed products to make Malaysian palm oil exports more competitive.

Malaysia also shifted to closer bilateral cooperation with Indonesia in production and stock management, harmonisation of standards, and development of framework for sustainable production. It has since signed a charter with Indonesia to establish the Council of Palm Oil Producer Countries (CPOPC) with the aims to "control the global CPO supply, stabilise prices, promote sustainable practices in the palm oil sector, and enhance the welfare of oil palm smallholders" (Indonesia Investments, 2015).

Table 3.4. Selected policy measures in transition to the innovation-driven stage.

Period	*2010s*
	Market-Based Interventions
Product Market	Revised CPO export duty (first time since 1970s) and abolition of CPO export quota to mimic Indonesia's policy
	Replanting schemes expanded to plantations (for production management and yield improvement)
Labour Market	Minimum wage
	Increased levies for hiring foreign workers
	Public Inputs
Product Market	Introduction of Malaysian Sustainable Palm Oil (MSPO) standards
	Establishment of Council of Palm Oil Producer Countries (CPOPC) with Jakarta
	Higher biodiesel blending mandate to increase domestic consumption
	Regulatory review to reduce business costs in palm oil sector
Technology	Relaxation of ban on seed exports to facilitate Malaysian firms' expansion overseas

Increased domestic consumption through a higher blending mandate for biodiesel is another key policy measure. To reduce reliance on foreign labour and to encourage mechanisation, a minimum wage was introduced in 2012 across sectors, and was raised again in 2016. Employment of foreign workers was made less attractive through more stringent conditions and higher levies on procedures. A regulatory review was conducted by the Malaysian Productivity Corporation (MPC), a MITI agency that is responsible for productivity improvement, to eliminate unnecessary regulatory burdens adding to business costs in the palm oil sector (MPC, 2014). Plantation firms have long claimed that the palm oil sector is among the most taxed in Malaysia, with some suggesting that they pay various statutory charges amounting to 40% of profits (Ooi, 2016; Adnan, 2010) (Table 3.5).

Table 3.5. Statutory charges on the palm oil sector.

Charge	*Rate*
Corporate tax	26%
Goods and Services Tax	6%
Windfall Profit Tax	3% on palm oil prices above 2,500 MYR per tonne in Peninsular Malaysia 1.5% on palm oil prices above 3,000 MYR per tonne in Sabah and Sarawak
CPO Export Duty	4.5% to 8.5% of CPO prices
State Sales Tax (for Sabah and Sarawak)	7.5% in Sabah and 2.5-5% sales tax in Sarawak when CPO prices exceed 1,000 MYR per tonne
Cess to MPOB	13 MYR per tonne of CPO (inclusive of 2 MYR to MPOC for promotion)
Cess for Price Stablisation Fund	2 MYR per tonne of CPO per tonne
Cess for Cooking Oil Subsidy Scheme	5% when CPO prices exceed 1,700 MYR
Agricultural Tools & Machinery	Import duties
Foreign Workers' Recruitment (per Worker)	Levy of 590 MYR Processing fee of 125 MYR Work permit fee of 50 MYR Mandatory health screening fee of 180 MYR (male) and 190 MYR (female) Security deposit of 250 MYR Visa payment of 70 MYR Compensation insurance of 100 MYR

Source: Ooi (2016), Hanim (2010), Royal Malaysian Customs Department.

3.5 Firm Ownership

At first glance, Malaysia as a country has a strong presence across the palm oil value chains, given that many firms catering to different segments (irrespective of nationality of ownership) are present in the country – indicating business activity there (Table 3.6). Developing countries are dominant in plantation and primary processing, accounting for virtually for all the firms that exist in those segments. Firms with registered addresses in Malaysia account for a third of the developing country total. This is not unexpected, given the country's established position as an important source of palm oil. Malaysia accounts for 33% of world production and 40% of world exports in 2014. Developing countries are also dominant in refining and secondary processing segments, with a share of over two thirds of firms. Firms located in Malaysia alone account for more than half of the developing country total. Of various input supply and trading firms listed, more than half of them are in developing countries, with Malaysia having the lion's share. In downstream segments such as food ingredients and products, consumer goods, retail and financing that the geographical concentration of firms shifts to advanced economies.

Table 3.6. Number and geographical distribution of firms in global palm oil value chains.

Segment	*Number of firms*	*Geographical distribution of firms*		
		Advanced economies	*Developing economies*	*Malaysia*
Input supply				
Agrochemicals	-	-	-	39
Machinery/ equipment	273	96	177	62
Fertilisers	33	1	32	23
Seeds & planting materials	26	3	23	11
Plantation & primary processing				
Plantation	1,044	14	1,030	300
Milling	98	4	94	58
Crushing	50	0	50	46
Refining & secondary processing				
Basic refined products	125	7	118	43
Animal feed	17	1	16	12
Biodiesel	256	128	128	76
Cooking oil	202	52	150	80
Margarine & shortening	73	20	53	28
Specialty fats	116	33	83	30
Oleochemicals	154	44	110	66
Specialty chemicals	51	25	26	6
Food & non-food manufacturing				
Food ingredients/ products	455	393	62	10
Consumer goods	367	320	47	12
Trading, distribution & retail				
Traders	1,435	563	872	224
Brokers	113	41	72	40
Shipping/ logistics	131	57	74	52
Retailers	30	30	0	0
Other services				
Financing	47	31	16	10
Inspection/ certification	56	23	33	15
Consulting	119	51	68	26

Source: Palm Oil Directory 2014, *Malaysia Agribusiness Directory 2003-2014*, *RSPO Annual Communications of Progress 2014*.

A more complex picture emerges when one considers who the firms in the country are, and how they are embedded in each segment of the value chain in terms of their capability, geographical scope of business activity, and market reach. Capability and power asymmetry between foreign and local firms becomes apparent, as does Malaysia's reliance on foreign capital goods imports.

Despite substantial local firm presence in input segments (agrochemicals, fertilisers, and machinery and equipment), most of the input supplies can in fact be traced to foreign lead firms, whose locally incorporated subsidiaries are deeply embedded though less visible in the palm oil value chains. Depending on the type of inputs, these subsidiaries (which are essentially foreign firms whose decisions are determined by a central corporate structure located elsewhere based on global strategy and considerations) sometimes perform local processing of imported inputs sourced from production facilities located elsewhere owned by parent or affiliate firms, before distributing them to domestic and other export/ re-export markets in the region. In comparison, the *bona fide* local firms have limited manufacturing and marketing capability, serve as distributors of these inputs for only domestic markets, and are much smaller in size (Table 3.7).

Table 3.7. Position of local firms in global palm oil value chains.

Segment	*Capability & Role*	*Location of Activity*	*Market*	*Presence of Local Lead Firms*
Input supply				
Agrochemicals	Importers and distributors of agrochemicals supplied by foreign firms e.g. BASF, Syngenta, Bayer, DuPont and Dow Chemical	Malaysia	Domestic	No
Machinery/ equipment	Importers and distributors of heavy equipment, agricultural implements and spare parts from foreign firms e.g. Caterpillar, Kubota, Komatsu, Case New Holland	Malaysia	Domestic	No
Fertilisers	Importers of straight fertilisers from foreign firms e.g. Yara, Behn Meyer, Agricultural Chemicals and All Cosmos for mixing and distribution	Malaysia	Domestic	No
Seeds & planting materials	Producers of planting materials	Malaysia	Domestic, limited export	Yes
Plantation & primary processing				
Plantation	Producers of palm fruits for own or external processing facilities	Malaysia, international (mostly Indonesia)	Domestic	Yes
Milling	Producers of crude palm oil	Malaysia, international (mostly Indonesia)	Domestic, export	Yes
Crushing	Producers of crude palm kernel oil	Malaysia, international (mostly Indonesia)	Domestic, export	Yes
Refining & secondary processing				
Basic refined products	Producers of refined products e.g. RBD palm oil, palm kernel oil, palm olein and palm stearin	Malaysia, international (various, including Europe, China, India)	Domestic, export	Yes

Animal feed	Producers of palm kernel cake and pellet	Malaysia	Domestic, export	No
Biodiesel	Producers of biodiesel	Malaysia	Domestic, export	No
Cooking oil	Producers of cooking oil	Malaysia, international	Domestic, export	Yes
Margarine & shortening	Producers of margarine and shortening	Malaysia, international	Domestic, export	No
Specialty fats	Producers of specialty fats	Malaysia, international	Domestic, export	Yes
Oleochemicals	Producers of basic oleochemicals	Malaysia, international	Domestic, export	Yes
Specialty chemicals	Producers of function-specific chemicals for industrial sectors e.g. automobile and textile	International	Domestic, export	No
Food & non-food manufacturing				
Food ingredients/ products	Manufacturers of compound food ingredients and finished food products	Malaysia	Domestic	No
Consumer goods	Manufacturers of consumer goods e.g. personal care, cosmetics, household products	Malaysia	Domestic	No
Trading, distribution & retail				
Traders	Arrangers for transfers of physical quantities of palm oil products	Malaysia, international	Domestic, export	Yes
Brokers	Agents dealing with futures contracts	Malaysia	Domestic, export	No
Shipping/ logistics	Agents for foreign operators of tanker vessels that ship palm oil products internationally e.g. Maersk, d'Amico, Stolt-Nielsen and Nova Carriers	Malaysia	Domestic	No
Retailers	Retailers of food and non-food products	Malaysia	Domestic	No
Other services				
Financing	Financiers and investors for plantation and other production/ processing facilities	Malaysia	Domestic	No
Inspection/ certification	Providers of testing, inspection and certification services	Malaysia	Domestic	No
Consulting	Providers of plantation management, consulting and advisory services	Malaysia	Domestic	No

Source: Interviews.

Malaysia was a net importer of agrochemicals (herbicides, insecticides and fungicides) in four out of five years from 2009 through 2013 (Lee et al., 2013). The trade flows and the resultant balance of trade reflected largely decisions made by foreign lead firms such as BASF (Germany), Syngenta (Switzerland), Bayer (Germany), DuPont (US) and Dow Chemical (US) based on their global and regional production and marketing strategy. For example, Malaysia's

herbicides imports totalled 89.5 million MYR in 2012, of which half was from Germany. Malaysia's herbicides exports/ re-exports stood at 214.3 million MYR during the same year, of which a third went to China. Similarly, for insecticides, 70% of Malaysia's imports came from Indonesia, China and India while more than half of the exports went to Indonesia, a neighbouring country which has in recent years been the growth centre for oil palm plantations. In fertilisers, Malaysia has been a net importer (ibid). Trade deficit in fertilisers grew by 140% to 3.6 billion MYR between 2005 and 2012.

For agro-processing machinery and agricultural production machinery, imports ranging from parts to presses used to extract water and oil out of solid fraction to complex monitoring and control systems for automation grew 56% to 635.74 million MYR between 2008 and 2012. Imports of agricultural production machinery have also been on the rise due to increased agricultural mechanisation. For example, imports of agricultural tractors grew 44% to 255.3 million MYR between 2009 and 2012, of which over a quarter came from Japan (Komatsu (Japan) and Tata Hitachi (India-Japan) are among the world's top five manufacturers of heavy equipment for mining, construction and agriculture), followed by Brazil and China which have gained on lower priced units in recent years.

The lower-priced units from China are made by Chinese manufacturers such as YTO (the largest manufacturer of tractors in China, part of China National Machinery Industry Corporation or Sinomach). Imports from China also include more expensive, higher-end models from Caterpillar (US), the world's largest machinery manufacturer which had amassed over 30 years of experience, more than 20,000 employees, and dozens of manufacturing facilities in China (Baldwin & Ruwitch, 2014). Other significant sources of agricultural tractors are Italy, South Korea and Turkey. Imports of bulldozers, motor graders, road rollers and shovel loaders – of which a significant proportion is used for agriculture-related activities such as construction of plantation roads and terraces – increased by 181% to 1.9 billion MYR between 2009 and 2012.

Domination by foreign firms is not limited to the input segments; it can also be seen in the food and non-food consumer goods manufacturing as well as retail segments going by different indicators. For instance, of the 711 consumer goods manufacturers registered with the Roundtable on Sustainable Palm Oil (RSPO), over 90% are firms which are headquartered in or originated from European countries (led by Germany, France, the Netherlands, and the UK) and the US. Of the 63 retailers registered with the RSPO, none of them is from the developing world. This concurs with an annual report tracking global retailing powers. Of the 250 largest retail chains in the world in 2015, 35% (88) are based in the US, followed by 34% (85) in Europe and

12% (30) in Japan. The retail chains from the triad together account for 87% (US$3.75 trillion) of US$4.31 trillion generated in sales revenue by all 250 retail chains (Deloitte, 2017).

In services-oriented segments, capability and power asymmetry between local and foreign firms in trading, brokering and to a lesser extent, financing is less obvious. Local firms have more substantial presence alongside their foreign counterparts in trading (through in-house trading arms or independent trading firms), brokering (brokerage firms attached to domestic financial institutions), and financing (though limited to domestic and regional transactions). However, in the shipping segment, local firms serve mostly as agents for foreign firms that own and operate tanker vessels that ship palm oil products internationally. The government has singled out sea freight charges as the largest component which has contributed to persistent deficits in the service account of Malaysia's balance of payments (MITI, 2006). A small number of firms exist to undertake shipbuilding and repairing services but their ownership is unclear. In any case, these firms are likely to be less important for the palm oil value chains since they focus more on commercial vessels, small ferries, tugboats, cruisers and patrol boats (ibid).

Across the palm oil value chains, upstream segments related to plantation, primary processing, refining and secondary processing are the only ones in which local firms clearly demonstrate substantial production capability, a wide geographical coverage of business operations, and international market reach. Arguments about the efficacy of industrial policy can be made both ways: that industrial policy is relevant (Malaysia will likely still be producing and exporting crude palm oil products without industrial policy) or that industrial policy is a lot more difficult than thought (Malaysia has not been able to make a break into segments that are dominated by foreign lead firms at the commanding heights even with industrial policy). There is validity in both arguments given the different assumptions and expectations one may have about industrial policy.

Interestingly, the more recent industrial policy discussion in the GVC literature often omits the issue of firm ownership altogether or mentions it in passing without making a case for or against it.[28] Morris et al. (2012) go one step further to suggest that local ownership is a "subsidiary priority of an indigenisation policy", which should focus on deepening of domestic value added through local content policy. The impression given is that industrial development can be driven by either local or foreign firms. This was not the case with the Malaysian palm oil sector.

[28] For example, Gereffi (1999) observes in passing that the bulk of exports in East Asian newly industrialised economies, except for Singapore, are produced by locally owned firms, be it industrial conglomerates in South Korea or densely networked SMEs in Hong Kong and Taiwan. The observation, however, is for descriptive purposes and not for further analysis.

In the late 1960s, FDI inflows into palm oil refining were muted despite the generous incentives offered and the introduction of the export duty on crude palm oil which increased costs for overseas refineries. Foreign firms, which owned refineries mostly in Europe, remained unwilling to invest in refining in Malaysia. In contrast, local firms were more willing to invest in palm oil refining. It was local firms in the form of investors with manufacturing or trading background which first took advantage of the opportunity and invested in the segment. Over time, the plantations firms, which by now were controlled by local capital (state and private) post-nationalisation, followed suit. The firms had sizable internal feedstock and did not have to compete for raw materials on the open market. They also had greater financial and non-financial resources (especially experience and network in marketing) at their disposal. Soon they established themselves as the dominant actors within the refining segment.

Unsurprisingly, FDI accounted for less than a fifth of ownership in palm oil refineries in Malaysia in 1987. Most of the FDI did not come from the Global North (with the exception of Japan); it originated from India, Singapore and Hong Kong (Jomo et al., 2003). Cargill (US), the world's largest privately held firm and a key commodity trading firm specialising in trade, purchase and distribution of grain and other agro-commodities, did not get into palm oil refining in Malaysia until it acquired two operating refineries in as late as 1991.

Once the refining and processing segment had been established, international processors and industrial users of palm oil realised the need to have a domestic stake in Malaysia's palm oil sector. When Malaysia targeted further downstream development into oleochemicals in the 1980s, foreign firms had become more receptive to the incentives offered and invested in joint ventures with local firms, mainly major locally owned plantation firms which had by now integrated vertically into refining and secondary processing activities. These local firms also expanded scale horizontally through local and overseas investments, and evolved into TNCs.

Recent investment patterns in the palm oil sector affirm local firms' continuous importance in driving future industrial development. Between 2007 and 2015, domestic investments have been at least as important as foreign investments. In most years, domestic investments exceed foreign investments by far (Table 3.8). In two segments which are mature and well-established – palm oil and palm kernel oil refining as well oleochemicals – domestic and foreign investments alternately assumed the leading role. However, for palm biomass products and palm biomass energy generation, domestic investments led foreign investment by large margins in all years. Both are relatively new segments with small shares of total palm oil product sales but have been high on the government's list of targeted areas. Annually, the oil palm industry produces over 30

million tonnes of biomass (oil palm fronds, trunks, empty fruit bunches, kernel shells, mesocarp fibre and palm oil mill effluent). The new segments seek to turn biomass into value added products (e.g. materials for wood-based and pulp and paper industries) and energy generation (e.g. biogas recovered from palm oil mill effluent for combustion in gas turbine).

Table 3.8. Manufacturing and services investments in the palm oil sector, 2007-2015.

MYR Million		2007	%	2009	%	2011	%	2013	%	2015	%
Palm oil & palm kernel oil	Domestic	535	81%	335	32%	19	2%	1,300	82%	268	49%
	Foreign	124	19%	702	68%	1,100	98%	285	18%	276	51%
	Total	658		1,037		1,119		1,585		544	
Oleochemicals	Domestic	360	38%	74	48%	1,100	79%	333	69%	249	38%
	Foreign	595	62%	81	52%	301	21%	149	31%	413	62%
	Total	956		155		1,401		482		663	
Palm biomass products	Domestic	120	76%	285	86%	321	81%	55	100%	249	63%
	Foreign	39	24%	45	14%	75	19%	0	0%	148	37%
	Total	159		330		397		55		397	
Palm biomass energy generation	Domestic	1,300	84%	85	77%	69	93%	254	98%	533	98%
	Foreign	246	16%	25	23%	5	7%	6	2%	11	2%
	Total	1,546		110		74		260		544	
All	Domestic	2,315	70%	779	48%	1,509	50%	1,942	82%	1,299	61%
	Foreign	1,004	30%	853	52%	1,482	50%	440	18%	848	39%
	Total	3,319		1,632		2,990		2,382		2,148	

Source: Malaysian Industrial Development Authority.

Due to a history of substantial local firm involvement, Lall (1995) notes that resource-based products are an exception with high domestic private capital participation in Malaysia's export structure. Most of the country's manufactured exports are typically dominated by foreign TNCs (accounting for over three quarters of total value of manufactured exports in 1990) and have low local content, few high value added and technologically demanding tasks, and weak linkages with the domestic economy.[29]

The Malaysian experience suggests that industrial policy for linkage development into the refining and secondary processing segments would not have been effective without substantial local firm participation. As Cramer (1999) observes, RBI requires a supportive political economy: "if the capitalist class is too weak, or if sections of it (especially foreign capital) are too strong in relation to others or to the state… no amount of initiatives to reduce transaction costs, or to reduce production costs, is likely to be effective". Having capable local firms is thus not merely a

[29] Lall describes these as "worrisome features" but acknowledges that they nonetheless contribute to Malaysia's relative export success.

desirable outcome but can in fact be a necessary means to drive industrial development in RBI. This is because FDI is of relatively limited relevance due to several reasons.

First, resources are location-specific yet these locations may not fit with foreign lead firms' investment and business strategy (Athukorala, 1998). Second, some processing activities are characterised by high physical and/or human-capital intensity and may not be suitable for locating in a low-income country. FDI considerations often depend on the absorptive capacity of the recipient economy. Local production takes place only when the basic skills needed for production relocation and further training are present in the host country for foreign investors to sustain production activities thereafter. This leads to the idea of a 'development threshold' for FDI (Borensztein et al., 1998). In the case of Malaysian palm oil refining, foreign firms indeed argued in the 1970s that Malaysia did not have a comparative advantage for capital-intensive processing, which included a lack of human capital (in addition to the lack of transportation, handling and shipping facilities and procedures for exports of processed palm oil products) (Gopal, 2001). Third, a major deterrent for foreign firms to invest in developing countries' RBI is cascaded tariff structures in industrialised economies which provide heavy effective protection to domestic processing industries (Helleiner, 1973; Athukorala, 1998; Gopal, 2001). In the case of palm oil, Takase (1990) and Gopal (2001) show that tariff escalation between edible crude and processed products under the General Agreement on Tariffs and Trade's Most Favoured Nation status was widespread throughout the 1970s in two key markets for Malaysian palm oil: Canada and the European Economic Community (EEC, which precedes the EU).

Some EEC countries provided preferential concessions in the form of the Generalised System of Preferences (GSP), which were subsequently expanded to the EU level, for which both Malaysia and Indonesia were eligible. However, tariff escalation remained an issue (the effective rates of protection are higher than suggested by the nominal tariff rates) which drove Malaysia to diversify its export markets (
Table 3.9). As Malaysia became an upper middle income economy, its eligibility for lower levies under the EU's GSP scheme expired in January 2014. A leading industry figure had warned that without the GSP and a Malaysia-EU free trade agreement, the tax rate on some Malaysian oleochemicals heading for the EU will be between 4% and 6%, putting in "another nail in the coffin" of the local palm industry sector (Oxford Business Group, 2014).[30]

[30] Negotiations for an FTA with the EU were launched in Brussels in late 2010. After seven rounds, negotiations were put on hold in April 2012 at Malaysia's request. A stocktaking exercise is being finalised to assess the prospect to resume negotiations.

Table 3.9. Import tariffs on crude and processed palm oil in selected advanced economies.

	CPO	PPO	Difference
EEC edible and technical use (Pre-Kennedy Round, 1967 and before)	9%	15%	6%
EEC edible and technical use (Post-Kennedy Round, 1967-1980)	4–9%	8–14%	4–5%
EEC edible and technical use (Post-Tokyo Round, 1980-1990)	4–6%	8–14%	4–8%
EEC edible and technical use (GSP, Post-Tokyo Round, 1980-1990)	2.5–4%	8–12%	5.5–8%
Canada (MFN, 1968-1983)	10%	17.5%	7.5%
Canada (GSP, 1968-1983)	0%	12.5%	12.5%

Source: Gopal (2001).

Beyond reasons related specifically with the RBI scenario, local firms also offer advantages for industrial development in the more general situation. Deeply embedded in the local business environment compared with foreign firms, local firms know their way around domestic institutional setting, infrastructure, suppliers and customers. Importantly, they are the ones that exploit a developing country's high risk opportunities not due to nationalistic sentiments but because, quite simply, "they have no other choice but to invest locally" (Amsden, 2009).

Local and foreign firms also behave differently with regards to profit reinvestment. Amsden (2009) argues that in the mining industry, foreign firms tend to repatriate profits or reinvest them in the same industry elsewhere, with few local jobs or skill formation. Meanwhile local firms invest a greater share of profits in diversifying locally, potentially creating new industries and activities with more jobs and skills established. Foreign lead firms also tend to use less local content than their local firms, especially in Category 3 and 4 products (component production and assembly as well as advanced technology final products). This is because foreign lead firms are likely to import inputs with large scale economies from a single source outside the country. The process of initial outsourcing to seek the lowest cost supplier extends in requiring the supplier to locate proximate to the factory. This 'follower supply chain' strategy was initiated in the automobile industry and has spread to other manufacturing sectors (Barnes & Kaplinsky, 2000).

Furthermore, when foreign firms set up production facilities through subsidiaries in developing countries, these are usually for mature products which are made through routinised, standardised functions, and which compete on the basis of cost (Vernon, 1966). The tacit knowledge, top managers and engineers and the prized high value added functions are usually retained at home within corporate headquarters in the Global North. This leads to international

division of labour in which some countries are locked in lower value added products and functions, with little chances to attain capabilities in higher value added ones which are rich in technology, knowledge and skills. Amsden and Tschang (2003) find that the R&D conducted in Singapore's hard disk drive industry, dominated virtually by foreign lead firms, was applied research at most (higher than pure science and basic research, but lower than exploratory and advanced development research). In contrast, a comparison of R&D in subsidiaries of five foreign lead firms and five local firms in South Korea's telecommunications industry finds that the local firms did more diversified R&D with the potential of generating frontier technology than their foreign counterparts (Amsden, 2009). This has upgrading implications for developing countries.

While local firms are important for RBI, the configuration of local capital plays a role too. Cramer (2003) cautions that if a resource-based sector was organised purely around large private concerns, the attraction of short-term profit from exports of raw materials may hamper effective linkage development. That Malaysia's state capital was involved heavily alongside domestic private capital in local firms was important for driving vertical integration at the key firms, for minimising tensions between producers and processors over relative economic returns, and for overcoming resistance by interest groups. In particular, the unresolved tensions between producers and processors can hamper development of domestic processing, as seen in the case of Sri Lankan tea. To produce value added tea blends for exports, local processors need to add cheap filler teas (those that do not possess significant flavour or colour attributes) to locally grown quality tea to increase the bulkiness of the final blends without significantly affecting the quality while keeping cost at a minimum (Ganewatta et al., 2006). The filler teas are not readily available locally, largely due to agro-ecological factors, and their imports are regulated tightly to protect domestic producers (who grow quality tea).

Critically related to the development of local firms is their size. With increasing consolidation in global industries, the asymmetry in market structure has become more entrenched. Foreign lead firms have further strengthened their oligopsony position in value chains, outsourced low value added or non-core activities, and stoked competition among a wide supplier base for cost efficiency and flexibility simultaneously (Milberg & Winkler, 2013). This strengthens foreign lead firms' leverage over local firms from developing countries, and perpetuates profit accrual to foreign lead firms. One possible strategy to address this asymmetry is by creating a small number of large local firms or 'national champions' similar to Japan's *kereitsu* and South Korea's *chaebol*, in order to accelerate industrial upgrading. Although it may be unrealistic to expect the national champions to fully compete with foreign lead firms from the Global North in the latest epoch of globalisation (Nolan, 2014a), not having any large local firms will conceivably

undermine a country's bargaining position and long-term capability for technological learning and industrial upgrading.

3.6 Firm Innovation

Globalisation allows transmission of technological and knowledge at a much faster pace in the past. However, such opportunities must be exploited through developing countries' "deliberate effort to absorb innovation through endogenous learning" (Archibugi & Pietrobelli, 2003). Deliberate indigenous efforts include government policies that promote selected FDI and collaborations between foreign lead firms and local firms, industrial clusters that facilitate exchanges among firms, and business innovation systems at a sectoral, regional or national level in which private actors and public institutions interact to improve generation, application and absorption of technology and knowledge (Freeman, 1995; Lundvall, 2012; Nelson, 1994; Malerba et al., 2016).

Compared with its other key export-oriented sector, electrical and electronics (specialising in semiconductor assembly operations), Malaysia's palm oil sector is less dominated by foreign firms and sees high participation by local, especially private, firms. Except for joint ventures most notable in oleochemicals, most local firms generally engage local lead firms or in some cases, foreign buyers through arms' length relationships. Such relationships are not uncommon for resource-based value chains.

The degree of coordination for meeting private and public standards has been on the rise in agro-commodity value chains but it is relatively less than what is observed in value chains for specialised and complex manufactured goods. The relatively loose governance (which is closer to arms-length trade as opposed to tight coordination and control by lead firms) in resource-based value chains reflects lower complexity and high codifiability of transactions, high supplier capability, and low appropriability of technology (in the sense that lead firms find it difficult to retain the value added of proprietary technology and knowledge that they provide) (Milberg, 2004; Pietrobelli & Rabellotti, 2006, 2011). Consequently, active transfers of technology and knowledge by local or foreign lead firms are limited.

For these reasons, public institutions (DOA, MARDI and universities) have historically played a vital role in driving innovation and learning in the Malaysian palm oil sector, the most important of which has been MPOB (previously PORIM before merger). Of 43 government research institutes (GRIs) in Malaysia, MPOB was the largest spender on R&D in 2004, with an outlay of

over 60 million MYR or a fifth of total R&D spending by GRIs (Yusuf & Nabeshima, 2009).[31] MPOB's R&D is conducted in six broad areas: biology, agricultural extension, engineering and processing, oleochemicals, product development, and biotechnology and breeding (Table 3.10). MPOB's research priorities are set by the Board, based on recommendations made by a Programme Advisory Committee made up of mostly multidisciplinary specialists and experts from abroad. Between 1986 and 2009, 441 technologies were developed and disclosed by MPOB. Of this total, 135 or 30.6% had been commercialised by various industries (the national average among other GRIs was 3.4% during the period). Between 1983 and 2010, MPOB was granted 84 patents in various countries, with another 100 pending as of mid-2010 (MPOB, 2010a). Most technologies were granted on a non-exclusive licencing basis, with MPOB retaining the right to exploit the same intellectual property and allow any number of other licensees to do the same.

Table 3.10. R&D focus areas, objectives and outputs of MPOB.

Area	*Objective*	*Example of Technology and Process Output*
Biology - Agronomy - Geospatial technology - Farm mechanisation - Applied entomology & microbiology - Oil palm diseases - Tropical peat research	Yield and productivity improvement Sustainable production Precision agriculture/ GIS databases Reduce labour dependence Minimise arduous nature of operations Pest and disease control to reduce losses Address carbon balance, greenhouse gas emissions and biodiversity associated with peatland cultivation	Oil Palm Resources Information System (OPRIS) that allows growers to locate suitable land for cultivation and plan inputs Use of natural enemies of the pests with bio-control agents for pest control Oil palm harvesting pole, motorised cutter (CANTAS), harvesting machine, loose fruit picker, and mechanical loader Balanced fertiliser formulations that are affordable and easy to apply
Agricultural extension - Extension & training - Project implementation - Crop & livestock integration	Increase smallholders' productivity Adoption of Good Agricultural Practices (GAP) among smallholders Maximise income through integrated land use	Cultivation practices that allow integration of crops (e.g. banana, pineapple, sugarcane) and livestocks (e.g. cattle, goats)
Engineering & processing - Milling & processing - Energy & environment - Biomass	Develop clean, efficient technology for palm oil processing and extraction of minor components Utilisation of oil resources and by-products for zero waste and value addition Commercialisation of palm biomass (trunk, fronds, empty fruit bunch, mesocarp fibre, palm kernel shell)	Continuous sterilisation process that reduces space, equipment and labour requirements (costs for new mills lowered by 15%; fewer than 10 operators needed, from 30 previously) Palm nut cracker capable of cracking hard palm shells for palm kernel oil extraction Palm oil mill effluent treatment into recycled process water and solid for fertiliser Recovery of antioxidants (carotenoids, tocopherols and tocotrienols) from mill

[31] This was followed by the Malaysian Institute of Microelectronic Systems (MIMOS), MARDI and Standards Industrial Research Institute, at 11.4%, 9.0%, and 7.6%, respectively of total R&D spending by GRIs.

		by-products
Oleochemicals - Polymer & composite products - Specialty & industrial chemicals - Product specifications - Consumer products	Increase non-food applications of palm oil and palm oil products Provide pilot plant facilities for industry and SMEs Add value to palm-based basic oleochemicals	Discovery of a natural palm-based surfactant (alpha sulphonated methyl ester) as an alternative to petrochemicals-based surfactants Food-grade grease to lubricate food processing machines (instead of petroleum-based grease that may cause food contamination) Palm biodiesel (known as Envo Diesel) as renewable energy
Product development - Food technology & nutrition - Food safety & code of practices - Technical & commercial information for palm oil users	Find new uses for palm oil products Promote utilisation and acceptance of palm oil for food and non-food applications	Nutrition trials and research findings on palm oil Trans fats free formulation (Smart Balance which blends several oils) for use in margarines and shortenings High-fibre chocolate formulation which substitutes cocoa fat with palm derivatives Specialty animal fat replacer (SAFaR)
Biotechnology & breeding - Breeding & tissue culture - Genomics & genetic engineering - Bioinformatics	Improve oil palm planting materials Develop bioinformatics data storage and analysis Develop genomic tools to improve breeding	Planting materials with higher oil yield, higher value-added oil content, and specific physical features for ease of harvesting Largest oil palm germplasm collection in the world

Source: Malaysian Palm Oil Board, Interviews.

MPOB's R&D activities, as well as it licensing and regulatory activities, are funded by budgetary allocations from the government and an industry cess. In recent years, MPOB's funding is believed to be derived almost entirely from cess revenues (cess is a tax that is earmarked for a specific purpose and its origin can be traced to British colonial rule), estimated at 220 million MYR in 2008 (Adebowale & Egbetokun, 2012; Adnan, 2008). The industry cess collected by MPOB amounts to 13 MYR per tonne of crude palm oil (less than 1% of 2014 average crude palm oil prices for local delivery, at 2,384 MYR per tonne) from palm oil producers. Out of every 13 MYR, 2 MYR is allocated for MPOC's promotion and marketing activities.

Interviewees noted that the MPOB model was effective for high diffusion of technologies and knowledge, consistent with studies suggesting that public R&D is best targeted at technologies that are far from being commercial (Ek & Söderholm, 2010). This was especially relevant during the factor-driven and early investment-driven phases. As public R&D and funding lower investment costs through scale effects, the government expectation was that private investments will be catalysed and 'crowded in' over time (Qiu et al., 2014). Yet, there was no clear evidence of an increase of private R&D investments in Malaysia's palm oil sector. Of the 20 largest plantation firms, only nine (FGV, Sime Darby, Wilmar International, Kuala Lumpur Kepong, IOI, Genting Plantations, Boustead Plantations, Sarawak Oil Palms, and Kulim (Malaysia)) reported some kind of R&D activity internally. Although the firms' annual reports do

not provide much detail on such activities, interviewees suggested that most of the R&D remains directed at agronomy and plantation operations (in other words, more upstream oriented).

The limited evidence of R&D activities within plantation firms appears broadly consistent with the findings of more recent studies that attempt to measure technology and innovation performance using *Oslo Manual* (OECD & Statistical Office of the European Communities, 2005), the widely used international guidelines for collection and use of innovation data. In a pilot cross-national study by (UNESCO, 2012), 42.5% of Malaysian manufacturing firms were engaged in R&D domestically and 15.8% in R&D abroad (Table 3.11). Similarly, Lim and Nagaraj (2011) find that 41.6% of Malaysian manufacturing firms had generated innovations or had ongoing innovation activities. Most of the innovator firms were more likely to be of a larger size, export-oriented, in sectors a higher level of technological intensity, and at least partially owned by foreign interests.

Table 3.11. Percentage of manufacturing firms engaged in innovation activities, 2011.

%	*Domestic R&D*	*Overseas R&D*	*Acquisition of machinery, equipment and software*	*Acquisition of other external knowledge*	*Training*	*Market introduction of innovations*	*Other preparations*
Euro-27 max	81.3	54.8	98.8	53.1	96.4	48.4	88.1
China	63.3	22.1	66.0	28.1	71.5	60.6	36.9
South Africa	54.1	22.4	71.2	24.8	69.6	42.6	47.7
Israel	48.9	32.2	85.1	12.9	52.6	59.1	n.a.
Indonesia	48.3	5.2	39.3	21.6	37.0	85.4	77.5
Malaysia	42.5	15.8	64.9	29.8	50.2	32.0	n.a.
Ghana	42.1	14.0	80.7	15.8	86.0	71.9	45.6
Egypt	41.3	5.5	74.3	11.0	56.9	19.3	35.8
Colombia	26.8	8.9	85.8	7.2	19.8	26.6	n.a.
Russia	18.9	20.0	64.0	12.7	18.3	9.6	n.a.
Uruguay	11.1	1.2	20.3	4.4	15.1	n.a.	n.a.
Brazil	4.7	1.9	34.1	4.8	26.5	14.7	16.7

Source: UNESCO (2011).

It is unlikely that public R&D has crowded out private R&D. Neither can private R&D substitute fully for public R&D in Malaysia's palm oil sector. After all, both public and private sources for R&D investment play different but complementary roles. For a successful transition to the innovation-driven phase, firms cannot rely solely on MPOB for R&D and innovation functions, given contradictions between the fundamental nature of public R&D and the specific needs of firms. By its very nature, MPOB's R&D must be made as accessible and generic for all as

possible. This explains why most of the technologies and knowledge developed by MPOB related to agronomic practices as well as products and processes. In practice, larger firms will likely benefit more from these technologies and knowledge given their greater access to financial and non-financial resources compared with smaller firms. However, MPOB's technologies and knowledge are at least theoretically available to any firm if there are no real-life obstacles hampering adoption. In contrast to the factor-driven phase, during the innovation-driven phase, firms need to create and sustain higher value added and profits accruing from niche, proprietary technology and knowledge which will differentiate them from competitors.

The transition to the innovation-driven phase is fraught with challenges especially for agro-commodities. Widely accepted as a strategy to secure price premiums, product differentiation commonly involves product branding supported by extensive marketing and advertising efforts. However, product differentiation – based on either functional (taste, quality standards, and usage) or emotional benefits (provenance, social responsibility, and exclusivity) – is difficult for bulk commodities, which are highly substitutable and reliant on price competition (Saccomandi, 1998). Furthermore, production differentiation must be persuasively conveyed through branding – a specialist field that requires expert understanding of consumers, markets, channels and products (Docherty, 2012). In many cases, price premiums at the farm and basic processing levels remain stagnant in relation to the extra costs that are incurred by producers (be it growers or processors) as a way to differentiate their products.

The implication is that past policy measures for promoting innovation in the Malaysian palm oil sector – either firms' acquisition of existing technology and knowledge through the use of tax incentives, as well as creation and diffusion of technology and knowledge by MPOB – are no longer adequate. Innovation among local firms must evolve beyond product and process innovation to include firm-initiated and firm-specific organisational and marketing innovation. Organisational innovation requires implementation of a new organisational method in the firm's business practices, workplace organisation or external relations. Marketing innovation is implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing (OECD & Statistical Office of the European Communities, 2005).

Firms may not undertake innovation for a variety of obstacles, some of which are complementary to each other (such as costs and risks) (Mohnen & Röller, 2005) (Table 3.12). In the case of Malaysian manufacturing firms, Lim and Nagaraj (2011) find that high costs, economic risks, lack of skilled labour, and lack of finance stand out as the most important obstacles for firms that innovate and firms that do not innovate. However, there are two

differences in the way obstacles are experienced by innovating and non-innovating firms. One, firms which are on the innovation path, even larger ones with greater resources to support innovation, are more likely to report obstacles than non-innovating firms because they have a better understanding of the problems after engaging in innovation activities. Two, risks and financing are bigger obstacles to non-innovating firms than innovating firms but cost and labour problems are equally important to both firm types.

Table 3.12. Factors hampering innovation activities.

Cost and Economic Factors	*Knowledge Factors*	*Market Factors*
Lack of funds within firm	Lack of qualified personnel	Market dominated by established firms
Lack of external funding (venture capital, public funding)	Lack of information on technology	Uncertain demand for innovative goods or services
High innovation costs	Lack of information on markets	Innovation is easy to imitate
Excessed perceived risks	Difficulty in finding cooperation partners for innovation	

Source: Adapted from OECD and Statistical Office of the European Communities (2005).

3.7 Conclusion

RBI requires selective government intervention. There is no single set of policy measures that guarantee success of RBI given different product and industry contexts. Nonetheless, common RBI policies will likely promote scale and efficiency to increase production of raw materials, ensure availability of feedstock for processing, adjust relative profitability of processing to primary production, facilitate exports and market diversification, and encourage technology and knowledge transfers. The policy emphasis gradually shifts from scale expansion to efficiency gains to innovation, and the declining relevance of policies to change internal terms of trade against traditional primary exports.

The limited evidence from Malaysian palm oil indicates that foreign firms are less inclined to invest in downstream processing at least during the early stages of RBI due to locational specificity of resources, domestic factor endowments, and trade distortions in resources which do not match their strategy and economic considerations. This potentially renders policies to attract FDI for RBI less effective than anticipated. Conversely, local firms may have a crucial role to play when it comes to investing in RBI. They have knowledge about the domestic business environment and a potentially bigger risk appetite due to practical constraints arising from their lack of ability to invest elsewhere. Public investments in R&D and innovation, usually financed by taxes on production and exports, are equally crucial for technology and knowledge

diffusion. Long-term indigenous innovation efforts however will require commensurable private investments to stay ahead of the competition.

The essay suggests the need to further clarify the role of foreign linkages for RBI in industrial policy research. Foreign linkages, with or without equity links, can be important sources of technology and capital for developing countries. Numerous examples show that these linkages in agro-commodity value chains can under specific circumstances deliver benefits in the form of better inputs and products, and more efficient processes (most visibly in logistics for harvesting, collecting, preserving and transporting the produce). However, these foreign linkages have been more established in primary production – either through FDI (operations via affiliates and subsidiaries in developing countries) or coordination (global buyers who set, monitor and enforce key parameters for the value chain processes) – than in downstream development. The essay also affirms the importance of public actions to accelerate R&D and innovation in agro-commodity value chains as identified in the GVC literature. The challenge is to create a more balanced innovation system that reflects efforts by all stakeholder groups including private firms, instead of one that relies overwhelmingly on public efforts.

Several policy implications arise, starting with a review of the bias towards FDI in domestic policies and institutions in developing countries. Many governments in developing countries did impose restrictions on foreign TNCs throughout the 1960s and 1970s to protect and give preferential treatment to local businesses. In the decades that followed, to attract foreign investment, governments offered foreign firms significant regulatory advantages – as perceived by the firms themselves[32] – over domestic firms in areas such as taxes and subsidies, business licensing, labour laws, foreign currency and exchange policies. These concessions were made to compensate for defects in the domestic investment climate and have the effect of discriminating against local firms (Collier & Dollar, 2002). Correcting the FDI bias does not entail cushioning local firms from foreign competition and compensating them for inefficiency; it is about creating an environment in which firms, foreign or local, can be competitive. In addition, in line with what advanced economies do, more active financial support to support firm-level innovation, including state funding for private R&D as well as credit for higher-risk innovation activities, must now be considered. To provide business with the required human and physical capital in their R&D and innovation undertakings, more public investments can be directed to

[32] Huang (2005) uses the data from the 2000 World Business Environment Survey (WBES) of over 10,000 firms across 81 countries and finds evidence that foreign firms' regulatory advantages are especially substantial where domestic firms are politically weak and where countries are corrupt.

general education, tertiary education in applied science-based subjects, and knowledge-based infrastructure and assets.

4 Economic Upgrading for Whom? Distribution of Gains from Development of the Malaysian Palm Oil Sector

4.1 Introduction

Industrial or economic upgrading in global value chains (GVCs) is crucial for national development. With industrial upgrading, a country achieves economic growth and increases its wealth and income, which translate into more resources for reducing poverty and solving other social problems. Given the increasingly globalised and coordinated capitalist environment in which production and trade occur – simultaneously expanding and limiting one's prospects for upgrading – much GVC research understandably focuses on how economic upgrading at the levels of country, sector or firm along a given value chain can best be achieved. However, history offers examples in which economic growth was not always followed by commensurable progress in human development.

The question who benefits from economic upgrading has received relatively little attention but is highly relevant (Bair, 2005; Rammohan & Sundaresan, 2003). This essay (Essay 3) attempts to link economic to social and development outcomes by investigating their progress made in key primary through tertiary industries within Malaysia's palm oil sector. Evidence suggests broad economic and social upgrading has been achieved across most industries, contributing to remarkable gains as reflected in national economic development and poverty eradication. Social upgrading is detected even in industries which can be categorised as having experienced economic downgrading. Individuals receive unequal amounts of benefits depending on where they are in the value chains. Migrant workers who account for 60% of the workforce make far less headway in wage and work conditions compared to others. The differences are normally attributed to the skill requirements of jobs and individuals' productivity levels. While skills are important, there is no evidence to suggest the migrant workers are less productive than others. The institutional arrangements and political representation that they enjoy (or lack thereof) are likely to be just as important in predicting and explaining their treatment vis-à-vis other groups.

Section 4.2 reviews the conceptual and measurement issues for economic and social outcomes in GVCs and discusses selected works in the area. Section 4.3 identifies 12 key industries within the Malaysian palm oil sector and explains the measurement of their economic and social outcomes using gross value added (GVA) data from 2000 to 2010. Section 4.4 presents the findings on how GVA in gross terms and as a share of output has evolved during the period as well as the evolving distribution of GVA between labour and capital. It analyses the distribution trends by linking them to the industries' occupational structure and employee profile. This is

followed by a discussion on the findings in Section 4.5, which seeks to provide some factors which possibly explain the findings in addition to the normal skill- and productivity-centric explanations. Section 4.6 concludes the essay with a summary of findings and briefly outlines the implications arising from these findings.

4.2 Economic and Social Upgrading

Asking who gets what in value chains is important for shedding light on "the winners and losers in the globalisation process, how and why the gains from globalisation are spread, and how the number of gainers can be increased" (Gereffi et al., 2001). The GVC literature first identified five types of economic upgrading – product, process, functional, channel and intersectoral (Humphrey & Schmitz, 2002; Frederick & Staritz, 2012). However, as Bair (2005) points out, upgrading in this sense has two limitations that need further work due to its firm-level orientation. The first is the unclear aggregative effect of firm upgrading as in how the process of upgrading at firm level adds up to the implications for the larger units that are traditionally regarded as the containers for development, such as the national or regional economy (ibid). The second is the need to specify who benefits from economic upgrading. Process upgrading in the direction of manufacturing automation illustrates this point: it may result in higher value-added for the firm but may displace lower-skilled workers, temporarily or otherwise.

The first issue is not fully resolved, though some recent work attempts to be more careful with the levels of analysis and makes a distinction between a firm's insertion into a specific value chain and a country's incorporation into the global economy. The second issue is being addressed as more work emerges to demonstrate that economic upgrading does not equal or automatically lead to social upgrading. This was observed, for example, in the case of coffee and banana, where increased value added did not translate into better farm-gate prices for producers. Rather, profits and oligopoly rents appear to gravitate to points of concentration dominated by developed-country firms in the input-output structure, as seen in a number of cases ranging from coffee and bananas (Milberg, 2004; Fitter & Kaplinsky, 2001; Vorley & Fox, 2004; Robinson, 2009).

Theoretically, four combinations of economic and social outcomes are possible (Figure 4.1) (Milberg & Winkler, 2011). The high-road growth scenario is one in which both economic and social upgrading are present. The high-road decline scenario occurs when social upgrading is present despite economic upgrading. The low-road growth scenario is one where economic upgrading is accompanied by social downgrading. The worst scenario, described as the low-road decline, occurs when both economic and social dimensions are worse off than before.

		Social Realm	
		Upgrading	Downgrading
Economic Realm	Upgrading	High-road growth	Low-road growth
	Downgrading	High-road decline	Low-road decline

Source: Milberg and Winkler (2011).

Figure 4.1. Economic and social outcomes in GVCs.

Social upgrading captures gains in living standards and conditions of employment over time, and does not involve any explicit assessment of environmental impact. Barrientos et al. (2011) argue that social upgrading is affected by the type of work performed and the status of workers – with non-regular workers performing low-skilled, labour-intensive work being most vulnerable to the risks of social downgrading. In operational terms, the measurement of economic and social upgrading is complicated by a wide variety of variables across levels of analysis (See Milberg and Winkler (2011) for an illustrative list of possible measures). Like economic upgrading, social upgrading comes with a choice of measures for aspects including wages, consumption, working conditions, workers' rights, gender equality and job security. Case studies present a mixed picture. For example, a review of GVCs in horticulture, garments and textiles finds contradictory evidence following their insertion into the global economy: modest income gains and job creation, accompanied by little improvement or deterioration in employment stability, income security and work conditions (Nadvi, 2004).

Pay remains the most basic representation of social upgrading. One reasonable measure of pay is the labour share or the fraction of production income accruing to labour – wages and salaries before taxes, plus employers' social contributions (Lübker, 2007). While movements in the labour share must not be interpreted as changes in real wages (Bentolila & Saint-Paul, 2003), the usual explanation for changes in the two is marginal labour productivity. The neoclassical theory based on the tradition of marginalist analysis sees wages as being determined by labour demand emanating from profit-maximising firms based on their calculation of the marginal revenue generated by labour. Wages therefore increase in tandem with rises in the marginal productivity of labour, assuming labour supply and product market conditions or prices remain constant (Milberg & Winkler, 2011). However, the link between labour productivity and wage growth remains debatable. In nine advanced Group of 20 economies including the US, Germany, and Japan, labour shares declined while real average wage growth lagged behind labour productivity growth since 1999, even when different deflators are used or when total compensation (instead of the narrower concept of wages) is used (ILO, 2015; ILO & OECD, 2015).

Considerable alternative effort has been made to explain wage and labour share trends. These include technological change, globalisation, financialisation, unemployment levels, and institutional factors. Because growth in labour productivity is not caused solely by improved labour skills and knowledge, some see capital-augmenting technical change and capital deepening as accounting for at least part of the decline in the labour share (Bentolila & Saint-Paul, 2003; Driver & Muñoz-Bugarin, 2010).

Incidentally, capital intensity is one reason that RBI may be limited in terms of social upgrading: processing industries and supporting services developed around primary production typically have small direct employment generation effects (Walker, 2001).[33] Similarly, Owens & Wood (1997) argue that while primary processing or RBI (apart from its need for more local raw materials) is fundamentally similar to other sorts of manufacturing in that they all depend on the skills of a country's workforce, the main difference is that primary processing is less labour-intensive than narrowly defined manufacturing. When jobs are created in RBI, they have higher skill and knowledge requirements and often favour semi-skilled and skilled labour instead of unskilled labour. This leads to their conclusion that "exporting processed primary products is thus likely to yield fewer of the distributional and social gains that East Asia reaped from massive expansion of manufacturing employment" (ibid).

Others find wage-moderating effects from the integration of labour-abundant countries into the global economy and increased levels of offshoring (or 'threat effects' even without actual changes in production locations) (Burke & Epstein, 2001; ILO, 2008). Under pressure to deliver shareholder value, firms divest non-core, typically labour-intensive activities and increase financial profits (instead of profits from productive investments) (Bell & Van Reenen, 2013; Weil, 2014). Additionally, high employment exerts downward pressure on wages while the level of unemployment benefits affects the level of pay deemed acceptable to workers (OECD, 2012).

In the institutionalist approach, wages are understood as a function of the bargaining power of labour versus management within a specific institutional context shaped by, among others, labour market regulations, the extent of public ownership, and the size of the welfare state. In particular, union density (the number of trade union members as percentage of total employees or as a percentage of total employment), bargaining rights, and minimum wage legislation have

[33] While direct employment spin-offs are limited, (Walker, 2001) cautions that RBI can still stimulate the development of additional industries, services and supporting firms within the vicinity of the main industry, enlarging the employment base and job opportunities in the local economy.

been found be significant in determining wage outcomes (Berg & Kucera, 2008; Howell, 2004; ILO & OECD, 2015; Milberg & Winkler, 2011).

More recently, the rise of industrial agriculture and agro-industrialisation has led to a growing schism between industrial agriculture and smallholder-based agriculture, and concerns that smallholders may get marginalised if not excluded because they lack the means to adjust to new production realities. The common challenges identified include high transaction costs, insufficient to financial and knowledge resources, and increasingly demanding standards and performance requirements (Ashley & Maxwell, 2001; Dolan & Humphrey, 2000; Gibbon & Ponte, 2005). Despite higher entry barriers, some studies suggest that for those who successfully gained access to the value chains, net earnings on a per hectare or per kilogramme basis has improved, compared with those who stay in the traditional channels (see, for example, (Natawidjaja et al., 2007; Hernández et al., 2007; Falkowski et al., 2008; Berdegue et al., 2008). In the Tanzanian and Kenyan cut flower industries, trade unions and labour groups used private social standards to enhance union organisation, and to perform a watchdog function by threatening non-compliant business with exposure in consumer markets (Riisgaard, 2009).

In comparison, there has been a dearth of research that systematically studies downstream segments beyond primary production as well as waged workers along the value chains. Enlarging the scope of inquiry to incorporate these dimensions is important. There has been a massive movement of people across borders – instead of internal migration – to fill jobs in agriculture and its downstream sectors in most industrial countries and in many middle-income developing countries, leading to estimates of migrant workers contributing up to 80% of the agricultural labour force in some countries and regions (Martin, 2016; IUF, 2008). This trend is likely to affect developing countries as well when they industrialise and exhaust unlimited supplies of labour domestically.

4.3 Methods and Data

The key data used in this essay are the three input-output (I-O) tables compiled by the Department of Statistics Malaysia for 2000, 2005 and 2010. Breakdown of gross value added (GVA) by labour and capital shares was introduced since 2000. The original I-O tables were compiled using different classification systems to cope with emergence of new products and new industries that produce them. The palm oil sector is disaggregated into 12 industries that span across primary, secondary and tertiary industries, based on their national activity and commodity codes. The way in which these industries relate to specific palm oil-related activities

can be found in Annex 8. Additionally, the tables, expressed in basic prices in local currency for the year, were adjusted to 2010 prices.

Additional data on employment statistics and occupational structure were extracted from official reports and industry publications. The sources are as so identified in the rest of the essay. Anonymous, semi-structured interviews with a total of 15 interviewees (12 senior-level firm executives, 7 government officials, and 6 analysts/ industry group officials) were conducted in Malaysia between March and August 2015. The interviews, together with documentary analysis of mainly policy documents and media reports, enhanced quantitative analyses.

Value added measures value created by production. Once the amount of value added appropriated by government in the form of other taxes on production is subtracted from value added and the value of subsidies is added, the compensation of labour and capital is revealed (United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, & World Bank, 2009). For this essay, GVA is output valued at basic prices less intermediate consumption valued at purchasers' prices. It has three components:[34]

> GVA at basic prices = Employees' compensation + Gross operating surplus + Taxes less subsidies on production

Employees' compensation as return to labour of the households can be divided into wages and salaries payable in cash or in kind, and the value of social contributions payable by employers. Gross operating surplus in the context of national accounts represents the excess amount of money generated by firms' operations after paying labour input costs. It is effectively profits as return to capital of corporations. Gross operating surplus has two components: consumption of fixed capital and net operating surplus. Taxes less subsidies (if any) represent the share of GVA going to government for its services. Labour, capital and government shares total 100% of GVA. Labour and capital shares are of relevant interest for analysis of functional distribution of income.

Factor shares need to be interpreted with caution due to well-recognised measurement issues. While national income accounting has become more standardised, it remains difficult to

[34] Purchasers' price is the price at which a product is sold in the market. Producers' price is purchasers' price, less wholesale and retail margins, transport charges and value added tax not deductible by the purchaser. Basic price is producers' price, plus subsidies on the product, less taxes on the product excluding invoiced value added tax. Using an income approach, GDP at current prices is the sum of GVA at basic prices and taxes on products (United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, & World Bank, 2009).

disaggregate national income into functional components in determining the factor shares (for example, entrepreneurs' income is not solely profits but also embodies wages) (Gollin, 2008). In addition, labour share tends to be understated, especially in developing economies, because income from self-employment is recorded as capital income (Guerriero, 2012; ILO & OECD, 2015).

Labour share is unadjusted in this essay and is likely be a lower estimate of the true share of labour income. That mixed income as a category does not exist in the I-O tables informs the choice of non-adjustment. Nonetheless, non-adjustment does not affect trends of factor shares (Guerriero, 2012; ILO, 2010). Furthermore, the usefulness of labour shares is widely accepted because they are one of the few available sources of data on income distribution, and because most individuals subsist on wage income (Gollin, 2008).

For the purpose of this study, economic upgrading occurs when three conditions are met: (a) GVA in gross terms (at 2000 prices) increases; (b) gross operating surplus in gross terms (at 2000 prices) increases; and (c) GVA as a percentage of output increases. This is especially important for trend analysis. After all, the absolute value of GVA could rise over time on increased output but may in fact be declining relative to the output increase. GVA expressed as a share of output over time provides a consistent way of tracking whether the same amount of production contributes to value added accretion, which signifies economic upgrading. Social upgrading occurs when two conditions are satisfied: (d) employees' compensation in gross terms (at 2000 prices) increases; and (e) employees' compensation as a percentage of GVA (labour share, unadjusted) increases. In other words, employees' compensation must not only increase in gross terms but also as a share of GVA before it can be considered as proof of social upgrading.

4.4 Findings

GVA, Profits and Employees' Compensation

GVA and two of its components – gross operating surplus and employees' compensation – increased between 2000 and 2010 for the entire economy and the palm oil sector. Mostly importantly, all industries within the palm oil sector experienced increases in gross terms (at constant prices) in GVA, gross operating surplus and employees' compensation, thus meeting partial requirements for economic and social upgrading by satisfying conditions (a), (b) and (d). Despite internal variations, the palm oil sector as a whole consistently outperformed the entire economy in GVA, profits and employees' compensation growth in percentage terms. GVA at

basic prices for the entire economy grew by an average annual growth rate of 6.5%. During the same period, GVA for the palm oil sector grew at a faster rate of 9.4% annually (Table 4.1). Gross operating surplus for the entire economy increased by 5.7% per year, compared with 9.1% for the palm oil sector. Employees' compensation for the entire economy was 7.8%, compared with 9.6% for the palm oil sector. Nine out of the 12 palm oil industries recorded faster GVA growth than the corresponding sectors (primary/ secondary/ tertiary) to which they belong, used as sectoral benchmarks. Within the palm oil sector, the five fastest growing industries in GVA terms are oil palm (P2), animal feeds (P5), nutraceutical chemicals (P7), biofuel (P9), and business services (P12).

Table 4.1. Annual percentage change of gross value added, profits and employees' compensation for palm oil industries (2000 prices), 2000-2010.

Sector/ industry	*Code*	*Gross value added*	*Gross operating surplus*	*Employees' compensation*
Palm oil sector		9.4%	9.1%	9.6%
Primary				
Planting materials and nursery	P1	1.5%	0.9%	10.1%
Oil palm	P2	16.5%	16.2%	17.6%
Secondary				
Oils and fats	P3	9.4%	7.7%	13.7%
Food processing	P4	1.5%	2.2%	0.1%
Animal feeds	P5	9.1%	8.0%	11.2%
Basic chemicals	P6	4.8%	4.5%	6.3%
Nutraceutical chemicals	P7	19.8%	27.4%	10.4%
Soaps and detergents	P8	6.7%	7.1%	5.9%
Biofuel	P9	9.6%	8.5%	24.9%
Tertiary				
Wholesale and retail	P10	9.0%	7.5%	12.5%
Transportation services	P11	5.1%	7.6%	0.3%
Business services	P12	13.8%	19.5%	7.6%
Whole economy		6.5%	5.7%	7.8%
Primary sector	W-P	7.0%	6.5%	9.5%
Secondary sector	W-S	3.9%	3.9%	4.1%
Tertiary sector	W-T	7.6%	6.4%	8.9%

Source: Calculations from *Malaysia Input-Output Tables*, various issues.

For both the economy and the palm oil sector, employees' compensation grew faster than profits between 2000 and 2010. Profits grew by an average growth rate of 5.7% for the whole economy and 9.1% for the palm oil sector. By comparison, employees' compensation increased annually by 7.8% for the whole economy and 9.8% for the palm oil sector. Specifically, seven

out of 12 industries within the palm oil sector saw their employees' compensation grow faster than their profits. They are planting materials and nursery (P1), oil palm (P2), oils and fats (P3), animal feeds (P5), basic chemicals (P6), biofuel (P9), and wholesale and retail (P10).

GVA, Capital and Labour Shares

The average GVA share for the whole economy in 2000, 2005 and 2010 was slightly below 40%. Across the entire economy, the primary sector has the highest GVA share (generally above 70%), followed by the tertiary sector (approximately 50%) and the secondary sector (approximately 20%) (Figure 4.2). The relatively high GVA shares for the primary and tertiary sectors reflect their lower requirement for intermediate consumption than manufacturing. Intermediate consumption for manufacturing is typically high because it represents not only the basic materials, components and semi-finished goods going into the product, but also electricity, cost of rents, insurances, accounting, legal and other services used in the production of goods. Seven out of 12 industries within the palm oil sector experienced increases in their GVA shares, thus satisfying condition (c) to be considered having experienced economic upgrading (since conditions (a) and (b) are already satisfied). They are planting materials (P1), oil palm (P2), food processing (P4), animal feeds (P5), nutraceutical chemicals (P7), soaps and detergents (P8), and business services (P12).

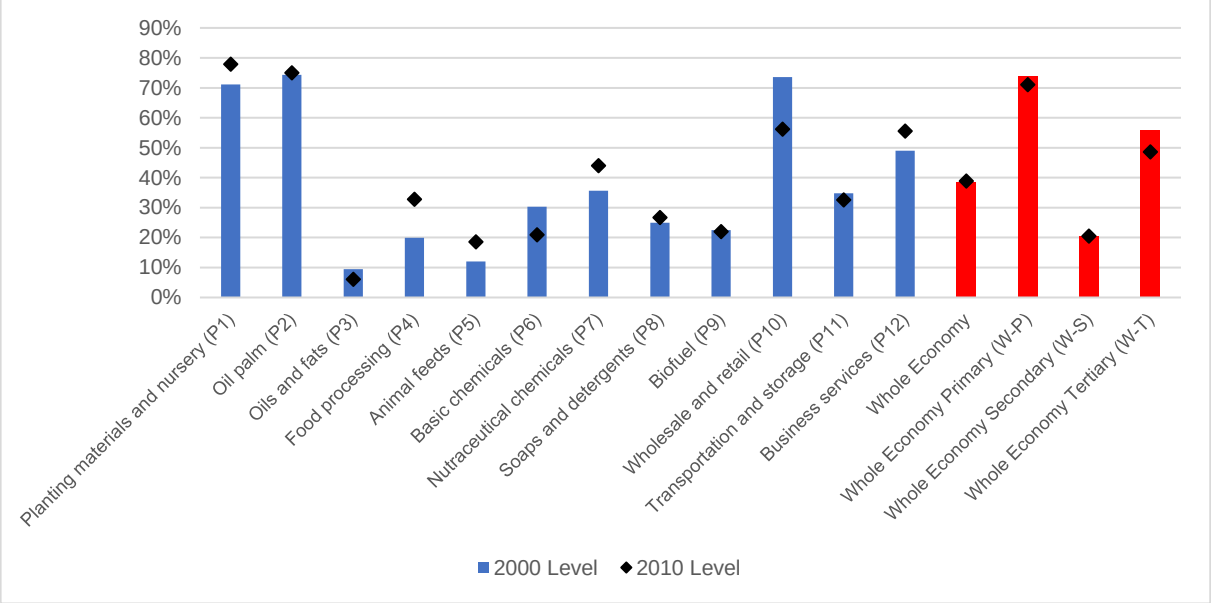

Figure 4.2. GVA as a percentage of output (GVA share) in palm oil industries, 2000-2010.

Source: Calculations from *Malaysia Input-Output Tables*, various issues.

Within the palm oil sector, the GVA shares for the two primary industries – planting materials and nursery (P1) and oil palm (P2) – appear broadly in line with their economy-wide sectoral

benchmark. Among the secondary industries within the palm oil sector, variations are more pronounced. Oils and fats (P3) had an unusually low GVA share at below 10% on average. This is likely related to the history of industry development. An export duty structure favouring exports of processed palm oil was introduced in the 1970s. It subsequently attracted massive investments and helped establish the local refining industry. However, it also created overcapacity in refining that lasted through the 1990s and drove down processing margins due to intense completion among refiners. The newer secondary industries within the palm oil sector had GVA shares which were higher than the economy-wide sectoral benchmark. These included basic chemicals (P6), nutraceutical chemicals (P7), soaps and detergents (P8) and biofuel (P9).

Gross operating surplus or profits was the largest component of GVA. During the periods for which data are available, on average, for every 100 MYR created in GVA for the entire economy, 70 MYR accrued to profits. For the entire economy, the primary sector had the highest capital share, at just below 90%. This was followed by the secondary sector (slightly above 70%) and the tertiary sector (at approximately 60%) (Figure 4.3). Employees' compensation was the second largest component of GVA.[35] For 2000, 2005 and 2010, on average, for every 100 MYR created in GVA for the whole economy, 30 MYR goes to employees' compensation. Labour shares mirror capital shares in that their sum amounts to almost 100%, since taxes less subsidies on production collected by the government have been negligible. As such, mirroring the trends in capital shares, the tertiary sector had the highest labour share at approximately 40%, followed by the secondary sector (slightly below 30%) and the primary sector (just above 10%) (Figure 4.4).

[35] Taxes on production less subsidies as the third component of GVA was not available in Malaysia's I-O Tables until 2010. In the data published for that year, taxes less subsidies accounted for a mere 1.2% of GVA.

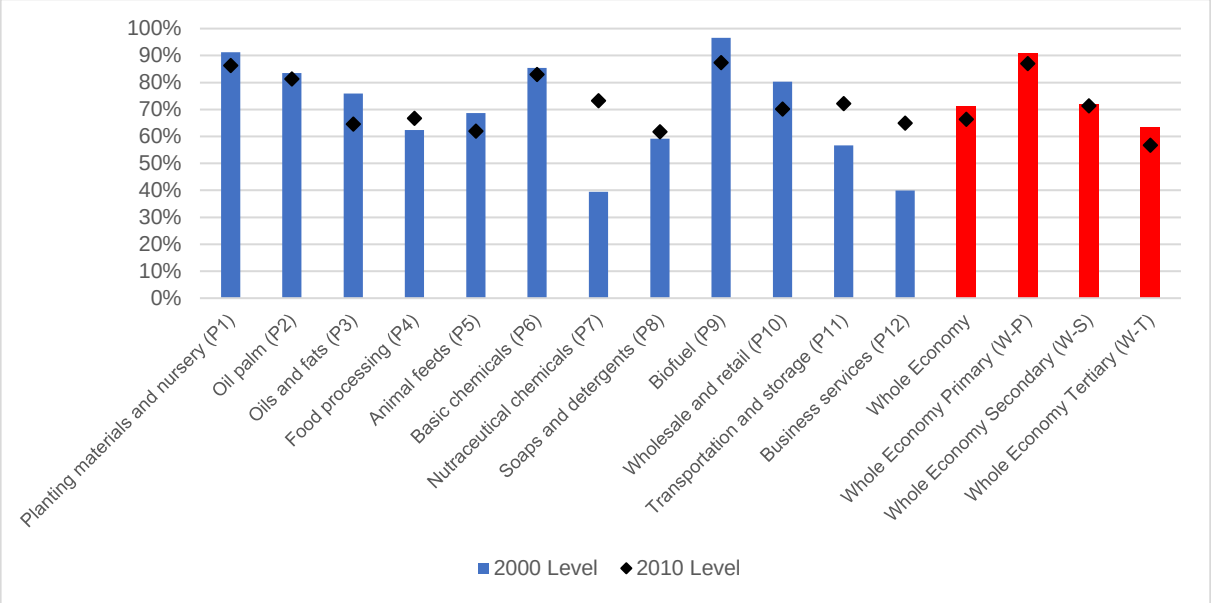

Figure 4.3. Capital shares in palm oil industries, 2000-2010.

Source: Calculations from *Malaysia Input-Output Tables*, various issues.

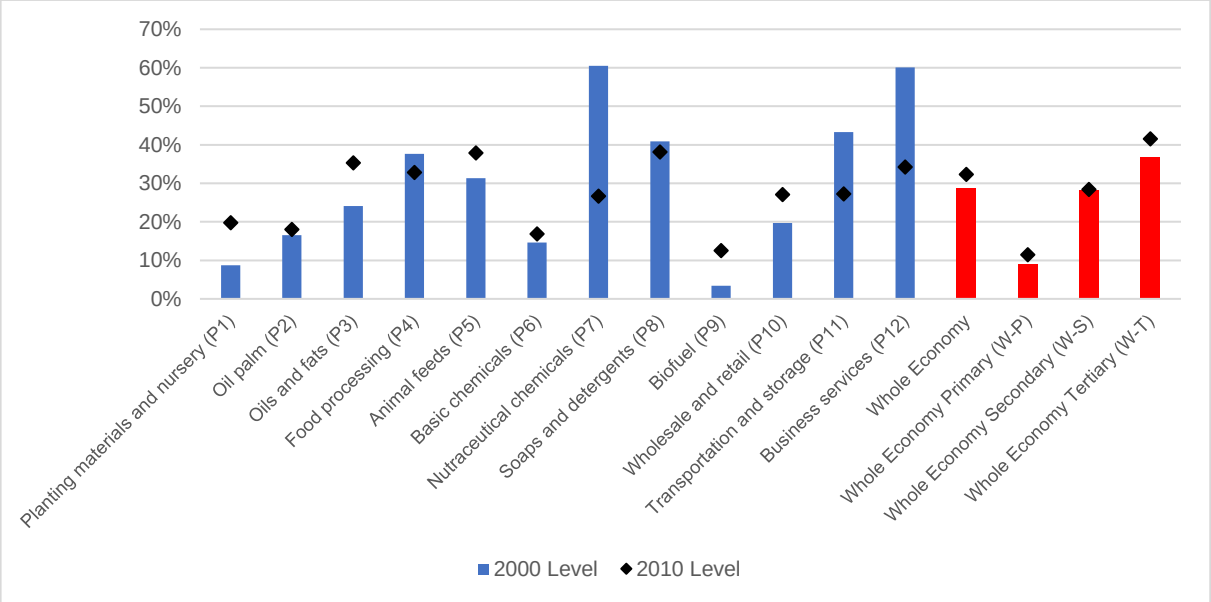

Figure 4.4. Labour shares in palm oil industries, 2000-2010.

Source: Calculations from *Malaysia Input-Output Tables*, various issues.

The exceptionally high capital share or low labour share for the primary sector was likely due to substantial existence of small farmers who are considered self-employed and not employees. Their incomes were treated as gross operating surplus in Malaysia's national accounts, which do not provide for mixed income. Mixed income is a concept similar to gross operating surplus but is used for unincorporated firms (such as small family businesses or self-employed people) because it is difficult to distinguish between remuneration for the work carried out by the owner

(or by family members) and entrepreneurial profit of the owner. Within the palm oil sector, the labour shares for the two primary industries – planting materials and nursery (P1) and oil palm (P2) – were close to 20% in 2010. This suggests that both industries, particularly oil palm (P2), use more hired labour than their peers in the primary sector. Except for basic chemicals (P6) and biofuel (P7), all secondary industries within the palm oil sector had labour shares that were broadly in line with or higher than their economy-wide sectoral benchmarks. While resource-based manufacturing activities may have minimal employment effects as suggested in the literature (in that that they do not create as many jobs), their labour shares seem at least comparable to those of regular manufacturing activities.

For the tertiary industries within the palm oil sector, wholesale and retail (P10) and transportation and storage (P11) had lower labour shares than their sectoral benchmark. The reasons differ for the two industries. For the former, the reason is possibly a large proportion of self-employed people, similar to what is observed in the primary sector. These self-employed people include traders, dealers and distributors of various inputs (machinery, fertilisers and agrochemicals) and palm products. For transportation and storage (P11), it is due to heavy use of capital such as vehicles, material handling equipment, information and communication technology, and storage facilities. By contrast, business services (P12) had a higher labour share than the sectoral benchmark. This was likely due to better pay for knowledge-intensive jobs associated with professions in legal services, accounting, technical and engineering advisory, and R&D. All in all, seven out of 12 industries within the palm oil sector experienced increases in their labour shares, thus satisfying condition (e) to be considered having experienced social upgrading (since condition (d) has been satisfied). The seven are planting materials and nursery (P1), oil pam (P2), oils and fats (P3), animal feeds (P5), basic chemicals (P6), biofuel (P9), and wholesale and retail (P10).

Taking GVA and labour share changes into account, the 12 palm oil industries are distributed over a four-way classification to illustrate their social and economic outcomes (Figure 4.5). An increase in the labour share means rising cost of production to business, which erodes its profitability and potentially its competitiveness too. Nevertheless, from the labour perspective, an increase in the labour share signifies social upgrading in that income distribution improves favouring wage earners. An increase in the GVA share indicates a shift to higher value added relative to output as a result of productivity gains (be it labour, capital or total factor productivity). Between the optimal and worst combinations (economic with social upgrading versus economic and social downgrading), it is also possible that economic upgrading is accompanied by social downgrading, or that social upgrading occurs despite economic downgrading.

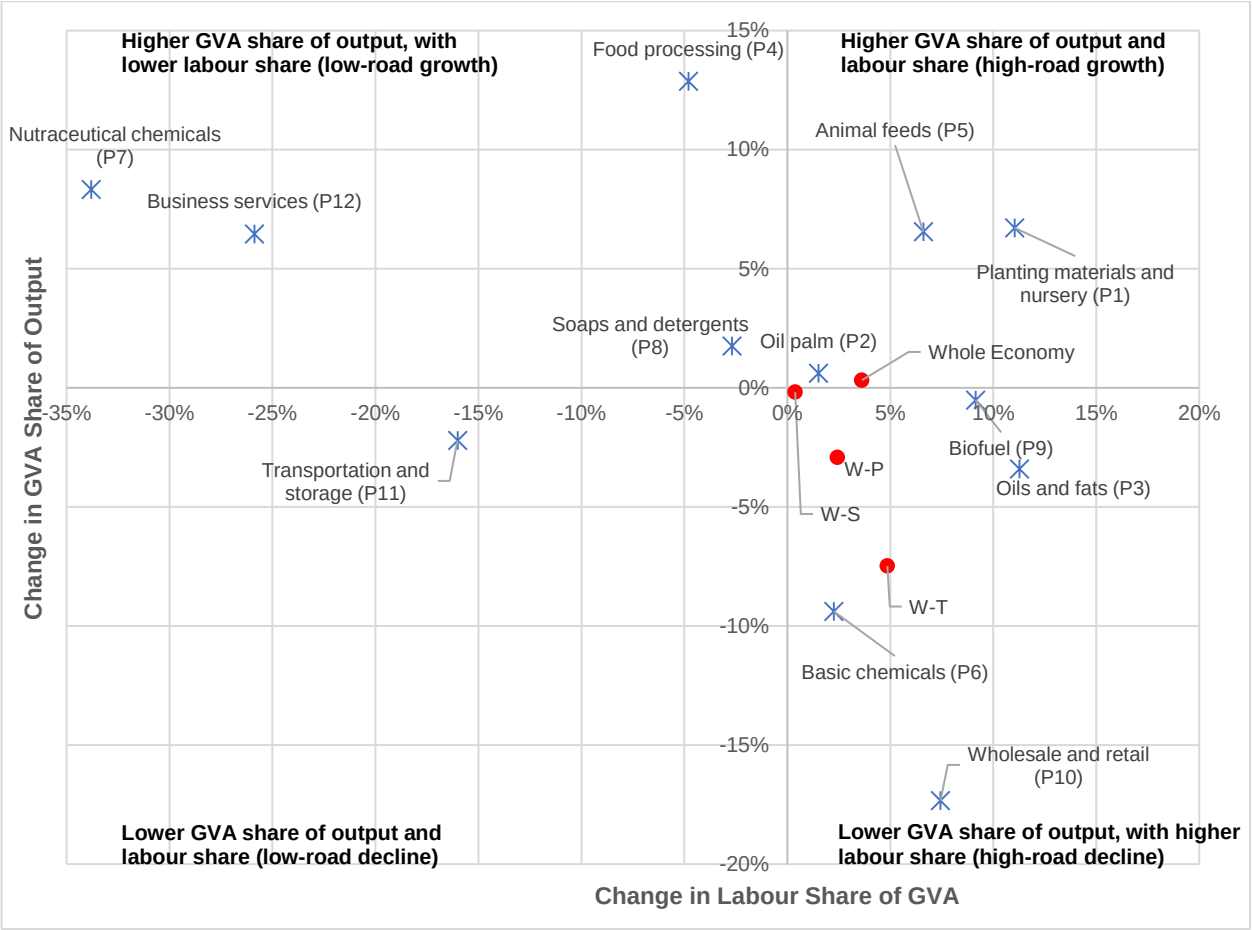

Figure 4.5. Percentage point change of GVA and labour shares in palm oil industries, 2000-2010.

Source: Calculations from *Malaysia Input-Output Tables*, various issues.

Notably, the entire economy underwent economic and social upgrading simultaneously between 2000 and 2010. The GVA share was fairly stable and increased by 0.3 percentage points, providing evidence of modest economic upgrading. The economy-wide GVA share advanced by a modest 0.3 percentage points. Compared with GVA share, labour share changes were more pronounced. Between 2000 and 2010, the labour share for the economy increased by 3.6 percentage points. The labour share for the tertiary sector grew the most, by almost 5 percentage points to more than 40%. The labour shares for the primary and secondary sectors increased by 2.4 and 0.4 percentage points respectively. In other words, the economy as a whole as well as its sectoral components experienced social upgrading when measured by labour share changes.

For the 12 industries within the palm oil sector, three experienced an increase in their GVA and labour shares, indicating high-road growth characterised by both economic and social upgrading. The three are planting materials and nursery (P1) and oil palm (P2), and animal feeds (P5). Of the three, planting materials and nursery (P1) gained the most in GVA and labour

shares in percentage point terms and by far outperformed even the primary sector benchmark. The GVA share for oil palm (2) increased in tandem with the commodity boom throughout the 2000s. Yet, its labour share growth was muted between 2000 and 2010. It was less than that of the economy-wide primary sector, and slower than even palm oil secondary industries whose GVA shares actually declined (in other words, economic downgrading).

In comparison, four industries experienced a decrease in their GVA shares but an increase in their labour shares, indicating low-road growth that is characterised by social upgrading with economic downgrading. Remarkably, most of these four industries experienced the worst declines in GVA shares compared to all 12 industries. Wholesale and retail (P10) was the most affected, recording a drop by 17.3 percentage points between 2000 and 2010. The next two industries that fell by the most were oils and fats (P3) and basic chemicals (P6), both of which have a longer history of establishment than other palm oil secondary industries. The GVA share for basic chemicals (P6) fell by 9.4 percentage points to 20.9%. The GVA share for oils and fats (P3) was already low relative to other palm oil secondary industries. It further declined by 3.4 percentage points to 6.1%. Yet, in terms of labour share growth, all three outperformed their respective sectoral benchmarks. However, all had relatively low average labour shares against their respective sectoral benchmarks historically.

Four industries recorded an increase in their GVA shares but a decrease in their labour shares, signalling low-road decline or economic upgrading with social downgrading. The four are food processing (P4), nutraceutical chemicals (P7), soaps and detergents (P8), and business services (P12). All had relatively high average labour shares against their respective sectoral benchmarks historically. Their increased GVA shares and decreased labour shares suggests that there could be capital deepening in the industries. Transportation and storage (P11) was the only among the 12 industries that experienced a decrease in both GVA and labour shares, pointing to high-road decline characterised by simultaneous social and economic downgrading. Productivity growth in transportation and storage (P11) slowed drastically from 2008 and did not recover until after 2010, coinciding with the trough of the global economic crisis then.

Occupational Structure and Employee Profile

The labour share for oil palm plantations (oil palm (P2)) is of particular interest within the palm oil sector for several reasons. First, oil palm plantations are the ‘progenitor’ that spawns the other industries which either use its inputs or supply to its production. They are concentrated in rural areas, where the incidence of poverty is usually the highest. Oil palm cultivation is thus an important source of income for rural populations and a useful tool for poverty reduction.

Additionally, it is extremely labour intensive especially in field maintenance and harvesting.[36] Some 35% of production cost in oil palm plantation is attributed to labour, which was the second largest cost component after fertiliser (39%) (MPOB, 2010c). More importantly, oil palm plantation has the highest number of workers, accounting for above 82% of workers employed in the palm oil sector, while refining, processing and other downstream activities account for 18% of the jobs within the palm oil sector (Table 4.2). Based on the type of job titles available and their skill classifications, oil palm plantations have mostly unskilled to semi-skilled positions requiring certificate qualifications and below, whereas refining and R&D activities have more skilled than unskilled and semi-skilled positions (Table 4.3).

Table 4.2. Number of workers in selected palm oil activities, 2008.

Activity	*Number*	*%*
Oil Palm Plantation (Primary)	500,817	82.1%
Milling (Secondary)	45,375	7.4%
Refining (Secondary)	6,860	1.1%
Crushing (Secondary)	956	0.2%
Oleochemicals (Secondary)	3,690	0.6%
Bulking Installations (Tertiary)	673	0.1%
Palm Fruit Dealers (Tertiary)	19,690	3.2%
Seed and Seedling Dealers (Tertiary)	26,100	4.3%
Palm Oil Dealers (Tertiary)	5,973	1.0%
Total	610,134	100.0%

Source: Malaysian Palm Oil Board.

Table 4.3. Job titles and skill classification in selected palm oil activities, 2008.

Activity	Skilled (Diploma and Above)	Unskilled/ Semi-Skilled (Certificate and Below)	Total
Plantation	6	14	20
Milling	7	8	15
Refining	28	12	40
Research and Development	5	0	5

Source: Ministry of Human Resources.

[36] Field maintenance includes weeding, water management, pruning, pest and disease management and manuring. The common harvesting method involves the use of a chisel or sickle to cut fresh fruit bunches off the top of palm trees that grow up to 30 feet. It is tedious and requires much time and care.

Despite a high labour requirement by oil palm plantations, the majority of workers are not local. The official definition of ‘foreign worker’ is a non-Malaysian citizen who is unskilled or semi-skilled, working in Malaysia using the Temporary Employment Visit Pass issued by the Immigration Department. Highly skilled workers and those with specialised expertise are officially classified as ‘expatriates’. As oil palm plantation area expanded rapidly from 54,638 hectares in 1960 to over 1 million hectares in 1980 and as the economy embarked on broad-based industrialisation, the industry was faced decreasing labour supply and rising labour costs.

The common prescription would be to gradually raise labour productivity and reduce labour requirements through mechanisation and retraining of workers. However, the oil palm plantation industry complained of ‘labour shortage’, taken to mean that it could not secure labour at the prevailing wages and work conditions. The construction industry made a similar complaint. The use of illegal foreign workers became widespread. Although unemployment was above 8% in the 1980s, the government eventually legalised the use of foreign workers for oil palm plantation, construction, and domestic help. This was extended to cover more industries over the years, including export-oriented manufacturing industries and food and beverage industries.

The number of documented foreign workers increased from about 380,346 in 1990 to over 2.1 million in 2014 (excluding another 1.3 million undocumented migrant workers), accounting for almost 15% of total labour force of 14 million. About 44% of migrant workers in Malaysia work in low-skilled occupations – often in work environments deemed ‘dirty, dangerous and difficult’ (3D jobs) (World Bank, 2015). Foreign workers remain concentrated in plantation and construction industries, and certain types of manufacturing. Of the 500,817 workers in oil palm plantations as of 2008, about three-quarters were foreign workers (Table 4.4). Some 80% of the production jobs, which require either primary or no formal education, were held by foreign workers. Meanwhile local workers dominated the management and administration positions and accounted for over 90% of the jobs. Indonesians made up over 90% of the foreign workers holding production jobs in oil palm plantations (Table 4.5). Bangladeshis were the second largest nationality group (4%).

Table 4.4. Distribution of oil palm plantation workers by work category and nationality, 2008.

Work Category	*Local*	*Foreign*	*Total*	*% of Foreign Workers*
Field Production	92,247	365,770	458,017	79.9%
Harvesting mandora	6,629	4,656	11,285	41.3%
General mandora	28,079	15,493	43,572	35.6%
Harvester	9,677	176,795	186,472	94.8%
FFB Collector	3,221	29,142	32,363	90.0%
Loose Fruit Collector	1,646	12,389	14,035	88.3%
Field Workers	26,290	91,814	118,104	77.7%
Other General Workers	16,705	35,481	52,186	68.0%
Management and Administration	39,495	3,305	42,800	7.7%
Executive	14,450	815	15,265	5.3%
Staff	25,045	2,490	27,535	9.0%
Total	131,742	369,075	500,817	73.7%

Source: Malaysian Palm Oil Board.

Table 4.5. Nationality of foreign workers in oil palm plantations, 2008.

Nationality (%)	*Mandore*	*Harvester*	*Fruit collector*	*General workers*	*Office workers*	*Total*
Indonesia	92.4	93.8	91.7	86.0	89.7	90.2
Bangladesh	0.6	1.7	4.0	6.5	0.1	3.9
Philippines	3.0	1.3	1.3	2.0	10.2	1.7
India	0.2	0.8	0.7	2.0	0.0	1.3
Thailand	0.1	0.2	0.4	0.1	0.0	0.2
Nepal	0.7	0.1	0.1	0.2	0.0	0.2
Myanmar	0.0	0.0	0.1	0.1	0.0	0.0
Others	3.1	2.3	1.6	3.0	0.0	2.5

Source: Malaysian Palm Oil Board.

A dualistic structure appears to have emerged in the palm oil sector. The plantation (upstream) segment accounts for over 80% of total jobs in the sector and remains labour intensive. Over 70% of the workers are foreign workers who have relatively low education attainment levels (primary or no formal education), while the level of mechanisation and automation in their daily work is relatively low. The downstream segment (e.g. refining, processing, others) makes up slightly less than a fifth of total jobs in the sector and has become increasingly capital intensive. Over 90% of the workers are local workers with relatively high education attainment levels (secondary education and above), while the level of mechanisation and automation is high.

The upstream employment and technological characteristics have been a major debate in recent years, mostly surrounding the causes and effects of such characteristics. Some hold the

view that indiscriminate government policy to allow the influx of foreign workers has enabled plantation operators to continue with their existing production mode and cost structure. The availability of foreign workers is said to dampen wage growth for local workers and slow down the pace of farm mechanisation and automation.

Others, however, see labour intensity as a persistent characteristic of the upstream segment. They point to the improved labour to land ratio, widely used as a performance indicator for oil palm plantations, from 1:4 (meaning one worker to service four hectares of land) in the 1980s to 1:9 in the early 2010s as proof of mechanisation and automation in the plantations. However, they caution that the anatomy of oil palm severely limits the scope for further mechanisation and automation in plantations, especially in harvesting. Furthermore, they argue that demand for labour in the plantations cannot be fully met by local labour supplies. Improvements in wages and work conditions would not attract local workers in sufficient numbers, because local workers will always be reluctant to work in oil palm plantations due to distance from urban centres, regimented lifestyle in plantations, and rising levels of education.

The government has enacted measures to reduce the reliance on foreign workers and to encourage farm mechanisation and modernisation. It remains to be seen if the measures produce results as intended. Mechanisation may reduce labour requirement but will not entirely change labour use in the foreseeable future. Major progress has been made in the areas of in-field fruit collection, fertiliser application, and mainline transport but mechanised harvesting has been attempted without success. It is likely that the dualistic structure within the palm oil sector will persist in the medium term.

4.5 Discussion

The bulk of the capital share accrues to industrial-scale plantation firms, the biggest of which are controlled by state and private local capital. Such firms held over 60% of oil palm plantation hectarage, compared to 14% held by independent smallholders and 24% held by government smallholder schemes. The state collects revenues from the palm oil sector through various taxes and cesses, as well as through massive dividend payment from its shareholdings in plantation firms. Varkkey (2016) describes the palm oil sector as an “easily accessible strategy to obtain rents (from natural resources)” that allows ruling elites to “enrich themselves and inner circle” and to “appease the masses through large-scale distribution policies”. Khor et al. (2015) argue that state and private local capital did not just profit from the operations of oil palm plantations; they also benefited substantially from timber logging during the initial phase up to the 1980s, when oil palm plantations encroached on primary and secondary forest land.

Notwithstanding these strictures, the palm oil sector is generally regarded as a vehicle through which relatively sound social policies were pursued. The rural development schemes associated with the palm oil sector were by far the most effective in reducing rural poverty given their large scope (Zin, 2014). This had the effect of reducing the poverty rate among the *Bumiputeras* from 64.8% in 1970 to 2.2% in 2012 and narrowed the gaps between the *Bumiputeras* and other ethnic groups in Malaysia (Figure 4.6). Lifting the *Bumiputeras* out of poverty had a remarkable impact on Malaysia's poverty rate. From 49.3% in 1970, it fell to 1.7% in 2012 despite the tripling of population, placing Malaysia among Asian countries with the lowest poverty rates (Figure 4.7). The United Nations Development Programme ranks Malaysia 59th on its 2016 Human Development Index and designates it as a country with 'high human development'. The lack of data on independent smallholders does not allow an analysis of the change in their welfare and income. However, it is likely that they have benefited from recent government efforts to assist all smallholders, and not just smallholders organised through various government schemes.

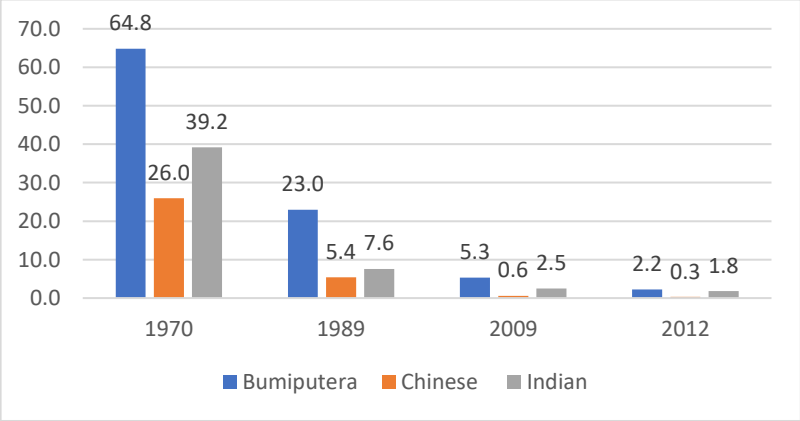

Figure 4.6. Poverty rate by ethnic groups, 1970-2012.

Source: Economic Planning Unit.

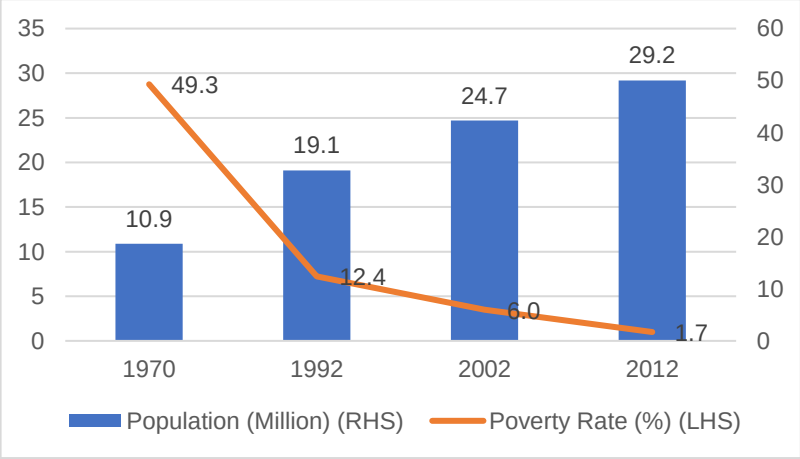

Figure 4.7. Population and poverty rate, 1970-2012.

Source: Economic Planning Unit.

The palm oil sector's contribution to poverty reduction and social development is likely to have spread beyond its national border through remittances sent home by migrant workers. Malaysia had the 26th highest stock of immigrants and was ranked 16th among top remittance-sending countries in 2013 (Ratha et al., 2016). Total remittance was US$8.1 billion in 2014, the second highest in Asia Pacific after South Korea's US$9.5 billion.

The findings in this paper however suggest more complex contours in which different stakeholder groups appear to have benefited in varying degrees from the development of Malaysian palm oil sector. Labour share expands when wage growth outpaces growth in labour productivity. The labour share for plantation workers grew at the slowest pace among seven industries whose labour shares expanded during the 2000-2010 period. This means wage growth for plantation workers relative to growth in their labour productivity was not as fast as that of workers in the other downstream industries.

Slower growth in labour share is not on its own an issue for concern; it is possible that labour productivity for plantation workers simply lagged that of other workers. While the lack of data on detailed employee numbers does not allow a cross-industry and cross-year comparison, one indicator suggests the former's labour productivity growth could be at least comparable to that of the latter. Between 2000 and 2010, the CPO extracted from per tonne of FFB rose consistently from 0.175 to 0.194 tonnes. Among the most important factors affecting the extraction rates are the ripeness of the fruits harvested, and the ability to collect the harvested fruits for timely delivery to processing sites – both of which are tasks performed by plantations workers. What is of further concern is the historically low labour share in oil palm plantations, which account for over 80% of workers in the palm oil sector, compared with other industries. The low and slow-growing labour share of plantations workers can be explained by weak institutional arrangements and the lack of political representation to protect their rights vis-à-vis workers in downstream industries.

Institutional Arrangements

Workers' welfare and well-being in Malaysia are stipulated and protected by law. Briefly, the Employment Act 1955 establishes the minimum legal terms and conditions of employment in Peninsular Malaysia, such as rest days, annual leave, sick leave, holidays, maternity allowance, conditions for dismissal, and termination benefits.[37] The Industrial Relations Act 1967 provides

[37] Sabah and Sarawak have their own labour ordinances providing for slightly varied terms and conditions.

for conclusion of collective agreements between employers and trade unions to guide the minimum terms of individual employment contracts. The Workers' Minimum Standards of Housing and Amenities Act 1990 prescribes the minimum standards of housing and various health and social amenities for workers and their dependants. Both local and foreign workers generally enjoy the same terms, except in specific instances such as redundancy where foreign workers will be terminated first. Foreign workers are also excluded from the Employees' Provident Fund Act 1991 and the Employees' Social Security Act 1969. The former mandates compulsory savings for retirement in old age, while the latter provides social security in the event of injury and death.

In practice, the provisions and enforcement of labour laws are inherently discriminatory and biased against migrant workers, which lead to many abusive practices against them (Table 4.6). For instance, great disparities exist in occupational safety and health. Protection of injured workers and their dependants comes under the Social Security Organisation (SOCSO) scheme under the Employees' Social Security Act 1969, and the compulsory insurance scheme under the Workmen's Compensation Act 1952. The SOCSO however is limited to local workers while migrant workers enjoy significantly lower benefits and compensation under the Workmen's Compensation Act 1952.

Table 4.6. Common abusive practices against foreign workers.

– Absence of employment contracts or contracts that are not honoured, given that the terms and conditions become less favourable compared to those that were agreed upon before their departure from their homeland.
– Outsourcing system that denies workers the benefits of collective bargaining agreements, given that the terms are agreed upon between recruitment agents and employers.
– Non-payment of wages and unfair dismissal.
– Wrongful deduction of wages to cover the cost of the work permits (though it is mandatory for employers to bear the cost).
– Substandard living conditions and lack of workplace protection against industrial injuries.
– Passports withheld by employers and recruiting agents, leaving them vulnerable to arrest, ill-treatment and extortion by police.
– Some outsourcing companies recruit, transport and receive workers through fraud and deception (e.g. jobs that do not exist; different economic sectors; different destination of work) mainly to exploit them, resulting in migrant workers becoming victims of trafficking in persons. The Malaysian border police and immigration authorities are said to be directly involved in trafficking.

Source: Adapted from Devadason and Chan (2014).

Foreign workers in general also have weak union rights. Foreign workers were previously barred from joining unions on the basis that they were in the country for a temporary period, and that existing labour laws were adequate to safeguard workers' rights. In 2001, the government amended the labour laws to allow foreign workers to become ordinary union members with

voting rights who are nonetheless not eligible to be union office bearers. The effects of such legislative changes on workers' rights and union memberships are unclear. Civil rights groups and trade unions assert that foreign workers are continuously subject to pressure from their employers and the immigration authorities to not join unions.

Cvil rights groups and trade unions have long contended that plantation workers' rights was a low policy priority to the government, even before the labour force became dominated by foreign nationals. Historically, plantation workers were mostly of Southern Indian origin. Tin mining and monocropping in the form of rubber plantations were the twin pillars of the British Malayan economy. Unable to attract local Malays to work in rubber plantations, European planters turned to indentured migrant labour from India (Kaur, 2014b). Indian labour mobility was confined to the plantation industry, first rubber and then oil palm, which contributed to their marginalisation in Malaysia's subsequent economic development. Plantation workers have been represented by the National Union of Plantation Workers, which was established in 1954 by merging various smaller trade unions then. Yet, it was not until 2001 that they received monthly wages by law. Before then, the government often resorted to the twin arguments of 'twilight industry' and domination by foreign workers as reasons that monthly wages for plantation workers were irrelevant (Ramasamy, 2001).

Another issue that complicates foreign workers' union rights is the legal ambiguity as to who their employers are. Foreign workers must first be employees at their workplaces before they can join unions (where unions exist) and enjoy common workers' rights such as inclusion under collective bargaining agreements. Yet, the exercise of such rights has been undermined by the rise of third-party 'labour outsourcing agents' or 'labour contractors' since 2007. Under labour contracting arrangements, firms engage labour contractors for labour supply and pay the contractors, not the workers. While the firms are in charge of control and supervision of the workers, the workers are not legally their employees. At the same time, because labour contractors are registered formally as recruitment agencies for foreign workers, they also do not consider the workers to be their employees.

The government institutionalised labour outsourcing in its amendment to the Employment Act in 2012. The practice of labour contracting proves more contentious than workforce casualisation, another trend that is becoming common. Casual or contract workers at least have clearly defined employers, despite not having permanent employment. With labour contracting, there have been cases where foreign workers were paid below minimum wage, cheated out of months of salary, and had their passports unlawfully detained by the contractors (thus limiting

their mobility) (Hodal & Kelly, 2016; Pattisson, 2016).[38] Foreign workers who entered the country illegally through human smuggling suffered the harshest abuses. Many supposedly ended up working in oil palm plantations (Al-Mahmood, 2015). The US State Department previously consistently placed Malaysia at the lowest rank of Tier 3 in its annual Trafficking in Persons Report, with oil palm plantation cited as an industry plagued by "bonded or forced labour". Malaysia was later elevated to Tier 2 at a time when the US had concluded the 12-country Trans-Pacific Partnership Agreement negotiations with Malaysia but was barred from signing a free trade pact with a Tier 3 country (ibid).

Even when employed legally and directly by plantation firms, foreign workers are exposed to poor working and living conditions. Smaller plantations had a higher tendency than large plantations to not pay foreign workers with minimum wage and provide them with proper facilities. There were other less tangible forms of circumstances that increased possibilities of abuse. For instance, being foreign nationals and given the remote location of plantations, the workers had to rely on their mandores and managers for supplies in day-to-day sustenance. In addition, Malaysia's use of a state-sponsored paramilitary group known as the People's Volunteers Corp (RELA for its Malay acronym) to check travel documents and immigration permits of foreigners has led to allegations of extortion and theft against foreign workers (Burton, 2007).

Since 2013, Malaysia's has introduced the Minimum Wage Order to set minimum wage for all industries. It was set initially at 900 MYR for Peninsular Malaysia and 800 MYR for Sabah and Sarawak, and revised to 1,000 MYR and 920 MYR respectively since mid-2016. The government positioned the initiative as critical for improving the skills, productivity and economic conditions of the labour force. Given the government's mixed track record with enforcement, there is much scepticism with regards to the effect of the new minimum wage rule on the labour share for oil palm plantation workers, especially the foreign workers.

In the context of oil palm plantations, the policy imperative behind minimum wage is more rooted in strategic concerns about labour shortage than improvement in social conditions. The number of Indonesian workers who are prepared to work in Malaysian oil palm plantations is

[38] The claim was made by a group of Nepalese workers who were among those provided by a labour contractor to the operations of McDonald's (the US fast food conglomerate) in Malaysia. The workers claimed they were deceived about their wages and were charged additional fees upon arrival in Malaysia, in addition to experiencing late salary payment. McDonald's had earlier ended the contract with the labour contractor in question after it became aware that the services provided "were not in compliance with our standards".

said to be declining in recent years (Chow, 2017). This is due to the weakening of Malaysia's currency against the Indonesian rupiah, and increased demand for labour in Indonesia as new plantations open there. As labour costs rose in Indonesia and wage differentials between the two countries narrow, Indonesians may prefer seek jobs elsewhere or remain in their own country, driven by non-income-based considerations such as not having to relocate or be separated from family. Success in sourcing for labour from other countries is not guaranteed and will not resolve the risk associated with high labour requirement. In recent years, labour shortages have caused losses amounting to 15% of ripe fruits in oil palm plantations due to insufficient numbers of harvesters (MPOB, 2010c).

Political Representation

The absence of political representation for migrant workers further undermines their social upgrading prospects. Foreign workers are employed for a period of 10 years for all permissible sectors and they may not marry nor bring their family members into Malaysia. This places them outside political life and keeps them voiceless and passive.

To fully appreciate the importance of political representation and power, the development concerning the historically vulnerable group, the smallholders, is instructive. The smallholders are legally not workers and therefore the above-mentioned laws and regulations governing workers' rights do not apply to them. Yet, this does seem to affect their welfare since smallholder inclusion has been a high government priority due to the alignment of Malay poverty with Malay political power (Lim, 2011). In 1957, over 70% of the population of the subsistence sector was Malay. For the 1955 and 1959 general elections, as the allocation of Parliamentary seats was weighted in favour of the rural areas, the Malays formed the majority of the seats and wielded the political power to demand institutional arrangements and programmes for agricultural and rural development (McGee, 1962; Lim, 2011).

Seen in this light, the economic significance of oil palm plantations for Malaysia only partly explains government assistance to smallholders. Electoral politics and social stability have been important calculations for government policy too. Since its inception, Felda's participation has been limited to Malays, the largest ethnicity group accounting for slightly above half of Malaysia's population. Felda areas, at over 850,000 hectares, account for 9% of Malaysia's 13 million registered voters (Khor et al., 2015). Studies have shown that Felda settlers constitute a 'vote bank' for Umno, the leading party within the ruling coalition. It is estimated that of the 180,000 independent smallholders, at least three quarters are Malays. Almost a third of the independent smallholders are concentrated in the state of Johore in southern Peninsular

Malaysia, the founding place of Umno where the party has won every past general election with a comfortable two-thirds majority.

The most notable government assistance targeting the Malays was the Federal Land Development Authority (Felda), which was set up in 1956. Landless peasants were given land plots to work on, in addition to being provided with complementary housing and recreational facilities and social services (piped water, electricity and access roads) as part of a package deal. Smallholders were provided with income until the trees began to produce an income. Felda would purchase and process the oil palm produce from it settlers. Subsidised credit and other essential farm inputs as well as extension services were provided to reduce real costs of production (Zin, 2014).

Settler intake ceased in 1990 due to high programme costs. But by then, it was widely recognised as a success story for rural land development (Khor et al., 2015; Pletcher, 1990). The current number of settler families, who became known as 'organised smallholders', stands in excess of 110,000. Felda settlers received not only incomes for their produce, but also secondary income in the form of investment returns from their cooperative entity, Koperasi Permodalan Felda (KPF). Smallholders' cash income fluctuates depending on palm oil prices and is estimated to range between 1,200 to 3,000 MYR during the past decade (compared to a monthly cash income of 500 to 650 MYR for plantation workers, excluding housing and utilities) (Choo, 2013; Khor et al., 2015).

The independent smallholders, defined as those who are self-financed and manage their own plantation land (of less than 40.5 hectares) outside state-sponsored smallholder schemes, have also received increasing government subsidies and assistance. For instance, the Oil Palm Replanting and New Planting Scheme offered subsidies up to 9,000 MYR per hectare for some 36,000 hectares held by independent smallholders since 2012. They were also given huge discounts on equipment such as mechanical harvesting poles.

Signs are emerging that past policies favouring the Felda settlers are coming under financial pressure. Historically, Felda settlers derived 20 to 30% of their monthly income from their investments in KPF, whose key assets included a 51% stake in of Felda's milling, transportation and other downstream business. The investment returns per year averaged 14% over a 30-year period. However, in 2012 KPF sold off the stake to Felda Global Ventures (FGV) in exchange for cash and shares in FGV, which was preparing for a listing on Malaysia's stock exchange. The exercise was expected to subject FGV to market disciplines, as an indirect way to strengthen Felda's commercial viability and overall efficiency. It was also expected to raise

working capital for Felda/ FGV's expansion. The disposal of key assets by KPF significantly affects its future investment returns as downstream income increasingly accrues to FGV (Khor et al., 2015). This has led to concerns over the dilution of socio-political agenda of Felda by commercial considerations.

However, given Felda settlers' considerable influence and power in electoral politics, the government will continuously find new ways to accommodate their needs. Since the early 2000s, the National Felda Settlers' Children Society (Persatuan Anak Peneroka Felda Kebangsaan or Anak) representing the second and third generations of Felda settlers have protested that they have little economic opportunity (given that government land schemes are located far away from urban growth centres) and limited social mobility compared with the previous generation. In response, the government has introduced new education programmes (training and scholarships for certificate and diploma levels), entrepreneurship loans and incentives, and new housing projects catering to the children of first-generation settlers (Salih et al., 2014).

The lack of political representation for foreign workers has been at times addressed by their national governments at the bilateral level, with limited impact. In 2009, amid cases of torture and deaths at the hands of employers, the Indonesian government intervened with a moratorium on the recruitment of Indonesian workers for work in Malaysia (Kaur, 2014a). However, this was only limited to domestic workers. The ban was lifted in late 2011 after an agreement was reached between Indonesia and Malaysia to provide a day off to the workers, allow them to keep their passports, and receive salaries in their bank accounts. For foreign workers in the plantation sector, their governments make intermittent threats to stop sending their workers to Malaysia but there has been no reliable evidence that they were carried out.

4.6 Conclusion

Development of Malaysia's palm oil sector is a relatively successful example of economic upgrading. Between 2000 and 2010, most industries with the palm oil sector recorded higher GVA in gross terms and as a share of their respective output. Economic upgrading was accompanied by increased employment in higher value activities in the modern sectors, and improved income for domestic and migrant workers. Social upgrading, defined as higher employees' compensation in gross terms and as a share of GVA, is observed in most of the industries. However, the benefits were unevenly spread across groups. Capital owners (including smallholders) in the labour-intensive plantation industry, as well as skilled labour in capital-intensive processing and services industries enjoyed relatively higher shares of GVA. These held steady or continued to grow. The labour share for migrant workers who account for

60% of the sector's total workforce and perform low-skilled jobs in primary production, was historically low and only grew marginally, with no evidence to suggest that their productivity growth was slower than that of their local semi-skilled or skilled counterparts in secondary industries. Weak institutional arrangements and political representation did little to help improve their share of income.

The essay provides further evidence to existing work which shows that economic and social outcomes do not perform in a synchronised manner. With resource-based industrialisation, economic upgrading can be achieved in agro-commodity chains. It creates fewer jobs and tends to favour semi-skilled and skilled labour as predicted. Much attention has been rightly accorded in the literature to smallholders' welfare given that they form the structural backbone of the rural economy, with extensive linkages with rural farm and non-farm sectors. However, the impact of value chain development on migrant workers as a subject receives much less attention in GVC research. As reflected in this essay, migrant workers encounter much difficulty because they lack power to engage in political action, and are excluded from rights and entitlements associated with citizenship and residency. It demonstrates a potential area for future GVC research because of its direct relevance to social outcome. GVCs do not always bring about benefits but may in fact produce and reproduce the chronic conditions that worsen the vulnerability and disposability of the marginal workforce (Phillips, 2016). However, one must avoid assumptions that migrant workers lack agency to respond to their conditions through participation and action. Much work is needed in this area.

Migrant workers will form an increasingly important part of the labour force in various value chains. On the demand side, an industrialising society will eventually exhaust its unlimited pool of labour supplies and will have to rely on migrant workers to fill slots vacated by domestic population. On the supply side, migration has been on the rise as people seek better opportunities outside their countries of birth. One area of potential concern is that international migration is driven more by South-South migration (38% of the total migrant stock in 2013) than other types of migration (Ratha et al., 2016), and that many developing countries have weaker institutions and policies for ensuring labour rights. There have also been concerns that rules associated with labour and other social standards in developed-country markets may be used as non-tariff barriers that are more restrictive than necessary to achieve intended goals. Discussion of decent work and rights for migrant workers is highly politicised and proves difficult even in advanced economies. Nonetheless, it must be addressed if social upgrading potential of GVCs is to be more equitably and sustainably realised.

5 Falling Behind, Keeping Up or Catching Up?

Development of the Malaysian palm oil sector shows that agro-commodity value chain upgrading can be achieved by building forward and backward linkages around a country's initial position in production of primary resources. While the scope for linkage development is determined by a number of factors and varies across countries and products, the development experience of the Malaysian palm oil sector certainly does not conform neatly to vertical specialisation or concentration in upstream production. Linkage development and resource-based industrialisation (RBI) require an appreciation of agriculture from value chain and agribusiness perspectives. They must form part of a broad economic diversification strategy which combines effective state policies and firm-specific actions, and uses resource rents for making productivity-enhancing investments rather than consumption. It entails preparedness to accept short-run welfare losses, and the ability to find markets to absorb increased supplies.

A reversal of policy biases against agriculture will be welcome. Heavy taxation on agriculture relative to other sectors in developing countries as well as protection measures of the advanced economies stand out among such discrimination. However, removing the constraints is insufficient. The case of Malaysian palm oil highlights the necessity of selective, active intervention for linkage development as well as the salience of some common functional policy features. These include trade measures, indigenous innovation and physical infrastructure. Other desirable features are continuous public-private coordination, in which government can elicit information from the private sector about constraints and opportunities to minimise mistakes, as well as transparent tracking of industry performance and dissemination of such information. The tricky part is to avoid using intervention to compensate for inefficiency and allowing low-productivity firms to become entrenched lobby interests, complicating future policy change. Policy design should also incorporate distributional considerations to better align economic and social upgrading.

Some cautionary notes are as follows. First, agricultural commodities have different agro-ecological and production requirements as well as initial cultivation and land use histories. Country differences also exist in contextual determinants of linkage development, including government capabilities and nationality and nature of ownership. Second, most of the upgrading as described in the case study occurred at a time when chain governance was loose and buyer-drivenness was relatively low. Much has since changed with procurement system modernisation characterised by a shift from spot market relations to the use of vertical coordination mechanisms such as explicit or implicit contracts (Reardon & Barrett, 2000; Reardon et al.,

2009). Entry barriers and conditions for continuous participation for suppliers have indeed increased.

Third, the policy space for linkage development has shrunk considerably since the 1990s with rules introduced by the World Trade Organisation, international financial institutions and preferential trade agreements (DiCaprio & Gallagher, 2006). Developing countries are likely to continue to work around and circumvent restrictions imposed by trade rules and free trade agreements. The constraints become real when one WTO member successfully mounts a legal challenge against another for the use of a particular policy. Nonetheless, the possibility of a legal challenge on its own introduces uncertainty, which bears a cost (Low & Tijaja, 2014).

Lastly, the "full flowering of global oligopolistic capitalism" over the recent decades has made it more difficult for developing country firms to become globally competitive 'national champion' firms with leading technologies and brands that could drive national development (Nolan, 2014a). In sector after sector, the number of lead firms shrunk while the degree of global industrial concentration increased greatly. The most visible part consists of the well-known firms with superior technologies and powerful brands. In 2007/2008, the world's top 1,400 firms (the G1400) invested a total of US$545 billion in R&D. The top 100 firms, all from the high income countries, account for 60% cent of the total R&D spending of the G1400, while the bottom 100 firms account for less than 1% of the total. In other words, around 100 or so firms in a small number of high-technology industries sit at the centre of technical progress in the era of globalisation (ibid).

5.1 Upgrading in the Age of GVCs

By the early 2000s, within the high value-added, high technology and strongly branded segments of global markets, which serve mainly the middle and upper income earners who control the bulk of the world's purchasing power, a veritable 'law' had come into play: a handful of giant firms, the 'systems integrators', occupied upwards of 50% of the whole global market (Nolan, 2014b). The pressure for consolidation and concentration is transmitted from the global lead firms is subsequently transmitted down to their suppliers in different tiers in what Nolan et al. (2008) describes as 'cascade effects'. These dynamics are indeed visible in the agribusiness sector. The case of Malaysian palm oil highlights that while upgrading is possible up to an extent, the challenge for developing-country firms to catch up with immensely powerful TNCs is in the GVC era of economic globalisation is more daunting as ever. After decades of work, seven Malaysian-controlled firms featured among UNCTAD's lists of the world's largest agribusiness TNCs by foreign assets and sales in 2007 (Table 5.1).

Table 5.1. The world's largest agribusiness TNCs by foreign assets and sales, 2007.

Rank	*Agriculture-based and Plantation*		*Suppliers of Agriculture*		*Food and Beverage*		*Food Retail*	
1	Sime Darby Bhd.	Malaysia	BASF AG	Germany	Nestlé SA	Switzerland	Wal-Mart Stores	US
2	Dole Food Company, Inc	US	Bayer AG	Germany	Inbev SA	Netherlands	Metro AG	Germany
3	Fresh Del Monte Produce	US	Dow Chemical Company	US	Kraft Foods Inc	US	Carrefour SA	France
4	Socfinal SA	Luxembourg	Deere & Company	US	Unilever	UK, Netherlands	Tesco PLC	UK
5	Charoen Pokphand Foods PCL.	Thailand	EI Du Pont De Nemours	US	Coca-Cola Company	US	McDonalds Corp.	US
6	Chiquita Brands Int', Inc.	US	Syngenta AG	Switzerland	SAB Miller	UK	Delhaize Group	Belgium
7	Kuala Lumpur Kepong	Malaysia	Yara International ASA	Norway	Diageo Plc	UK	Koninklijke Ahold NV	Netherlands
8	KWS Saat AG	Germany	Potash Corp. of Saskatchewan	Canada	Pernod Ricard SA	France	Sodexo	France
9	Kulim (Malaysia) Bhd.	Malaysia	Kubota Corp.	Japan	Cadbury PLC	UK	Compass Group PLC	UK
10	Camellia PLC	UK	Monsanto Company	US	Bunge Ltd.	US	Seven & I Holdings Company Ltd.	Japan
11	Seaboard Corp.	US	Agco Corporation	US	Heineken NV	Netherlands	China Resources Enterprise Ltd.	Hong Kong
12	Sipef SA	Belgium	The Mosaic Company	US	Pepsico Inc	US	Yum! Brands, Inc.	US
13	Anglo-Eastern Plantations PLC	UK	ICL-Israel Chemicals Ltd	Israel	Molson Coors Brewing Co.	US	Autogrill	Italy
14	Tyson Foods Inc	US	Provimi SA	France	Kirin Holdings Company Ltd.	Japan	Alimentation Couche Tard Inc	Canada
15	PPB Group Bhd.	Malaysia	Bucher Industries AG	Switzerland	Archer-Daniels-Midland Co.	US	Safeway Incorporated	US
16	Carsons Cumberbatch PLC	Sri Lanka	Nufarm Ltd.	Australia	Associated British Foods PLC	UK	Sonae Sgsp	Portugal
17	TSH Resources Bhd.	Malaysia	CLAAS KGaA	Germany	Carlsberg A/S	Denmark	George Weston Ltd.	Canada
18	Multi Vest Resources Bhd.	Malaysia	Sapec SA	Belgium	HJ Heinz Company	US	Dairy Farm Int'l Holdings Ltd.	Hong Kong
19	Bakrie & Brothers Terbuka	Indonesia	Terra Industries Inc	US	Danone	France	Jeronimo Martins SA	Portugal
20	PGI Group PLC	UK	Aktieselskabet Schouw & Company A/S	Denmark	Anheuser-Busch Companies Inc	US	Kuwait Food Company (Americana) SAK	Kuwait
21	Firstfarms A/S	Denmark	Genus PLC	UK	Wilmar International Ltd.	Singapore	Kesko OYJ	Finland
22	New Britain Palm Oil Ltd.	PNG	Scotts Miracle-Gro Company	US	Sara Lee Corp.	US	Starbucks Corp.	US
23	Karuturi Global Ltd.	India	Kverneland ASA	Norway	Constellation Brands Inc	US	Burger King Holdings, Inc.	US
24	Nirefs SA	Greece	Sakata Seed Corp.	Japan	Fraser & Neave Ltd.	Singapore	Maruha Nichiro Holdings, Inc.	Japan
25	Country Bord Holdings Ltd.	South Africa	Auriga Industries A/S	Denmark	Danisco A/S	Denmark	Familymart Company Ltd.	Japan
44					IOI Corporation Bhd.	Malaysia		

Source: World Investment Report 2009.

The seven firms are present mostly in the plantation segment, despite having expanded into the processing segment. In general, developing country firms are absent in most other segments such as agricultural input supply, food and beverage, and food retail. These segments are characterised by ownership of created assets such as brands, superior technologies, logistics expertise, marketing capabilities and intellectual property which allow firms to compete dynamically with others. Because the segments are highly profitable and offer potentially higher value added, they have turned into increasingly oligopolistic and concentrated markets through rapid consolidation. Dominance by far larger and far more established brand-name TNCs from the advanced economies in these segments has become entrenched. These firms are deeply nested within economies worldwide, including those of developing countries. In contrast, firms from the Global South – even the best performing ones – hold little assets in advanced economies, derive much less revenues from international sales, and have earnings that pale in comparison to their counterparts from high income economies. Nolan (2012) sums up this relationship between firms from the developing and developed world in each other's economy as "I have you within me but you do *not* have me within you".

Driven by increased financialisation of large firms, a commodity boom and rising food prices, agribusiness industries were among the most takeover-intensive industries over the past decade (Dicken, 2011). In 2007, the aggregate value of global food industry M&As was approximately US$200 billion, double the amount in 2005. The consolidation in the agribusiness sector mirrors the global M&A trend in all sectors, which recorded US$4.48 trillion in total value in 2007, representing a 27% rise from US$2.7 trillion in 2005 (ETC Group, 2008). In some instances, the M&As in agribusiness industries involved not only horizontal integration but also vertical integration. For example, many large agrochemical chemicals branched out into plant biotechnology and the seed business, heralding a move towards unprecedented convergence between agricultural input segments (UNCTAD, 2006). Rapid consolidation further enhances concentration in various agribusiness industries.[39] A study based on 2006-2007 revenue figures of agribusiness makes the following observations (ETC Group, 2008):

[39] Concentration refers to the extent to which a market is dominated by a limited number of firms. Determination of precise market size and structure for the overall industry are difficult, complicated by availability issues regarding firm data. Two common measures for concentration are the Herfindahl index which is calculated as the sum of the squares of the individual market shares of all known players and the N-firm concentration ratio which expresses the combined market share of the N largest firms in a particular industry as a percentage (Law, 2009; Black et al, 2009). The limited empirical work measuring and analysing the increase of concentration in agribusiness is typically based on estimates.

- In the seeds industry, the top 10 seed companies account for 67% of the global market. The largest firm, Mosanto (US) alone accounts for almost 23% of the global market. The top three firms (the other two being DuPont (US) and Syngenta (Switzerland)) together account for 47% of the worldwide seed market.

- In the agrochemical industry, the top 10 firms control 89% of the global pesticide market. The top 6 firms account for 75% of the total market. The top three firms – Bayer (Germany), Syngenta, and BASF (Germany) – together account for 49% of the worldwide pesticide market. The world's six largest agrochemical manufacturers are also key players in the seed industry.

- In the food and beverages industry, the top 10 food and beverage firms control 26% of the global market for packaged food products, a 14 percentage point increase from 2004. The top 10 firms – Nestle (Switzerland), PepsiCo (US), Kraft Foods (US), Unilever (The Netherlands), Tyson Foods (US), Cargill (US), Mars (US), Archer Daniels Midland Company (US), and Danone (France) – have combined revenues of US$966 billion, accounting for 35% of sales recorded by the world's top 100 food and beverage companies.

- In the pharmaceutical industry, the top 100 pharmaceutical firms have combined sales of US$504 billion in 2006. The top 10 firms – Pfizer (US), GlaxoSmithKline (UK), Sanofi-Aventis (France), Roche (Switzerland), AstraZeneca (UK-Sweden), Johnson & Johnson (US), Norvatis (Switzerland), Merck & Co. (US), Wyeth (US, acquired by Pfizer in 2009), and Lilly (US) – account for 55% of total sales.

- In the biotechnology industry, the top 10 biotech firms account for two-thirds of the sector's global revenue of US$78 billion. This is a segment that is dominated almost exclusively by US firms, including Amgen, Genentech (acquired by Roche in 2009), Mosanto, Gilead Sciences, and Genzyme.

- In the veterinary pharmaceutical industry (catering to animal health), the global market is US$19.2 billion, with the top 10 firms accounting for 63% of the total market.

- In the bioinformation industry (technology for generating, storing, processing and analysing information in the life sciences sector), the top 10 firms include many established technology big names, including Hewlett-Packard (US), IBM (US), Microsoft (US), Fujitsu (Japan), and Apple (US).

– In the forest, paper and packaging industry, the top 10 firms – led by International Paper (US), Stora Enso (Finland), and Kimberly-Clark (US) – account for 42% of global sales.

Since the 2000s, consolidation and concentration in agribusiness business industries have continued apace. Dow Chemical and DuPont, two American chemicals giants, announced a US$130 billion merger in 2015, pending approval by antitrust authorities. Sygenta has agreed to a US$44 billion takeover offer by China National Chemical Corporation or ChemChina. Bayer has proposed a US$66 billion buyout of Monsanto to create the world's biggest seed and pesticide firm. PotashCorp and Agrium, two rivalling Canadian potash suppliers, have agreed to merge into a US$30 billion fertiliser giant. Kraft made an unsuccessful bid for US$143 billion to merge with rival Unilever in early 2016 (Chazan & Whipp, 2016).

Consolidation and concentration of global lead firms not only affect developing country firms but also smaller firms in the Global North. In the US seed industry, until the 1970s, small firms accounted for about 30% of the corn seed market while the four largest firms held 50% to 60%. By 1997, the four-firm concentration ratio had risen to 69% with the strategic entry of multinational firms (Fernandez-Cornejo & Just, 2007). Similar trends were observed for soybean varieties and cotton seeds. In the EU, concentration varies strongly across food processing sectors (Bukeviciute et al., 2009). In sectors such as chewing gum, soft drinks, savoury biscuits and artificial sweeteners, the four-firm concentration ratios are above 60%. These usually involve firms which operate at the global level and typically offer internationally branded products. The EU food retail sector is characterised by a high degree of concentration: in all member countries, the five-firm concentration ratio increased between 2004 and 2007. By 2007, the five largest retail chains in most member countries accounted for over 50% of their markets.

5.2 Conclusion

The current epoch of economic globalisation driven by the proliferation of GVCs is a multi-dimensional phenomenon fraught with complexities and paradoxes. On the one hand, it has brought about tremendous benefits for society through increased cross-border flows of information, capital, inputs, products, technology and people. The benefits are most visible in economic efficiency, consumer welfare, and technical progress. On the other hand, the process has amplified undesirable outcomes such as income and wealth inequality, environmental degradation, uneven capability development, and concentration of power.[40]

[40] Both positive and negative effects of globalisation are felt differently by at the levels of region, country, sector, sub-region, community and even household. In development studies, it has been

It begs the larger question to what extent developing countries and their firms can 'develop' and improve their living standards in the current epoch of economic globalisation. The more optimistic analysis from the modernisation, late industrialisation, neoclassical and comparative institutional schools has predicted convergence and catch-up (see, for example, Solow (1956); Rostow (1960); Kerr et al. (1960); Gerschenkron (1979); Wade (1990); Amsden (1989); Balassa et al. (1986); Sachs (1994); Dore (1990)). Broadly, the convergence hypothesis suggests that developing countries can grow faster than developed countries and narrow their gaps in living standards. Variables including prices, production structures, and consumptions patterns can be used but per capita income, productivity, and wages are most commonly used measures. The stronger variant known as unconditional convergence predicts that follower countries catch up by bringing into production a large backlog of unexploited technology and will reach similar income levels (van Ark & Timmer, 2003). The weaker version of conditional convergence predicts that countries converge to their own steady states but that these steady states can differ between countries controlling for differences in parameters such as savings rates and population growth. The experience of developing countries in the world economy from 1970 to 2010 does not validate the hypothesis and suggests instead that convergence and divergence are often simultaneous (Nayyar, 2013).

Developing Asia achieved the fastest growth rates and increased its share of the world GDP in current prices at market exchange rates from less than a tenth to more than a fifth. Latin America's share increased slightly, while Africa's share actually decreased (Table 5.2). In terms of GDP per capita, developing Asia had the highest growth rate, Latin America was in the middle, and Africa had the lowest growth rate. A comparison of developing countries and regions and the industrialised is telling of how big the gap is between them for catch-up to take place. In 2010, developing countries accounted for 82% of the world population but only 32% of the world GDP. The GDP per capita in developing countries, at US$3,715, was less than a tenth of that of industrialised countries (US$39,723) (Table 5.3). On a purchasing power parity (PPP) basis, developing countries get a much higher weight in the world GDP, accounting for over half in 2010. The GDP per capita gaps between developing countries and industrialised countries are modestly reduced but remain exceptionally large (Table 5.4).[41]

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recognised that there is no clear-cut distinction between 'developed' and 'developing' parts of the world – pockets of low levels of development exist in the richest countries, just as there are pockets of high levels of development in the poorest countries (Hodder, 2005). However, characteristics of a country still apply to a large proportion of its population and it is therefore still relevant and useful to consider development in country terms.

[41] Aggregate economic data across countries are converted using either market exchange or PPP rates, each with its own advantages and disadvantages. Used in international flows and transactions,

Table 5.2. Population and GDP in current prices at market exchange rates in developing countries and the world, 1970-2010.

Year	*World population (billion)*	*Developing countries population (billion)*	*Developing countries population as a percentage of world population*	*World GDP (US$ billion)*	*Developing countries GDP (US$ billion)*	*GDP as a percentage of world GDP*			
						Developing countries	*Asia*	*Africa*	*Latin America*
1970	3.7	2.7	72.8%	3,283	549	16.7%	8.7%	2.7%	5.3%
1975	4.1	3.0	74.3%	6,410	1,228	19.2%	9.9%	3.2%	6.0%
1980	4.5	3.4	75.7%	11,865	2,540	21.4%	11.3%	3.7%	6.3%
1985	4.9	3.7	77.0%	12,993	2,552	19.6%	10.9%	3.0%	5.7%
1990	5.3	4.1	78.3%	22,206	3,851	17.3%	10.0%	2.2%	5.0%
1995	5.7	4.5	79.4%	29,928	5,896	19.7%	11.8%	1.8%	6.1%
2000	6.1	4.9	80.5%	32,244	6,973	21.6%	13.1%	1.8%	6.6%
2005	6.6	5.3	81.3%	45,722	10,789	23.6%	15.5%	2.2%	5.9%
2010	6.9	5.7	82.1%	63,151	20,362	32.2%	21.8%	2.6%	7.8%

Source: Nayyar (2013).

Table 5.3. GDP per capita in current prices at market exchange rates in developing world as proportion of GDP per capita in industrialised countries, 1970-2010.

Year	*Developing countries GDP per capita (US$)*	*Industrialised countries GDP per capita (US$)*	*GDP per capita as a percentage of that of industrialised countries*			
			Developing countries	*Asia*	*Africa*	*Latin America*
1970	209	2,873	7.3%	5.1%	8.4%	21.2%
1975	416	5,387	7.7%	5.3%	9.0%	22.3%
1980	772	9,710	8.0%	5.7%	9.3%	21.6%
1985	697	10,761	6.5%	4.9%	6.6%	17.2%
1990	947	19,303	4.9%	3.9%	4.0%	13.2%
1995	1,324	24,898	5.3%	4.4%	3.0%	15.4%
2000	1,444	25,711	5.6%	4.7%	2.9%	16.0%
2005	2,081	33,977	6.1%	5.6%	3.2%	14.4%
2010	3,715	39,723	9.4%	8.9%	4.2%	21.5%

Source: Nayyar (2013).

market exchange rates are highly relevant for internationally traded goods. But PPP rates are derived a wider basket that considers non-traded goods and services as well, which tend to be cheaper in low-income and high-income countries. PPP rates are thus sometimes regarded as a better measure of overall well-being and purchasing power of consumers in developing countries (Callen, 2007).

Table 5.4. GDP and GDP per capita in current prices at purchasing power parity rates in the world, developing countries and industrialised countries, 1980-2010.

Year	*World GDP (billion international dollar)*	*Developing countries GDP (billion international dollar)*	*Developing countries GDP as a percentage of world GDP*	*Industrialiased countries GDP per capita (international dollar)*	*Developing countries GDP per capita (international dollar)*	*GDP per capita as a percentage of that of industrialised countries*			
						Developing Countries	*Asia*	*Africa*	*Latin America*
1980	13,140	4,783	36.4%	10,158	1,544	15.2%	5.5%	11.5%	45.1%
1985	19,227	6,879	35.8%	14,540	2,005	13.8%	6.2%	9.7%	38.0%
1990	27,208	9,867	36.3%	19,751	2,525	12.8%	6.8%	8.6%	32.3%
1995	38,096	15,938	41.8%	23,639	3,488	14.8%	8.8%	7.3%	32.7%
2000	49,837	21,409	43.0%	29,413	4,257	14.5%	9.5%	6.5%	30.6%
2005	67,699	31,998	47.3%	35,810	5,915	16.5%	12.0%	7.0%	30.1%
2010	89,269	47,907	53.7%	40,245	8,294	20.6%	17.2%	8.0%	33.5%

Source: International Monetary Fund.

Despite its rapid growth within a remarkably short period of time, Asia's GDP per capita in 2010 was just 9% of that of industrialised countries. China, the star performer among developing countries, offers interesting lessons. For all its significant economic achievements and having been the world's second largest economy since 2011, China is far from having caught up with the high-income economies. It is still a developing country of a low level of income per person. Furthermore, it cannot be assumed that China will grow indefinitely at its current high speed and make the transition to a high income economy (Nolan, 2012).

This is not to suggest that developing countries should or will not try to achieve growth and upgrading using a range of old and new solutions in a GVC world. After all, earlier experiences of "catching up" also took place despite global constraints. The barriers to industrialisation created by GVCs are not totally impenetrable albeit difficult. The case of Malaysian palm oil illustrates both the possibilities and severe challenges of upgrading in GVCs. Even if catch up remains an elusive goal, developing countries should – and most certainly will – try to achieve growth to at least keep up and not fall behind further in economic globalisation. At the same time, developing countries will do well to bear in mind that development is not a materialistic process towards a uniform 'ideal' state of being the same for all, and that they will have to find their own meaning and purpose for development.

Annexes

Annex 1: Semi-Structured Interview Questions

1. What are the benefits and disadvantages of vertical integration? What are the benefits and disadvantages of vertical specialisation? Which is more suitable for agricultural commodity producing firms, and why?
2. Upstream horizontal integration (acquisition of existing plantations and establishing new plantations) seems to be the ‘starting point’ for firms that wish to vertically integrate (more products and functions across the value chains). Is ample feedstock (CPO) internally is the single most important factor for firms to integrate vertically?
3. Without government policy, how likely was it that upstream and downstream activities could have emerged on their own? Did the investors (both foreign and local) have the incentives to do it?
4. Many plantation firms lack the ability to sell directly to the world (a low proportion of revenue from overseas customers) and have a concentration of revenue among a handful of major local customers.
    i. Does this suggest that they are contented with serving as tier-1 suppliers (selling upstream products) to large integrated firms?
    ii. In spite of the benefits associated with vertical integration, why won’t these firms integrate and develop a fuller of capabilities (profitability reasons, difficulties in vertical integration, other factors for consideration)?
5. Upgrading necessitates a substantial degree of internationalisation as it gets further downstream, closer to foreign markets where the consumers are actually based. What are the difficulties in internationalisation for developing-country firms?
6. Does government policy have a role in facilitating the internationalisation process?

Annex 2: Explanatory Notes for Industry Reclassification and Aggregation

The four original input-output tables used in this dissertation were compiled by the Department of Statistics Malaysia using different industry classification systems. The 1991 Absorption Matrix of Domestic Production at Basic Values (Activity by Activity) (Table 16) was for 92 industries classified using the Malaysia Industrial Classification (MIC) 1972, which was based on the United Nations System of National Accounts (SNA) 1968. The number of industries increased to 94 in the 2000 Absorption Matrix of Domestic Production at Basic Prices (Activity by Activity) (Table 16), based on the Malaysia Standard Industrial Classification (MSIC) 2000 which was modelled after the UN SNA 1993. Taking into consideration of International Standard Industrial Classification of All Economic Activities (ISIC) Revision 3, the 2005 Absorption Matrix of Domestic Production at Basic Prices (Activity by Activity) (Table 22) further revised the number of industries to 120 although it was still based on the MSIC 2000. The 2010 Absorption Matrix of Domestic Production at Basic Prices (Activity by Activity) (Table 10) was compiled using the new MSIC 2008, reflecting ISIC Revision 4. The number of industries increased to 124. To ensure consistency for cross-year comparison, the industries in each of the tables were reclassified and aggregated into 36 by referencing the national activity and commodity codes used for the respective years.

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Sector	**No.**	**Reclassified Industry**	**No.**	**1991 Activity (MIC 1972) (92 industries)**	**No.**	**2000 Activity (MSIC 2000) (94 industries)**	**No.**	**2005 Activity (MSIC 2000) (120 industries)**	**No.**	**2010 Activity (MSIC 2008) (124 industries)**
Agriculture, Fishery & Forestry	**1**	**Rubber**	2	Rubber planting	2	Rubber planting	5	Rubber	5	Rubber
	2	**Oil Palm**	3	Oil palm estates	3	Oil palm estates	6	Oil palm	6	Oil palm
	3	**Agriculture**	1	Agriculture, other	1	Agriculture, other	1	Paddy	1	Paddy
			4	Coconut	4	Coconut	2	Food crops	2	Food crops
			5	Tea estates	5	Tea estates	3	Vegetables	3	Vegetables
							4	Fruits	4	Fruits
							7	Flower plants	7	Flower plants
							8	Other agriculture	8	Other agriculture
	4	**Livestock and Fishing**	6	Livestock breeding etc.	6	Livestock breeding etc.	9	Poultry farming	9	Poultry farming
			8	Fishing	8	Fishing	10	Other livestock	10	Other livestock
							12	Fishing	12	Fishing

	5	**Forestry and Logging**	7	Forestry and logging	7	Forestry and logging	11	Forestry and logging	11	Forestry and logging
Mining & Quarrying	**6**	**Crude Oil and Natural Gas**	9	Crude petrol, natural gas and coal	9	Crude petrol, natural gas and coal	13	Crude oil and natural gas	13	Crude oil and natural gas
	7	**Other Mining and Quarrying**	10	Metal ore mining	10	Metal ore mining	14	Metal ore mining	14	Metal ore mining
			11	Stone, clay and sand quarrying	11	Stone, clay and sand quarrying	15	Stone, clay and sand quarrying	15	Stone, clay and sand quarrying
							16	Other mining and quarrying	16	Other mining and quarrying
Manufacturing	**8**	**Food, Beverage and Tobacco**	12	Meat and meat production	12	Meat and meat production	17	Meat and meat production	17	Meat and meat production
			13	Dairy production	13	Dairy production	18	Preservation of seafood	18	Preservation of seafood
			14	Preservation of fruits and vegetables	14	Preservation of fruits and vegetables	19	Preservation of fruits and vegetables	19	Preservation of fruits and vegetables
			15	Preservation of seafood	15	Preservation of seafood	20	Dairy production	20	Dairy production
			17	Grain mills	17	Grain mills	22	Grain mills	22	Grain mills
			18	Bakeries	18	Bakeries	23	Bakery products	23	Bakery products
			19	Manufacture of confectionery	19	Manufacture of confectionery	24	Confectionery	24	Confectionery
			20	Manufacture of ice	20	Manufacture of ice	25	Other food processing	25	Other food processing
			21	Manufacture of other foods	21	Manufacture of other foods	26	Animal feeds	26	Animal feeds
			22	Manufacture of animal feeds	22	Manufacture of animal feeds	27	Wine and spirit	27	Wine and spirit
			23	Production of wine and spirits	23	Production of wine and spirits	28	Soft drink	28	Soft drink
			24	Production of beer and soft drinks	24	Production of soft drinks	29	Tobacco products	29	Tobacco products
			25	Manufacture of tobacco	25	Manufacture of tobacco				
	9	**Oils and Fats**	16	Manufacture of oils and fats	16	Manufacture of oils and fats	21	Oils and fats	21	Oils and fats
	10	**Textiles and Leather**	26	Manufacture of yarns and cloth	26	Manufacture of yarns and cloth	30	Yarn and cloth	30	Yarn and cloth
			27	Manufacture of knitted fabrics	27	Manufacture of knitted fabrics	31	Finishing of textiles	31	Finishing of textiles
			28	Manufacture of other textiles	28	Manufacture of other textiles	32	Other textiles	32	Other textiles
			30	Leather industries	30	Leather industries	34	Leather industries	34	Leather industries
	11	**Apparels and Footwear**	29	Manufacture of wearing apparels	29	Manufacture of wearing apparels	33	Wearing apparels	33	Wearing apparels
			31	Manufacture of footwear	31	Manufacture of footwear	35	Footwear	35	Footwear
	12	**Wood Products**	32	Sawmills	32	Sawmills	36	Sawmilling and planning of	36	Sawmilling and planning of wood

								wood		
			33	Manufacture of other wooden products	33	Manufacture of other wooden products	37	Veneer sheets, plywood, laminated board, particle board and other panels and boards	37	Veneer sheets, plywood, laminated board, particle board and other panels and boards
							38	Builders' carpentry and joinery	38	Builders' carpentry and joinery
							39	Wooden and cane containers	39	Wooden and cane containers
							40	Other wood products	40	Other wood products
	13	**Paper Products and Furniture**	34	Manufacture of furniture and fixtures	34	Manufacture of furniture and fixtures	41	Paper and paper products and furniture	41	Paper and paper products and furniture
			35	Paper and board industries	35	Paper and board industries				
	14	**Printing and Publishing**	36	Printing	36	Printing	42	Publishing	42	Publishing
							43	Printing	43	Printing
	15	**Refined Petroleum Products**	42	Petrol and coal industries	42	Petrol and coal industries	44	Petroleum refinery	44	Petroleum refinery
	16	**Chemicals and Pharmaceuticals**	37	Manufacture of industrial chemical	37	Manufacture of industrial chemical	45	Basic chemicals	45	Basic chemicals
			38	Manufacture of paints and lacquers	38	Manufacture of paints and lacquers	46	Fertilisers	46	Fertilisers
			39	Manufacture of drugs and medicines	39	Manufacture of drugs and medicines	47	Paints and varnishes	47	Paints and varnishes
			40	Manufacture of soap etc.	40	Manufacture of soap etc.	48	Pharmaceuticals, medicinal chemicals and botanical products	48	Pharmaceuticals, medicinal chemicals and botanical products
			41	Other chemical industries	41	Other chemical industries	49	Soap and detergents, perfumes, cleaning & toilet preparations	49	Soap and detergents, perfumes, cleaning & toilet preparations
							50	Other chemicals products	50	Other chemicals products
	17	**Processed Rubber Products**	43	Rubber processing	43	Rubber processing	51	Tyres	51	Tyres
			44	Rubber industries	44	Rubber industries	52	Rubber processing	52	Rubber processing
							53	Rubber gloves	53	Rubber gloves
							54	Rubber products	54	Rubber products
	18	**Plastics and Non-Metallic Mineral Products**	45	Manufacture of plastic products	45	Manufacture of plastic products	55	Plastics Products	55	Plastics Products
			46	China and glass industries	46	China and glass industries	56	Sheet glass and glass products	56	Sheet glass and glass products
			47	Manufacture of clay products	47	Manufacture of clay products	57	Clay and ceramic	57	Clay and ceramic

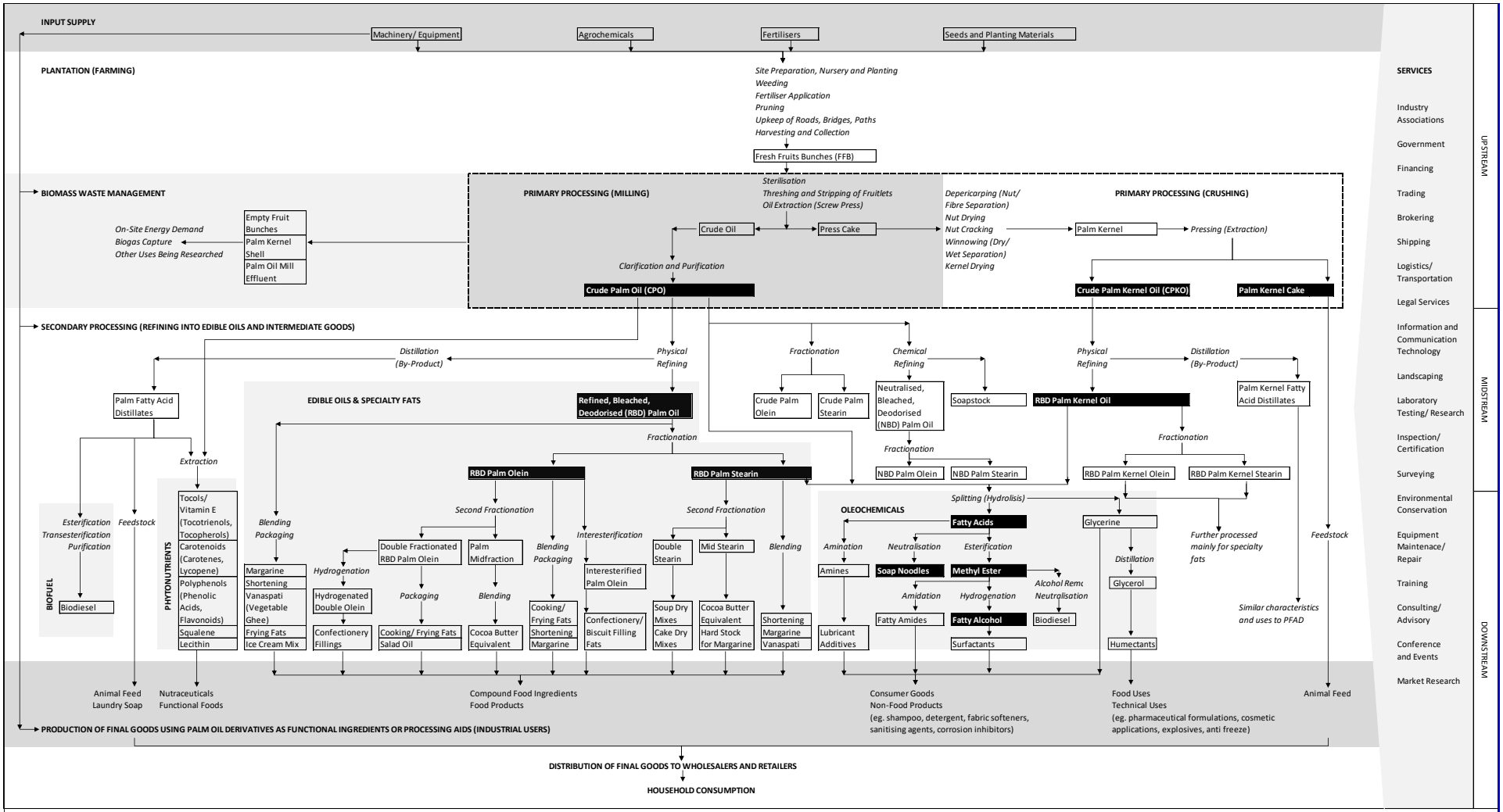
			48	Manufacture of cement etc.	48	Manufacture of cement etc.	58	Cement, lime and plaster	58	Cement, lime and plaster
			49	Other non-metallic manufacture	49	Other non-metallic manufacture	59	Concrete and other non-metallic mineral products	59	Concrete and other non-metallic mineral products
	19	**Metal Products**	50	Iron and steel industries	50	Iron and steel industries	60	Iron and steel products	60	Iron and steel products
			51	Manufacture of non-ferrous metals	51	Manufacture of non-ferrous metals	61	Basic precious and non-ferrous metals	61	Basic precious and non-ferrous metals
			52	Manufacture of metal furniture and fixture	52	Manufacture of other fabricated metal and fixture	62	Casting of metals	62	Casting of metals
			53	Structural metal industries	53	Structural metal industries	63	Structural metal products	63	Structural metal products
			54	Other metal industries	54	Other metal industries	64	Other fabricated metal products	64	Other fabricated metal products
	20	**Machinery**	55	Manufacture of industrial machinery	55	Manufacture of industrial machinery	65	Industrial machinery	65	Industrial machinery
			56	Manufacture of household machinery	56	Manufacture of household machinery	66	General purpose machinery	66	General purpose machinery
							67	Special purpose machinery	67	Special purpose machinery
							69	Office, accounting and computing machinery	69	Office, accounting and computing machinery
	21	**Electric Appliances and Electronic Components**	57	Manufacture of radio, television etc.	57	Manufacture of radio, television etc.	68	Domestic appliances	68	Domestic appliances
			58	Manufacture of electric appliances etc.	58	Manufacture of electric appliances etc.	70	Electrical machinery and apparatus	70	Electrical machinery and apparatus
			59	Manufacture of other electrical machinery	59	Manufacture of other electrical machinery	71	Other electrical machinery	71	Other electrical machinery
							72	Insulated wires and cables	72	Insulated wires and cables
							73	Electric lamps and lighting equipment	73	Electric lamps and lighting equipment
							74	Semi-conductor devices, electronic valves, tubes and printed circuit boards	74	Semi-conductor devices, electronic valves, tubes and printed circuit boards
							75	Television and radio receivers and transmitters, sound or video recording or reproducing apparatus and associated goods	75	Television and radio receivers and transmitters, sound or video recording or reproducing apparatus and associated goods
	22	**Precision Equipment**	64	Manufacture of instruments and clocks	64	Manufacture of instruments and clocks	76	Medical and surgical equipment and orthopaedic appliances	76	Medical and surgical equipment and orthopaedic appliances
							77	Instruments and appliances for measuring, checking, testing, navigating and other purposes; manufacture of industrial	77	Instruments and appliances for measuring, checking, testing, navigating and other purposes; manufacture of industrial process

								process control equipment		control equipment
							78	Optical instruments and photographic equipment	78	Optical instruments and photographic equipment
							79	Watches and clocks	79	Watches and clocks
	23	**Motor Vehicles and Transport Equipment**	60	Ship and boat building	60	Ship and boat building	80	Motor vehicles	80	Motor vehicles
			61	Manufacture of motor vehicles	61	Manufacture of motor vehicles	81	Motorcycles	81	Motorcycles
			62	Manufacture of cycles and motorcycles	62	Manufacture of cycles and motorcycles	82	Building and repairing of ships and boats; manufacture of bicycles and invalid carriages	82	Building and repairing of ships and boats; manufacture of bicycles and invalid carriages
			63	Manufacture of other transport equipment	63	Manufacture of other transport equipment	83	Other transport equipment	83	Other transport equipment
	24	**Recycling and Other Manufacturing**	65	Other manufacturing	65	Other manufacturing	84	Other manufacturing	84	Other manufacturing
					89	Recycling	85	Recycling	85	Recycling
Services	**25**	**Electricity, Gas and Water**	66	Electricity and gas	66	Electricity and gas	86	Electricity and gas	86	Electricity and gas
			67	Waterworks	67	Waterworks	87	Waterworks	87	Waterworks
									88	Sewerage, waste collection and remediation activities
	26	**Construction**	68	Building and construction	68	Building and construction	88	Residential	89	Residential
							89	Non residential	90	Non residential
							90	Civil engineering	91	Civil engineering
							91	Special trade works	92	Special trade works
	27	**Wholesale and Retail**	69	Wholesale and retail trade	69	Wholesale and retail trade	92	Wholesale and retail trade and motor vehicle	93	Wholesale and retail trade and motor vehicle
			85	Repair of motor cycles	87	Repair of motor cycles				
			86	Other repair	88	Other repair				
	28	**Hotels and Restaurants**	70	Hotels and restaurants	70	Hotels and restaurants	93	Accommodation	94	Accommodation
							94	Restaurants	95	Restaurants
	29	**Transport and Communications**	71	Transport	71	Transport	95	Land transport	96	Land transport
			72	Communication	72	Communication	96	Water transport	97	Water transport
							97	Air transport	98	Air transport
							98	Other transport services	99	Other transport services

							99	Port and airport operation services	100	Port and airport operation services
							100	Highway, bridge and tunnel operation services	101	Highway, bridge and tunnel operation services
							101	Communication	102	Communications
									103	Publishing activity
									104	Telecommunications
									105	Cinema, video and television activity
	30	**Finance and Insurance**	73	Banks	73	Banks	102	Banks	107	Banks
			74	Other financial institutions	74	Other financial institutions	103	Financial institutions	108	Financial institutions
			75	Insurance	75	Insurance	104	Insurance	109	Insurance
							105	Other financial institutions	110	Other financial institutions
	31	**Real Estate**	76	Real estate	76	Real estate	106	Real estate	111	Real estate
			77	Ownership of dwellings	77	Ownership of dwellings	107	Ownership of dwellings	112	Ownership of dwellings
	32	**Business Services**	78	Business services	78	Business services	108	Rental and leasing	106	ICT and computer services
							109	Computer services	113	Rental and leasing
							110	Research and development	114	Research and development
							111	Professional	115	Professional
							112	Business services	116	Business services
	33	**Private Services**	81	Private non-profit institutions	83	Private non-profit institutions	118	Non-profit private institutions	122	Non-profit private institutions
			82	Entertainment	84	Entertainment	119	Amusement and recreational services	123	Amusement and recreational services
			83	Radio and TV broadcasting	85	Radio and TV broadcasting	120	Other private services	124	Other private services
			84	Recreation	86	Recreation				
			87	Laundry and cleaning	90	Other private services				
			88	Other private services						
	34	**Education**	79	Education	79	Education - private	114	Education	118	Education
					80	Education - public				
	35	**Health**	80	Health	81	Health - private	115	Health	119	Health
					82	Health - public				

	36	**Government Services**	89	Public administration	91	Public administration	113	Public administration	117	Public administration
			90	Public order	92	Public order	116	Defence and public order	120	Defence and public order
			91	Defence	93	Defence	117	Other public administration	121	Other public administration
			92	Other public administration	94	Other public administration				

Annex 3: Products and Processes in Palm Oil Value Chains



Description of Key Processes in Palm Oil Processing

No.	Process	Description
1	Milling	Fresh fruit bunches are sterilised and stripped. The fruit is pressed to separate the oil from the 'cake' (a mixture of kernel and fibre). The oil is then purified and clarified.
2	Crushing	The kernel is cracked to remove the palm kernel shell (palm kernel expeller) and the kernel is crushed and pressed to produce palm kernel oil.
3	Refining (refining, bleaching and deodorising)	Oil is refined to remove colour, odour and flavour.
4	Fractionation	Liquid palm olein and solid palm stearin are separated. This is achieved by using crystallisation techniques followed by a membrane filter process.
5	Interesterification	Oils are reformulated to produce different properties. Carbon chains are separated from the glycerine anchor and reattached in a different formation to create oils with improved properties for specific use in the food industry.
6	Hydrogenation	A means of increasing the melting point of oils using hydrogen gas.
7	Hydrolysis	The chemical breakdown of an oil compound due to reaction with water.
8	Glycerolysis	The process of creating emulsifiers by adding glycerine. Emulsifiers facilitate the mixture of oil and water.
9	Distillation	A method of separating mixtures based on differences in volatility of components in a liquid mixture.
10	Nuetralisation	The process known as deacidification neutralises fatty free acids using caustic soda, thereby converting the acids into soaps.

Source: Adapted from Green Palm's *Oil Palm: Fractions and Derivatives*.

Palm Oil Products

1. Crude palm oil
2. Crude palm olein
3. Crude palm stearin
4. Bleached palm oil
5. Bleached palm olein
6. Bleached palm stearin
7. Cooking oil/ double olein
8. Double fractionated RBD palm olein/ superolein
9. Double fractionated RBD palm stearin
10. Double fractionated palm olein
11. Hydrogenated palm fatty acid distillate
12. Hydrogenated palm oil
13. Hydrogenated palm olein
14. Hydrogenated palm stearin
15. HB palm stearin
16. HRBD double fractionated olein
17. HRBD stearin flakes
18. Interesterified palm oil
19. Interesterified palm stearin
20. Interesterified palm olein
21. Interesterified mixed palm/vegetable oil
22. Interesterified mixed palm/ palm kernel oil based
23. NB palm olein
24. NBD palm oil
25. NBD palm olein
26. NBD palm stearin
27. Neutralised palm oil
28. Neutralised palm olein
29. NB interesterified olein
30. NB interesterified stearin
31. Nutrolein
32. Palm acid oil
33. Palm fatty acid distillate
34. Palm-mid fraction
35. RB palm olein
36. RBD blended palm oil
37. RBD hydrogenated palm oil
38. RBD hydrogenated palm olein
39. RBD hydrogenated palm stearin
40. RBD palm oil
41. RBD palm olein
42. RBD palm stearin
43. Refined palm oil
44. Refined palm olein
45. Refined palm stearin
46. Refined hydrogenated palm stearin
47. Stabilised palm oil
48. Vegetable oil

Palm Kernel Products

49. CPKO
50. Crude palm kernel olein
51. Crude palm kernel stearin
52. Double fractionated RBD palm kernel olein
53. Double fractionated RBD palm kernel stearin
54. Hydrogenated palm kernel oil
55. Hydrogenated palm kernel olein
56. Hydrogenated palm kernel stearin
57. Interestified palm kernel oil
58. N palm kernel olein
59. N palm kernel stearin
60. NB palm kernel olein
61. NB palm kernel stearin
62. NBD palm kernel oil
63. NBD palm kernel olein
64. NBD palm kernel stearin
65. Palm kernel acid oil
66. Palm kernel fatty acid distillate
67. RBD palm kernel oil
68. RBD palm kernel olein
69. RBD palm kernel stearin
70. RBDH palm kernel oil
71. RBDH palm kernel olein
72. RBDH palm kernel stearin
73. Refined palm kernel oil

Palm Kernel Cake Products

74. Palm kernel expeller
75. Palm kernel pellets

Oleochemicals

76. Stearic acid
77. Lauric acid
78. Myristic acid
79. Oleic acid
80. Palmitic acid
81. Other fatty acids
82. Fatty alcohol
83. Methylester
84. Glycerine
85. Soap noodles

Finished Products

86. Shortening
87. Vegetable ghee/ vanaspati
88. Vegetable/ dough fats
89. Cocoa-butter substitutes/ equivalents/ replacer
90. Margarine
91. Soap
92. Red olein
93. Prayer oil
94. Hydrogenated vegetable oil
95. Blended vegetable oils
96. Biodiesel

Finished Products

97. Residue oil/ scavenger oil
98. Mixed acid oil
99. Industrial grade palm oil
100. Sludge oil
101. Palm fatty acid residue
102. Palm kernel shell
103. High free fatty acid oil
104. Lauric fatty acid distillate
105. Methyl ester residue
106. Mixed vegetable acid oil
107. Palm kernel oil residue
108. Oil palm fibre
109. Stearin wax
110. Volatiles
111. Pitch oil

Annex 4: Explanatory Notes for Linkage Analysis

Input-output analysis developed by Wassily Leontief in the 1930s has been widely used to assess structural changes and interdependence of sectors and industries in an economy. This analytical framework has its limitations due to well-recognised assumptions about homogeneity of output, zero substitution between inputs, fixed proportion between inputs and outputs, constant returns to scale, and exogeneity of primary inputs and final demand components. Nonetheless, it has significant advantages and provides valuable information for socio-economic analysis.

In this framework, production by an industry has two kinds of economic effects on other industries (See (Miller & Blair, 2009) for a detailed discussion on I-O analysis). If industry *j* increases its output, there will be increased demand from industry *j* on the industries whose goods are used as inputs to production in *j.* This demand relationship is termed backward linkage. If industry *i* increased its output, there will be increased supply from industry *i* for the industries which use product *i* in their production. This supply relationship is termed forward linkage.

Total backward linkage measures both direct and indirect effects of one monetary unit change in the final demand for each industry (as consumer) on total output of all industries (including itself, as suppliers). It is the sum of the elements in the j^{th} column of the Leontief inverse matrix and can be defined as:

$$BL_{\bullet j} = \sum_{i=1}^{n} b_{ij} \qquad (1)$$

where $BL_{\bullet j}$ is the backward linkage of industry *j* and b_{ij} is the Leontief inverse matrix in an economy with *n* industries.

Total forward linkage measures both direct and indirect effects of one monetary unit change in output of each industry (as supplier) on total output of all industries (as consumers) that depend on the industry's output for production. It is the sum of the elements in the i^{th} column of the Ghosh inverse matrix and can be defined as:

$$FL_{i\bullet} = \sum_{j=1}^{n} b_{ij}^{*} \qquad (2)$$

where $FL_{i\bullet}$ is the forward linkage of industry *I* and b_{ij}^{*} is the Ghosh inverse matrix.

Both linkages are then calculated in normalised form (against the global average) for expression as indices (Rasmussen, 1957). The index for total backward linkage, known as the Power of Dispersion Index, is defined as:

$$U_{\bullet j} = \frac{BL_{\bullet j}}{\frac{1}{n}\sum_{j=1}^{n} BL_{\bullet j}} = \frac{\sum_{i=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n} b_{ij} \sum_{j=1}^{n} b_{ij}} \quad (3)$$

while the parallel for total forward linkage, known as the Sensitivity of Dispersion Index, is

$$U_{i\bullet} = \frac{FL_{i\bullet}}{\frac{1}{n}\sum_{i=1}^{n} FL_{i\bullet}} = \frac{\sum_{j=1}^{n} b_{ij}^{*}}{\frac{1}{n}\sum_{j=1}^{n} b_{ij}^{*} \sum_{i=1}^{n} b_{ij}^{*}} \quad (4)$$

Industries can be classified as (1) not strongly connected to other industries (both linkage measures less than 1); (2) strongly connected to other industries (both linkage measures greater than 1); (3) dependent on interindustry supply (only backward linkage greater than 1); and (4) dependent on interindustry demand (only forward linkage greater than 1) (Miller & Blair, 2009). This allows identification of 'key industries' (with both backward and forward linkages greater than 1). Coefficients of variation further provide a sense of whether the linkage effects are narrowly or widely spread over all industries (Boucher, 1976). The backward coefficient of variation of industry *j* is

$$V_{\bullet j} = \frac{\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(b_{ij} - \frac{1}{n}\sum_{i=1}^{n} b_{ij})^2}}{\frac{1}{n}\sum_{i=1}^{n} b_{ij}} \quad (5)$$

and the forward coefficient of variation for industry *i* is

$$V_{i\bullet} = \frac{\sqrt{\frac{1}{n-1}\sum_{j=1}^{n}(b_{ij}^{*} - \frac{1}{n}\sum_{j=1}^{n} b_{ij}^{*})^2}}{\frac{1}{n}\sum_{j=1}^{n} b_{ij}^{*}} \quad (6)$$

A relatively high $V_{\bullet j}$ shows that industry *j* draws heavily on a small number of industries while a low $V_{\bullet j}$ means that it draws more evenly from the other industries. A high $V_{i\bullet}$ means that a small number of industries draw heavily on industry *I* while a low $V_{i\bullet}$ means that the other industries draw evenly on industry *i*.

Annex 5: Backward and Forward Linkages and Coefficients of Variation of 36 Industries in Malaysia, 1991-2010

Industry	Code	1991								2000							
		Backward Linkage	Rank	Forward Linkage	Rank	Backward Coefficient	Rank	Forward Coefficient	Rank	Backward Linkage	Rank	Forward Linkage	Rank	Backward Coefficient	Rank	Forward Coefficient	Rank
Rubber	1	0.747	33	1.259	6	5.332	4	3.890	27	0.728	35	1.314	5	5.438	2	3.821	29
Oil palm	2	0.742	36	1.457	1	5.372	2	4.009	24	0.859	26	1.659	1	4.614	14	3.792	30
Agriculture	3	0.842	29	0.995	17	4.810	9	3.994	25	0.846	27	1.090	12	5.048	5	3.930	28
Livestock and fishing	4	1.254	4	1.052	14	3.832	30	4.356	17	1.303	2	1.091	10	3.764	32	4.338	18
Forestry and logging	5	0.754	32	1.024	15	5.295	5	4.067	21	0.797	32	1.198	7	5.101	4	3.522	33
Crude oil and natural gas	6	0.744	35	1.007	16	5.429	1	3.902	26	0.720	36	0.990	17	5.579	1	4.026	26
Other mining and quarrying	7	0.969	18	1.380	4	4.182	24	3.123	33	0.958	20	1.446	2	4.183	20	3.221	34
Food, beverage and tobacco	8	1.221	5	0.954	20	3.678	33	4.531	16	1.197	4	1.044	14	3.829	33	4.304	19
Oils and fats	9	1.790	1	1.222	8	4.167	25	5.664	5	1.956	1	1.436	3	4.106	26	5.293	10
Textiles and leather	10	0.961	19	0.837	26	4.757	11	5.228	10	1.050	12	0.901	24	4.160	21	4.732	14
Apparels and footwear	11	0.895	27	0.699	32	4.650	13	5.688	4	1.048	13	0.751	28	4.082	27	5.497	7
Wood products	12	1.305	3	0.854	24	3.643	35	4.896	13	1.231	3	0.868	26	3.687	34	4.669	15
Paper products and furniture	13	1.069	11	1.142	11	4.087	27	3.646	29	1.094	8	1.033	15	4.073	28	4.164	21
Printing and publishing	14	0.917	23	1.408	3	4.471	17	2.809	35	1.073	10	0.977	18	3.866	29	4.069	24
Refined petroleum products	15	1.323	2	1.247	7	3.822	31	3.232	32	1.064	11	1.143	9	4.218	22	3.585	32
Chemicals and pharmaceuticals	16	0.985	15	0.980	18	4.370	19	4.171	18	1.183	5	1.090	11	3.920	30	4.099	23
Processed rubber products	17	1.218	6	0.784	28	3.748	32	5.277	8	1.125	7	0.900	25	4.233	23	5.095	12
Plastics and non-metallic mineral products	18	1.070	10	1.217	9	4.080	28	3.586	30	1.032	16	1.030	16	4.239	24	4.182	20
Metal products	19	1.099	8	1.167	10	4.452	18	4.047	22	0.990	18	1.171	8	4.745	11	3.941	27
Machinery	20	0.978	16	0.805	27	4.332	22	4.996	12	0.815	31	0.700	33	4.961	6	5.577	6

Electric appliances and electronic components	21	0.906	25	0.776	30	4.876	8	5.428	7	0.864	25	0.725	30	4.906	9	5.665	4
Precision equipment	22	0.976	17	0.668	34	4.207	23	5.853	1	0.914	23	0.714	32	4.518	16	5.610	5
Motor vehicles and transport equipment	23	0.960	20	0.921	22	4.781	10	4.757	15	1.036	15	0.964	21	4.738	12	4.933	13
Recycling and other manufacturing	24	0.934	22	0.959	19	4.367	20	4.025	23	1.048	14	0.951	22	3.944	31	4.162	22
Electricity, gas and water	25	1.002	13	1.359	5	4.144	26	2.897	34	0.932	22	1.401	4	4.498	17	2.859	36
Construction	26	1.092	9	0.726	31	3.675	34	5.276	9	1.089	9	0.719	31	3.673	35	5.369	9
Wholesale and retail	27	0.908	24	1.098	12	4.521	14	3.562	31	0.818	30	1.262	6	4.899	10	3.115	35
Hotels and restaurants	28	1.189	7	0.920	23	3.394	36	4.145	19	1.156	6	0.966	20	3.516	36	4.039	25
Transport and communications	29	0.988	14	1.087	13	4.493	15	3.883	28	0.983	19	0.976	19	4.472	18	4.343	17
Finance and insurance	30	0.899	26	0.847	25	4.709	12	4.764	14	0.826	29	0.736	29	5.010	7	5.441	8
Real estate	31	0.747	34	0.935	21	5.365	3	4.082	20	0.789	34	0.905	23	5.395	3	4.539	16
Business services	32	0.948	21	1.433	2	4.353	21	2.724	36	0.886	24	1.086	13	4.635	15	3.632	31
Private services	33	0.842	30	0.777	29	4.956	6	5.119	11	1.003	17	0.781	27	4.200	25	5.250	11
Education	34	0.804	31	0.663	36	4.945	7	5.748	3	0.795	33	0.649	36	4.964	8	5.905	1
Health	35	0.894	28	0.664	35	4.479	16	5.782	2	0.845	28	0.654	35	4.673	13	5.870	2
Government services	36	1.028	12	0.677	33	3.869	29	5.640	6	0.947	21	0.681	34	4.253	19	5.763	3

Industry	Code	2005								2010							
		Backward Linkage	Rank	Forward Linkage	Rank	Backward Coefficient	Rank	Forward Coefficient	Rank	Backward Linkage	Rank	Forward Linkage	Rank	Backward Coefficient	Rank	Forward Coefficient	Rank
Rubber	1	0.754	34	0.767	29	4.283	8	4.152	15	0.888	28	0.767	28	4.025	15	4.521	14
Oil palm	2	0.826	29	1.590	1	4.309	7	3.481	24	0.761	33	1.527	2	4.580	5	3.643	24
Agriculture	3	0.884	26	1.211	6	4.256	9	3.290	29	0.718	35	0.886	22	4.874	2	4.018	18
Livestock and fishing	4	0.967	23	1.150	12	4.119	14	3.419	27	1.044	14	0.769	27	3.509	31	4.590	13
Forestry and logging	5	0.684	36	1.230	5	4.720	1	2.902	33	1.217	4	1.578	1	4.123	13	3.245	32
Crude oil and natural gas	6	0.706	35	1.051	16	4.696	2	3.275	31	0.684	36	1.138	10	5.175	1	3.369	30
Other mining and quarrying	7	1.086	11	1.197	7	3.022	36	2.778	36	0.763	32	1.487	4	4.547	6	2.524	35
Food, beverage and tobacco	8	1.099	9	0.838	27	3.621	27	4.646	10	1.063	12	0.814	26	3.837	25	4.893	8
Oils and fats	9	1.483	1	1.108	14	3.674	24	4.587	11	1.527	1	0.998	19	3.535	30	4.884	9
Textiles and leather	10	1.101	8	0.951	21	3.652	25	4.143	16	1.052	13	0.827	24	3.596	28	4.424	15
Apparels and footwear	11	0.946	24	0.710	33	3.463	33	4.487	12	0.922	22	0.741	30	3.880	23	4.681	12
Wood products	12	1.056	15	0.841	26	3.515	31	4.196	14	1.439	2	1.006	16	3.019	36	3.820	20
Paper products and furniture	13	1.086	10	1.008	19	3.899	20	4.109	17	1.198	5	0.926	21	3.187	35	3.966	19
Printing and publishing	14	0.992	21	1.008	20	3.876	21	3.713	22	0.993	17	1.522	3	3.538	29	2.438	36
Refined petroleum products	15	1.124	6	1.286	4	3.535	30	2.845	35	0.988	18	1.002	17	3.980	17	3.422	29
Chemicals and pharmaceuticals	16	1.069	13	0.939	22	3.478	32	3.835	19	1.119	9	1.118	11	3.807	26	3.674	23
Processed rubber products	17	1.366	2	1.290	3	4.202	11	4.337	13	1.403	3	1.096	13	3.977	18	4.937	7
Plastics and non-metallic mineral products	18	1.044	17	1.088	15	3.615	28	3.444	26	1.155	7	1.187	8	3.453	32	3.353	31
Metal products	19	1.070	12	1.111	13	4.129	13	3.899	18	1.008	16	1.175	9	4.341	9	3.637	25
Machinery	20	0.834	28	0.681	34	4.085	15	4.868	6	0.823	30	0.661	32	4.305	11	5.216	5
Electric appliances and electronic components	21	0.973	22	0.783	28	4.174	12	5.078	4	0.778	31	1.052	14	4.508	7	4.102	17
Precision equipment	22	0.900	25	0.755	31	4.026	17	4.705	9	0.856	29	0.654	34	4.109	14	5.238	4

Motor vehicles and transport equipment	23	1.048	16	0.765	30	3.588	29	4.782	8	1.014	15	0.833	23	3.964	19	4.688	11
Recycling and other manufacturing	24	0.795	33	1.165	11	4.313	6	2.990	32	0.899	27	0.986	20	3.881	22	3.427	28
Electricity, gas and water	25	1.103	7	1.172	9	3.683	23	3.284	30	0.901	26	1.350	6	4.489	8	2.877	34
Construction	26	1.040	19	0.871	24	3.154	35	3.696	23	1.133	8	0.760	29	3.318	33	4.775	10
Wholesale and retail	27	0.805	31	1.174	8	4.214	10	2.878	34	0.908	24	0.999	18	4.019	16	3.551	27
Hotels and restaurants	28	1.149	5	0.844	25	3.627	26	4.805	7	1.158	6	0.824	25	3.244	34	4.369	16
Transport and communications	29	1.178	4	1.168	10	3.853	22	3.742	21	1.104	10	1.118	12	3.897	21	3.702	22
Finance and insurance	30	1.034	20	1.346	2	4.563	3	3.462	25	1.063	11	1.362	5	4.716	4	3.555	26
Real estate	31	0.872	27	0.909	23	4.072	16	3.798	20	0.920	23	1.022	15	4.338	10	3.751	21
Business services	32	0.795	32	1.041	18	4.438	4	3.292	28	0.955	20	1.326	7	4.281	12	3.005	33
Private services	33	1.208	3	1.043	17	4.327	5	4.891	5	0.979	19	0.687	31	3.914	20	5.402	3
Education	34	0.820	30	0.556	36	3.979	18	5.763	1	0.735	34	0.581	35	4.834	3	5.966	2
Health	35	1.060	14	0.715	32	3.926	19	5.725	2	0.902	25	0.657	33	3.875	24	5.125	6
Government services	36	1.041	18	0.638	35	3.202	34	5.109	3	0.932	21	0.562	36	3.696	27	5.992	1

Annex 6: Explanatory Notes for Derivation of Net Foreign Exchange Earnings

Exports are one component of final demand, and economies generate foreign exchange earnings from this demand. In the process of producing goods and exports, industries will use imports as inputs. Net foreign exchange earnings are calculated as foreign exchange earnings less the imports used to fulfil the production. The import coefficient for industry *i* is derived by dividing the imports purchased by industry *i* by the output of industry *i* and is defined as:

$$\eta_i = \frac{u_i^m}{x_i} \tag{1}$$

where η_i is the import coefficient, u_i^m is the imports of industry *I*, and x_i is the output of industry *i*.

The final demand f_i for the output of industry *i* is divided into a domestic component f_i^d and an export component f_i^x. The imports of industry *i* are divided into import requirement for domestic component σ_i^d and import requirement for export component σ_i^x.

The total imports required by all industries to produce f_j^x of exports in industry *j* is

$$\sigma_j^x = f_j^x \times \sum_{i=1}^{n} \eta_i \, \theta_{ij} \tag{2}$$

where σ_i^x is the total import requirements, η_i is the import coefficient, and θ_{ij} is the Leontief inverse.

The net foreign exchange earnings from the export of f_j^x is given by subtracting the import requirements from the export value, expressed as

$$e_j^x = f_j^x - \sigma_j^x \tag{3}$$

where e_j^x is the net foreign exchange earnings, f_j^x is the export value, and σ_j^x is the total import requirements of industry *j*.

Annex 7: Market Capitalisation and Substantial Shareholders of 20 Largest Palm-Based Firms, 2014/2015

	Firm	*Market Capitalisation (Million US$)* [3]	*Substantial Shareholder(s)* [4]	
1	Federal Land Development Authority (Felda) Group [1]	1,597	Felda [*]	33.7%
			National Equity Corporation (PNB) [3]	1.6%
			Pilgrims Fund Board (LTH) [*]	7.8%
			Koperasi Permodalan Felda Malaysia Bhd (KPF)	5.8%
			Retirement Fund Incorporated (KWAP) [*]	5.6%
			Employees Provident Fund (EPF) [*]	5.3%
			Pahang State Government	5.0%
2	Sime Darby	12,320	National Equity Corporation (PNB) [5]	54.1%
			EPF	13.1%
3	Wilmar International	13,675	Robert Kuok Hock Nien [6]	32.4%
			Archer Daniels Midland Company (AMD) [7]	18.1%
			Kuok Khoon Hong [8]	12.0%
			Martua Sitorus [9]	8.0%
4	Kuala Lumpur Kepong	6,236	Lee Oi Hian and Lee Hau Hian [10]	46.6%
			EPF	13.2%
			PNB	11.9%
5	IOI Corporation	7,216	Lee Shin Cheng [11]	46.8%
			EPF	9.4%
			PNB	9.2%
6	Tradewinds Plantation [2]	N.A.	Syed Mokhtar Al-Bukhary	N.A.
			Others	N.A.
7	Genting Plantations	2,099	Lim Kok Thay [12]	53.6%
			EPF	14.6%
			KWAP	5.0%
8	Boustead Plantations	610	Armed Forces Fund Board (LTAT) [*]	69.4%
			LTH	5.0%
9	Sarawak Oil Palms	493	Ling Chiong Ho [13]	35.8%
			Pelita Holdings Sdn Bhd [^]	20.4%
			State Financial Secretary of Sarawak	7.9%
10	TH Plantations	262	LTH	71.8%
			EPF	7.3%
11	IJM Plantations	800	IJM Corporation Bhd [14]	55.2%
			EPF	11.8%
12	Rimbunan Sawit	189	Tiong Hiew King [15]	54.9%
			State Financial Secretary of Sarawak	5.4%
13	TSH Resources	675	Kelvin Tan Aik Pen	12.1%
			Tunas Lestari Sdn Bhd	6.4%
			Embun Yakin Sdn Bhd	5.6%
14	Kulim (Malaysia)	1,270	Johor Corporation [^]	62.7%
			KWAP	6.8%
			Waqaf An-Nur Corporation Bhd [^]	5.2%
15	TDM	264	Terengganu Incorporated Sdn Bhd [^]	47.4%
			Terengganu State Economic Development Corporation [^]	13.3%
			KWAP	7.8%
16	United Plantations	1,349	The Bek-Nielsen family [16]	48.7%
			EPF	14.3%
			Perak State Agricultural Development Corporation [^]	6.3%
17	Hap Seng Plantations Holdings	491	Lau Cho Kun [17]	52.8%
			Innoprise Corporation Sdn Bhd [^]	15.0%
			EPF	7.6%
			LTH	5.6%
18	Sarawak Plantation	152	Abdul Hamed Sepawi	30.5%
			State Financial Secretary of Sarawak	25.5%
			LTH	6.7%

			Mohamad Bolhair Reduan	6.7%
19	BLD Plantation	220	Henry Lau Lee Kong [18]	39.2%
			Wan Abdillah Wan Hamid	18.3%
20	United Malacca	323	Aberdeen Asset Management Plc	15.1%
			Oversea-Chinese Banking Corporation (OCBC) Ltd [19]	14.2%
			Hongkong and Shanghai Banking Corporation (HSBC) Ltd	8.6%
			EPF	5.7%
			Lee Foundation	5.0%

* Federal-level statutory bodies

^ State-level statutory bodies/ government investment arms

[1] Felda Group comprises the corporate entities and smallhoders' schemes launched by Felda, a statutory body under the Prime Minister's Department. Data are for Felda Global Ventures (FGV) Bhd, which is 34% owned by Felda.

[2] Based on 31 December 2015 closing price on stock exchanges and central bank annual average exchange rates (1 USD to 3.9073 MYR and 1.3749 SGD).

[3] Data obtained from its last annual report for 2012 before the listed company was taken private the following year.

[4] For cumulative direct and indirect shareholding that is 5% or more.

[5] Directly through PNB and indirectly through PNB's wholly owned unit trust, AmanahRaya Trustees Bhd.

[6] Indirectly through the Kuok Group of companies, namely Kuok Brothers Sdn Bhd (which controls PPB Group Bhd), Kerry Group Ltd and Kuok (Singapore) Ltd.

[7] Indirectly through Archer Daniels Midland Asia-Pacific Ltd, ADM Ag Holding Ltd and Global Cocoa Holdings Ltd.

[8] Directly held by Kuok and indirectly through a range of investment companies controlled by Kuok.

[9] Directly held by Sitorus, or indirectly through a range of investment companies controlled by Sitorus.

[10] Directly held by Lee and his immediate family members, and indirectly through Vertical Capacity Sdn Bhd, which is wholly owned by family-controlled Progressive Holdings Sdn Bhd.

[11] Directly held by the Lee brothers, and indirectly through Batu Kawan Bhd, which is controlled by the brothers' jointly-owned company, Wan Hin Investments Sdn Bhd.

[12] Directly held by Lim, or indirectly through Genting Bhd, which is controlled by the family-owned Kien Huat Realty Sdn Bhd and Kien Huat International Ltd and which serves as the investment holding company for the Genting Group.

[13] Directly held by Ling, or indirectly through Shin Yang Plantation Sdn Bhdh, which is a subsidiary of the Shing Yang Group of which Ling is the founding chairman.

[14] A construction and property development firm that is controlled by EPF (13.1%), PNB's Amanah Trustees Bhd (8%) and Lembaga Tabung Haji (5.3%).

[15] Directly held by Tiong, or indirectly through a list of companies in which Tiong has substantial interests, mainly Tiong Toh Siong Holdings Sdn Bhd, Pemandangan Jauh Plantation Sdn Bhd and Rimbunan Hijau Southeast Asia Sdn Bhd.

[16] Directly held by the Bek-Nielsen family members, or indirectly through the family-owned Maximum Vista Sdn Bhd and United International Enterprises Ltd.

[17] Indirectly though Hap Seng Consolidated Bhd, which is 74.07% owned by Lau Cho Kun through Gek Poh (Holdings) Sdn Bhd and Lei Shing Hong Investment Ltd.

[18] Indirectly through BLD Holdings Sdn Bhd of which Lau is the chairman and other companies in which he has substantial interests.

[19] Indirectly through Great Eastern Life Assurance (Malaysia) Bhd, which is wholly owned by Great Eastern Holdings Ltd (GEH) whose parent is Singapore-based OCBC.

Source: Annual reports 2014/ 2015, company websites**.**

Annex 8: A Brief History and Milestones of 20 Largest Palm-Based Firms

1. Federal Land Development Authority (Felda) Group

1956

- Established as a government agency for land development and resettlement of landless peasants to virgin land for oil palm and rubber cultivation.

1956-1961

- Distributed funding to existing state-level land developments.

1962-1967

- Started managing own schemes. Land was developed by contractors, with each settler household typically allocated a 4-hectare lot and receiving the land title under a full loan repayment scheme.
- World Bank funding was sourced for a major programme in the Pahang state.

1967-1990

- Diversified its upstream and downstream activities. Settlers given complementary facilities and social services as part of the package deal.

1990

- Granted a total of 850,000 hectares of land by state governments since inception.
- Became a self-funded statutory body and began to generate its income via business arms.
- Ceased settler intake due to high programme costs and growing labour shortages.

1991-present

- Managed land not granted to settlers (over 40% of total land bank) on a commercial basis.
- Transformed from an agency with social objectives to add a profit-making dimension.
- Continued with restructuring of group assets and businesses, culminating in the 2012 listing of Felda Global Ventures (FGV) Bhd, which manages non-settler land and holds Felda's key processing and logistics assets.
- Increased efforts to find investment opportunities in overseas plantation and downstream businesses.

2. Sime Darby Bhd

1910

- Set up as Sime, Darby & Co in British Malaya by William Middleton Sime, Henry d'Esterre Darby and Herbert Milford Darby as a British agency house.

1920s-1950s

- Became a large agent for rubber plantations and diversified into timber, preservatives, motor insurance and tractor and heavy equipment dealership.
- Shaw, Darby and Co was formed in London, with profitable interests ranging from the Far to Middle East and Africa.

1964-1974

- Explored oil palm crop as rubber prices declined due to competition from synthetic rubber.
- The largest plantation company in Malaysia with 81,000 hectares of oil palm and rubber.
- Together with Guthrie, Harrisons & Crosfield and Boustead Barlow of similar agency house origins, the 4 firms owned 30% of Malaysia's total plantation hectarage.

1976-1980

- National Corporation (Pernas) built up its shareholdings in Sime Darby and placed it under Malaysian management
- Sime Darby Berhad was incorporated in Malaysia and listed on the Kuala Lumpur Stock Exchange

1981-1988

- National Equity Corporation (PNB) gained control of the London-listed Guthrie through a dawn raid, triggering

	a series of ownership transfers among foreign-ocontrolled plantation firms.
–	Harrisons & Crosfields sold its plantation business (later renamed as Golden Hope) to PNB.
	1990s-2000s
–	Diversified into healthcare, manufacturing, automotive dealership and real estate.
	2007
–	Merged with Golden Hope and Guthrie - two other plantation companies under PNB's control - to form the world's largest oil palm plantation company.
	2008-Present
–	Obtained concession rights to 220,000 hectares of land and commenced large-scale plantation in Liberia.
–	Acquired NBPOL and its 135,000 hectares in Papua New Guinea, bringing land bank to almost 1 million hectares in 5 countries.
3.	Wilmar International Ltd
	1991
–	Founded as Wilmar Holdings Pte Ltd, a palm oil trading company headquartered in Singapore, by Kuok Khoon Hong and Martua Sitorus
–	Acquired a land bank of approximately 7,100 hectares for oil palm cultivation in Western Sumatra, Indonesia, followed by crushing plants and refineries in Sumatra and Riau.
	1995-1999
–	Purchased first liquid bulk vessel to provide logistics and transportation support to business operations.
–	Expanded refinery operations into Malaysia.
–	Entered the Indian market through Wilmar Adani Limited, a joint venture with the Adani Group of India.
	2000-2005
–	Began developing and marketing own brand of Sania edible oil consumer pack in Indonesia.
–	Acquired a controlling interest in Indonesia-listed PT Cahaya Kalbar Tbk, a producer of specialty oils and fats.
	2006-2007
–	Expanded oil palm plantation hectarage aggressively through acquisition of plantation companies and land bank in Indonesia.
–	Renamed Wilmar International Ltd and listed on the Singapore Exchange via a reverse takeover.
–	Underwent a major capacity expansion drive in refining, crushing, milling and compound fertiliser manufacturing plant.
–	Completed a merger exercise with the Kuok Group and Archer Daniels Midland (ADM) contributing their businesses in palm plantation, edible oils, oilseeds and grains businesses in Malaysia and China, respectively, to Wilmar International in exchange for shares.
–	Formed a joint venture with Olam International Ltd and SIFCA Group to target palm oil, natural rubber, sugar and other plantation crops in Africa.
	2010-Present
–	Acquired Sucrogen Limited (now Wilmar Sugar Australia Ltd), the largest raw sugar producer and refiner in Australia, and PT Jawamanis Rafinasi, a leading sugar refinery in Indonesia.
–	Further expanded into the sugar business through the acquisition of PT Duta Sugar International in Indonesia and Proserpine Mill in Australia.
–	Expanded in Ghana through the acquisition of Ghana-listed Benso Oil Palm Plantations Ltd.
–	Established a joint venture with Kellogg Company for the manufacture, sale and distribution of breakfast cereals and savoury snacks in China.
–	Acquired approximately 30,000 hectares of land in Nigeria for oil palm plantations.
–	Acquisition of 35% equity interest in Estate Management Services Pte Ltd, which manages estates and plantation property in Sri Lanka.

–	Completed acquisition of Goodman Fielder, Australasia's leading food manufacturer.
4.	Kuala Lumpur Kepong Bhd *1906-1907* – Incorporated as Kuala Lumpur Rubber Company Ltd by Everard Feilding in London and listed on the London Stock Exchange. – Focused on tin mining operations in British Malaya, with small plantations in rubber and coffee *1958-1960s* – Acquired a number of plantations, one of which was the Kepong (Malay) Rubber Estates Ltd, followeid by a name change to Kuala Lumpur-Kepong Amalgamated Ltd (KLKA). – Diversified into oil palms as replacement for rubber. *1969-1970* – Shares sold down in the aftermath of racial riots in Malaysia. – Acquired by Lee Loy Seng from a famous tin-mining family in Ipoh, Perak; management and operations of KLKA moved back to Malaysia. *1*970s – Kuala Lumpur Kepong Bhd incorporated to take over all assets and liabilities of KLKA – Kuala Lumpur Kepong listed in London, Singapore and Kuala Lumpur (listings ceased in Singapore 1990 and in London in 2005. *1980s* – KLK expanded into Sabah, accumulating up to 40,000 hectares of land over time. *1990s* – Diversified into resource-based manufacturing (oleochemicals, latex gloves, wood flooring and soap) and retail (acquisition of Crabtree & Evelyn, US brand for body and home products in 1996 until it was sold in 2012). – Expanded into Indonesia's plantation in 1994, which grew to be as big as the size of its Malaysian plantations. *2000s* – Expanded manufacturing operations through organic growth, joint-ventures and acquisitions in Malaysia, China, Switzerland, Germany, The Netherlands and Belgium, resulting in internationally-scaled oleochemicals operations.
5.	IOI Corporation Bhd *1969* – Established as Industrial Oxygen Incorporated Sdn Bhd as a manufacturer of industrial gas. *1982-1983* – Lee Shin Cheng, a former plantation manager who had ventured into property development, gained control of the company. – Renamed IOI Corporation and entered plantation and property development business from zero base. – Acquired Dunlop Estate's 27,800 hectares of oil palm and processing facilities. *1990s* – Acquired Unipamol Malaysia Sdn Bhd and Pamol Plantations Sdn Bhd from Unilever BV following the latter's strategy to divest non-core businesses. – Total plantation hectarage expanded to over 45,000 hectares by 1990. – Became the most efficient plantation company in the world in terms of oil yield (over 6 tonnes per hectare per year) and production cost. – Ventured into the oleochemical business with acquisition of Palmco Holdings Bhd, which owned Malaysia's largest integrated oleochemical complex.

	2000s
–	Annual combined refining capacity exceeded 3.5 million tonnes – its Rotterdam refinery being the largest palm oil refinery in Europe.
–	Became Asia's largest oleochemical manufacturer, with an annual manufacturing capacity in excess of 740,000 tonnes.
–	Acquired Unilever's oils and fats division and Loders Croklaan BV (now IOI Loders Croklan), a leading global supplier of specialty fats to the food sector.
–	Partnered with Kerry Group to develop and market infant nutrition business.
6.	Tradewinds Plantation Bhd
	1974-1975
–	Tradewinds (M) Sdn Bhd incorporated as a vehicle of National Corporation (Pernas) to acquire foreign-owned plantation, mining and property interests.
	1987
–	Acquired sugar refining and insurance businesses.
–	Became Tradewinds (M) Bhd and listed on the Kuala Lumpur Stock Exchange.
–	Pernas held the controlling stake with the Kuok Group being a major partner.
	1995-1996
–	Underwent a management buyout but reverted to government ownership before it was sold to Syed Mokhtar Al-Bukhary.
–	Established Tradewinds Plantation Services Sdn Bhd to provide advisory services to all plantation companies within Pernas.
–	Acquired plantation companies in East Malaysia and Indonesia, with plantation hectarage exceeding 100,000 hectares by late 1990s.
	2004-2006
–	Merged plantation operations with Johore Tenggara Oil Palm Bhd, resulting in a new entity, Tradewinds Plantation Bhd.
	2013
–	Tradewinds Plantation Bhd and Tradewinds (M) Bhd taken private by Syed Mokhtar Al-Bukhary.
–	Tradewinds Plantation remains a large oil palm company with over 160,000 hectares of land bank in total, and over 132,000 hectares of oil palm plantations in Malaysia.
7.	Genting Plantations Bhd
	1977
–	Incorporated as Asiatic Development Sdn Bhd
	1980s
–	Became a subsidiary of Genting Bhd
–	Commenced business through acquisition of 3 Hong Kong-domiciled rubber companies with plantation land in Malaysia
–	Made inroads into Sabah, Malaysia given land scarcity in Peninsular Malaysia
	1990s
–	Expansion in Sabah through acquisition of land and milling facilities
–	Expanded into property development
	2005-2006
–	Expanded plantation activities into Indonesia
–	Ventured into biotechnology through a joint venture to commercialise synthetic genomic processes and alternative energy resources.

8. Boustead Plantations Bhd

1946

– Incorporated as Kuala Sidim Rubber Company Ltd.

1960s

– Converted rubber crops into oil palm.

1969

– Barlow Boustead Estates Agency (BBEA) Ltd of British agency house origin assumed control.

1970s

– Listed in Singapore and Kuala Lumpur.

– Expanded into agricultural research and advisory services.

1980s

– Local shareholders including the Armed Forces Fund Board (LTAT), Pilgrims Fund Board (LTH) and Felda acquired the interest held by the Barlow family in BBEA.

– Shares in BBEA transferred to Boustead Holdings, now controlled by LTAT.

1990s

– Delisted from the Singapore Stock Exchange.

– Became the vehicle for Boustead Holdings' plantations interest.

– Expanded direct ownership of plantation land, focusing on Sarawak, Malaysia and Sumatra, Indonesia.

2000s

– Name changed to Boustead Plantations Bhd following a restructuring and relisting exercise.

9. Sarawak Oil Palms Bhd

1968-1969

– Sarawak Oil Palms Sdn Bhd incorporated as a joint venture between the UK's Commonwealth Development Corporation (CDC) and Sarawak State Government to pioneer commercial oil palm plantation in Sarawak.

1990-1991

– Conversion to Sarawak Oil Palms Bhd and listed in Kuala Lumpur.

– Shin Yang Group, one of the major companies with significant timber concessions in Sarawak, acquired CDC's remaining stake in Sarawak Oil Palms, with Sarawak State Government continuing its involvement thtorugh Pelita Holdings Sdn Bhd.

1990s

– Expansion of plantation land in Sarawak.

2000s

– Ventured into edible oils business.

– Expansion of plantation land in Sarawak through agreements with Sarawak Economic Development Corporation and Shin Yang Group.

2012-Present

– Ventured into refining, consumer cooking oil and property development business.

10. TH Plantations Bhd

1972

– Incorporated as Perbadanan Ladang-Ladang Tabung Haji Sdn Bhd (Pilgrims Fund Board Plantations Corporation).

1990s

– Expanded plantations to Sarawak.

–	Acquired land through strategic ventures with state and government agencies.
	1997
–	Name changed to TH Plantations Sdn Bhd.
	2005
–	Name changed to TH Plantations Bhd and listed in Kuala Lumpur.
	2014
–	Acquired plantations in Kalimantan Timur, Indonesia, marking TH Plantations' first foray overseas.
11.	IJM Plantations Bhd
	1985
–	IJM Corporation Bhd, a construction firm, ventured into oil palm cultivation in Sabah, Malaysia
	1993
–	Commissioned the first palm oil mill
	2002-2003
–	Built jetty and bulking facilities in Sabah
–	Ventured into crushing business
–	Listed in Kuala Lumpur
	2007
–	Expanded into Indonesia through acquisition of plantations.
12.	Rimbunan Sawit Bhd
	1993
–	Rimbunan Hijau, a Sarawak-based company controlled by Tiong Hiew King with significant timber concessions in the state, ventured into oil palm plantation amid depleting timber resources and increasing profitability of oil palm
–	Timrest Sdn Bhd incorporated as the oil palm subsidiary
	1990s-2000s
–	Rapid expansion through acquisition of existing plantations and setting up of new plantations
	2005-2006
–	Oil palm business unde Rimbunan Hijau consolidated under Rimbunan Sawit Sdn Bhd
–	Rimbunan Sawit became a public limited company and listed in Kuala Lumpur
–	Continuous expansion of plantations in Sarawak.
13.	TSH Resources Bhd
	1979-1985
–	Set up by Tan Sook Hong as a company to engage in marketing and distribution of cocoa beans sourced from suppliers in Sabah, Malaysia.
	1994
–	Listed in Kuala Lumpur as a cocoa manufacturing and processing company.
	1995
–	Diversified into manufacture and trading of downstream timber products.
	1997-2001
–	Ventured into oil palm plantations and milling in Sabah, Malaysia.
–	Awarded a forestation licence by the Sabah State Government to manage 123,000 hectares of forest reserve for 100 years.
–	Subsidiary involved in biomass power generation, TSH Bio-Energy Sdn Bhd, signed a power purchase

	agreement to supply electricity to Sabah Electricity Sdn Bhd.
	2002-Present
–	Expansion into plantations and milling in West Sumatera and Kalimantan, Indonesia.
14.	Kulim (Malaysia) Bhd
	1933-1940s
–	Kulim Rubber Plantation Ltd (KRPL) incorporated in the UK.
–	Commenced operations with rubber plantation in Johore, Malaysia.
	1970s
–	Name changed to Kulim Group Ltd (KGL) and listed in London.
–	Expanded from business in Malaysia to include property development in the UK, hotels in the Carribean and a rubber plantation in Nigeria.
	1975-1976
–	Kulim (Malaysia) Bhd incorporated and listed in Kuala Lumpur.
–	Johor State Economic Development Corporation (now Johor Corporation) became a controlling shareholder of Kulim.
–	KGL ceased listing in London and transferred to Kulim its assets and liabilities.
	1980s
–	Expanded oil palm and rubber plantations in Malaysia.
–	Disposed of property business overseas.
	1990s
–	Expanded into rubber-based manufacturing and oleochemicals
–	Expanded regionally with acquisition of New Britain Palm Oil Limited (NBPOL) in Papua New Guinea.
–	Ventured into plantations in Indonesia.
	2005-2007
–	Diversified into fast food business through acquisition of the franchise operator of Kentucky Fried Chicken and Pizza Hut in Malaysia.
–	Exited from property business in Malaysia and from plantation operations in Indonesia.
	2011-Present
–	Re-entered into plantations in Indonesia.
–	Ventured into oil and gas exploration and production in Indonesia.
–	Sold NBPOL to Sime Darby.
15.	TDM Bhd
	1965
–	TDM Bhd incorporated to cultivate and manage oil palm plantations leased from the Terengganu State Economic Development Corporation.
	1970
–	Listed in Kuala Lumpur
	1990s
–	Diversified into healthcare, poultry, fast food, transportation, hotel and property businesses.
	2000s
–	Consolidated businesses into plantations and healthcare services, divesting others.
–	Expanded into plantations in Indonesia.

16. United Plantations Bhd

1906-1917

- Aage Westenholz, a former Danish Army officer who served in Siam and who was trained as a civil engineer, established rubber plantations near Teluk Anson, Perak.
- Westenholz acquired other plantations nearby and merged them into United Plantations Ltd.

1918

- Westenholz's younger cousin, William Lennart Grut, acquired land up the Bernam River in Perak and founded Bernam Oil Palms, coinciding with Guthrie's and Socfin's venture into oil palm cultivation.

1932

- Bernam Oil Palms listed on the Copenhagen Stock Exchange.

1966-1969

- United Plantations Ltd and Bernam Oil Palms Ltd amalgamated into United Plantations Bhd.
- Listed on the Kuala Lumpur Stock Exchange (KLSE) Main Board on the 8th October 1969.

1970s

- Ventured into refining business.
- Borge Bek-Nielsen, who had risen from Bernam Oil Palms' assistant engineer to United Plantations' chief engineer, became the controlling shareholder over time.
- Bek-Nielsen rose to senior executive director and became chairman by 1978.

1981

- Sold to state-owned Food Industries of Malaysia Bhd (FIMA) under nationalisation process; Danish shareholders kept 15% of the company.

1991

- The original Danish shareholders, together with their more recent business partner Aarhus Oliefabrik (now AarhusKarlshamn) bought back a controlling share of United Plantations.

2000s

- Moderate expansion of plantations in Malaysia and entered into Indonesia aggressively.

17. Hap Seng Plantations Holdings Bhd

1950

- River Estates Ltd incorporated by Lau Gek Poh, a sundry operator-turned-timber businessman in Sabah, Malaysia, to move into rubber, cocoa and oil palm plantations.

1976-1978

- East Asiatic Company (Malaysia) Bhd incorporated and became Lau's principal vehicle for plantations and trading.
- Listed in Kuala Lumpur (later renamed as Hap Seng Consolidated Bhd).

1980s-1990s

- Hap Seng Consolidated diversified into building materials, property development, fertilisers and agrochemicals, and vehicle trading.

2007

- Hap Seng Plantations Holdings Sdn Bhd incorporated to hold Hap Seng Consolidated Bhd's plantation interest.
- Hap Seng Plantations listed in Kuala Lumpur.

18. Sarawak Plantation Bhd

1997

- Sarawak Plantation Sdn Bhd incorporated as the vehicle company for the privatisation of Sarawak Land Development Board's assets.

–	The Sarawak State Government received shares in Sarawak Plantation in return.
–	Commenced operations in the same year.
	2000s
–	Listed in Kuala Lumpur.
–	Ventured into seed production business.
–	Expansion of plantations in Sarawak, Malaysia, some of them on Native Customary Rights land that belongs to the indigenous people.
19.	BLD Plantation Bhd
	1975
–	Bintulu Lumber Development Sdn Bhd incorporated as part of the KTS Group of companies to undertake timber logging business in Sarawak, Malaysia.
	1987
–	Bintulu Lumber Development diversified into oil palm plantation on logged-over land amid depleted timber resources and rising profitability of oil palm.
	1996-1999
–	Oil palm plantation became the principal activity of Bintulu Lumber Development.
–	Bintulu Lumber Development's timber licence for 1975-1999 period expired, to be renewed on an annual basis.
–	Ventured into milling.
	2000-2003
–	Acquired existing plantation companies with land bank for future expansion.
–	BLD Plantation Bhd incorporated to hold selected KTS's oil palm-based businesses in plantation, milling and crushing.
–	BLD Plantation listed in Kuala Lumpur.
20.	United Malacca Bhd
	1910
–	United Malacca Rubber Estates Ltd founded by Tan Cheng Lock.
	1966
–	Diversified into oil palm cultivation; old rubber trees replaced with oil palm.
	1990s
–	Expanded plantations activities to Sabah, Malaysia.
	2001
–	Renamed United Malacca Bhd.
	2015
–	Expanded into plantations in Indonesia through an acquisition that doubled United Malacca's total plantation land bank.

Annex 9: Palm Oil Industries with Corresponding Activity and Commodity Codes

Industry	1991			2000			2005			2010		
	No.	Activity	Commodity	No.	Activity	Commodity	No.	Activity	Commodity	No.	Activity	Commodity
Planting Materials and Nursery (P1)	1	**24111** Agriculture (smallholdings, n.i.e.)	**111** Paddy, coffee, cocoa, pepper, fruit growing and other permanent crops	1	**24012** Fruits	**01129** Growing of flower plants for planting or ornamental purposes **01139** Growing of other fruits	1,3,4, 7,8	Fruits	**01129** Growing of flower plants for planting or ornamental purposes **01139** Growing of other fruits	1,3,4, 7,8	Fruits, Other Agriculture	**01252** Growing of fruit seeds **01259** Growing of other tree and bush fruits **01301** Growing of plants for planting **01304** Operation of tree nurseries
Oil Palm (P2)	3	**24113** Oil palm	**113** Fresh fruits bunch, kernel and nuts for planting only	3	**24018** Oil palm	**01117** Oil Palm Estates **01118** Oil Palm Smallholdings	6	Oil Palm	**01117** Oil Palm Estates **01118** Oil Palm Smallholdings	6	Oil Palm	**01261** Growing of oil palm (estate) **01262** Growing of oil palm (smallholdings)
Oils and Fats (P3)	16	**24315** Manufacture of vegetable and animal oils and fats	**315** Coconut oil, palm oil, palm kernel oil and other vegetable and animal oils and fats	16	**24115** Manufacture of crude and refined palm oil and palm kernel oil **24116** Manufacture of coconut oil and other vegetable and animal oils and fats	**15142** Manufacture of crude palm oil **15143** Manufacture of refined palm oil **15144** Manufacture of palm kernel oil **15149** Manufacture of other vegetable and animal oils and fats	21	Oils and Fats	**15142** Manufacture of crude palm oil **15143** Manufacture of refined palm oil **15144** Manufacture of palm kernel oil **15149** Manufacture of other vegetable and animal oils and fats	21	Oils and Fats	**10401** Manufacture of crude palm oil **10402** Manufacture of refined palm oil **10403** Manufacture of palm kernel oil **10406** Manufacture of compound cooking fats
Food Processing (P4)	12, 15, 21	**24322** Manufacture of other food products	**322** Sugar, coffee, tea, meehoon, noodles and related products, spices and curry powder, starch and other food products n.e.c.	12, 15, 21	**24125** Manufacture of other food products, n.e.c.	**15499** Manufacture of other food products, n.e.c.	17, 18, 25	Manufacture of other food products, n.e.c.	**15499** Manufacture of other food products, n.e.c.	25	Other Food Processing	**10750** Manufacture of prepared meals and dishes (emulsifiers, food stabilisers, thickeners etc)
Animal Feeds (P5)	22	**24323** Manufacture of prepared animal feeds	**323** Animal feeds for animal and fowls, including dog and other pet food	22	**24120** Manufacture of prepared animal feeds	**15330** Manufacture of prepared animal feeds (for dogs, cats, birds, fish or other pet animals and farm animals)	26	Animal Feeds	**15330** Manufacture of prepared animal feeds (for dogs, cats, birds, fish or other pet animals and farm	26	Animal Feeds	**10800** Manufacture of prepared animal feeds

									animals)			
Basic Chemicals (P6)	37, 41	**24351** Manufacture of basic industrial chemicals **24355** Manufacture of chemical products n.e.c.	**351** Industrial chemicals, fertilizers and pesticides, synthetic resins, plastic materials and man-made fibers except glass **355** Chemical products n.e.c.	37, 41	**24147** Manufacture of basic chemicals, except fertilizers and nitrogen compounds **24155** Manufacture of other chemical products, n.e.c.	**24119** Manufacture of other basic industrial chemicals except fertilizers and nitrogen compounds (includes alcohols and colouring matter of vegetable origin) **24290** Manufacture of other chemical products n.e.c e.g. lubricating oil additives) **24210** Manufacture of pesticides and other agrochemical products	45, 46, 50	Basic and Other Chemicals	**24119** Manufacture of other basic industrial chemicals except fertilizers and nitrogen compounds (includes alcohols and colouring matter of vegetable origin) **24290** Manufacture of other chemical products n.e.c e.g. lubricating oil additives) **24210** Manufacture of pesticides and other agrochemical products	45, 46, 50	Basic and Other Chemicals	**20112** Manufacture of basic organic chemicals **20119** manufacture of other basic chemicals n.e.c. **20299** Manufacture of other chemical products n.e.c.
Nutraceutical Chemicals (P7)	39	**24353** Manufacture of drugs and medicines	**353** Drugs and medicines	39	**24153** Manufacture of pharmaceuticals, medicinal chemicals and botanical products	**24230** Manufacture of pharmaceuticals, medicinal chemicals and botanical products	48	Pharmaceuticals, Medicinal Chemicals and Botanical Products	**24230** Manufacture of pharmaceuticals, medicinal chemicals and botanical products	48	Pharmaceuticals, Medicinal Chemicals and Botanical Products	**21001** Manufacture of medicinal active substances to be used for their pharmacological properties in the manufacture of medicaments **21009** Manufacture of other pharmaceuticals, medicinal chemical and botanical products n.e.c.
Soaps and Detergents (P8)	40	**24354** Manufacture of soap and cleaning preparations, perfumes, cosmetic, etc.	**354** Soap and cleaning preparations, perfumes, cosmetic and other toilet preparations	40	**24154** Manufacture of soap and detergents, perfumes, cleaning and toilet preparations	**24240** Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations (includes crude glycerol)	49	Soaps, Detergents, Perfumes, Cleaning and Toilet Preparations	**24240** Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations (includes crude glycerol)	49	Soaps, Detergents, Perfumes, Cleaning and Toilet Preparations	**20231** Manufacture of soap and detergents, cleaning and polishing preparations **20232** Manufacture of perfumes and toilet preparations

Biofuel (P9)	42	**24356** Petroleum refiners. Manufacture of miscellaneous products of petroleum and coal	**356** Petroleum refineries products such as petrol, kerosene and other miscellaneous products of petroleum and coal	42	**24146** Manufacture of coke oven, refined petroleum products and nuclear fuel	**23200** Manufacture of refined petroleum products	44	Petroleum Refinery	**23200** Manufacture of refined petroleum products	44	Petroleum Refinery	**19202** Manufacture of bio-diesel products
Wholesale and Retail (P10)	69	**24431** Wholesale and retail trade	**431** Wholesale and retail trade margins	69	**24404** Wholesale trade and commission trade, except of motor vehicles and motorcycles	**51212** Wholesale of palm oil	92	Wholesale and Retail Trade and Motor Vehicle	**51212** Wholesale of palm oil	93	Wholesale and Retail Trade	**46202** Wholesale of palm oil
Transportation Services (P11)	71	**24445** Services allied to transport	**441, 442, 443 & 444** Transport margins **445** Services allied to transport such as storage and warehousing	71	**24638** Activities of other transport agencies	**63020** Storage and warehousing service (includes warehousing of furniture, automobiles, lumber, gas and oil, chemicals, textiles, food and agricultural products, etc. as well as storage of goods in foreign trade zone) **63039** Other supporting transport services n.e.c. **63091** Activities of freight forwarding / forwarding agencies **63092** Activities of shipping agencies **63099** Activities of other transport agencies n.e.c.	95, 96, 97, 98, 99, 100	Transportation services	**63020** Storage and warehousing service (includes warehousing of furniture, automobiles, lumber, gas and oil, chemicals, textiles, food and agricultural products, etc. as well as storage of goods in foreign trade zone) **63039** Other supporting transport services n.e.c. **63091** Activities of freight forwarding / forwarding agencies **63092** Activities of shipping agencies **63099** Activities of other transport agencies n.e.c.	96, 97, 98, 99, 100, 101	Transportation Services	**52100** Warehousing and Storage Services **52211** Operation of terminal facilities **52219** Other service activities incidental to land transportation n.e.c. **52291** Forwarding of freight **52292** Brokerage for ship and aircraft space **52299** Other transportation support activities n.e.c.
Business Services (P12)	78	**24480** Business services	**480** Legal services, accounting, auditing and book-keeping services, data processing and tabulating services, engineering, architecture and	78	**24721** Computer and related activities **24731** Research and development	**72100** Hardware consultancy **72200** Software consultancy and supply **73101, 73102, 73104,**	108, 109, 110, 111, 112	Business Services	**72100** Hardware consultancy **72200** Software consultancy and supply **73101, 73102, 73104, 73105, 73109** Research	106, 113, 114, 115, 116	Business Services	**62010, 62021, 62022, 62091 , 62099** Computer programming activities, consultancy, facilities management

			technical services, advertising services, machinery and equipment rental and leasing and other business services n.e.c.		**24741** Legal activities **24743** Market research, business and management consultancy activities **24744** Architectural, engineering and other technical activities	**73105, 73109** Research and developmental services on physical sciences, chemistry and biology, agricultural sciences, medical sciences and pharmacy **74110** Legal service **74212** Engineering consultancy services (includes engineering and technical activities related to chemical engineering, mechanical, industrial and systems engineering, sanitary and pollution control engineering etc. **74220** Technical testing and analysis			and developmental services on physical sciences, chemistry and biology, agricultural sciences, medical sciences and pharmacy **74110** Legal service **74212** Engineering consultancy services (includes engineering and technical activities related to chemical engineering, mechanical, industrial and systems engineering, sanitary and pollution control engineering etc. **74220** Technical testing and analysis			activities, ICT security **63111, 63112, 63120** Data processing, hosting and related activities **72101, 72102, 72103, 72104, 72105, 72106, 72109** Research and development on natural sciences and engineering **69100, 69200** Legal and accounting activities **71101, 71102, 71103, 71109, 71200** Architecture and engineering activities, technical testing and analysis

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