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CHEMICAL GLOBAL
VALUE CHAIN

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The Duke University Center on Globalization, Governance & Competitiveness undertakes client-sponsored research that addresses economic and social development issues for governments, foundations and international organizations. We do this principally by utilizing the global value chain (GVC) framework, created by Founding Director Gary Gereffi, and supplemented by other analytical tools. As a university-based research center, we address clients' real world questions with transparency and rigor.

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The Philippines in the Chemical Global Value Chain Executive Summary

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Executive Summary

This report uses the Duke CGGC global value chain (GVC) framework to examine the role of the Philippines in the global chemical industry and identify opportunities for the country to upgrade. The Philippine chemicals sector is growing rapidly alongside economic expansion and a revival in manufacturing. By 2013, the chemicals sector as a whole accounted for 6.7% of GDP. Chemicals exports reached US\$2.2 billion in 2014, approximately 3.5% of the country's export basket. The sector's expansion has outpaced both global and regional trade; with a compound annual growth rate of 13% since 2007, three times as fast as global exports, and twice as fast as Asian regional exports. Participation in the export market is based primarily on commodity products in the oleochemicals and petrochemicals sub-sectors. Within these segments, exports are driven by a small number of products, with the top 10 accounting for approximately three-quarters of all exports. While the country is a small player in the global chemicals trade, accounting for just 0.2% of exports in 2014, it has generally been successful in carving out a presence in these niche products, and is one of the global leaders in most of its top product categories.

Chemicals Global Value Chain

The global chemicals market has grown rapidly over the past three decades. By 2014, it was valued at US\$4.2 trillion. Trade in the sector also increased significantly during a similar time period, reaching US\$1.3 trillion by 2014. The sector draws from a number of raw materials, including oil and gas, bio-based products, and minerals; applying a divergent range of manufacturing processes; and contributing to a very wide range of industries and end markets, from agriculture to construction and consumer products. Estimates suggest there are as many as 100,000 different chemicals being produced today. Key characteristics of the chemical GVC today include:

- **The chemical GVC is essentially comprised of a large number of varied and intersecting value chains.** For simplicity, this report divides the chain into five main segments: feedstock provision, breaking down of feedstock into basic chemicals together with the production of commodity chemicals, the production of intermediate chemicals, the production of specialty chemicals, followed by marketing, sales, and distribution into key end markets.
- **Demand and supply have shifted from traditional markets to emerging regions, including Asia-Pacific.** As a result of the close link between chemical consumption, manufacturing and economic growth, the sector has seen a shift in demand towards growth economies, in general, and the Asia-Pacific region, in particular. "Factory Asia", together with construction booms and a growing demand for a host of consumer products, has fostered strong demand for chemicals in the region. Faced with the need to expand capacity to meet growing global demand, together with high shipping costs, chemical producers have opted to relocate their production facilities in this region closer to the source of demand.
- **Capital intensity, technology development, and significant regulatory challenges create important barriers to entry and affect the number of firms in each stage.** Important differences in the business models required for the different stages of the chain result in a distinct power structure. While upstream segments are capital intensive and

dependent on economies of scale, the technologies are generally considered to be mature and available on the market. Downstream segments are smaller, far less capital intensive, but research and development is central to success. As a result, upstream segments are affected by occasional large capacity additions, while growth in the specialties segment is more incremental.

- **Upstream chemicals have become highly commoditized and are at risk of over-capacity dampening prices.** Aggressive expansion of petrochemical feedstocks in the United States (US) as a result of the expansion of “fracking” technologies and capacity expansion of related upstream chemicals in both the US and Asia has led to the upstream stages of the chain becoming increasingly characterized by tight margins and potential over-capacity. This makes it difficult for new entrants in the short to mid-term, particularly if there is a fall in global demand. Likewise, strong expansion has been seen in the oleochemicals sector as a result of capacity growth in Malaysia and Indonesia.
- **Global lead firms are focusing on specialty chemicals where margins are higher and require more product development.** Vertically integrated lead firms such as BASF, Dow, and Dupont have been amongst the most powerful in the industry for decades. However, the growth of large, competitive commodities operators in upstream segments, focused on a very small range of related products, has contributed to a shift in strategy for these firms, which are focusing more on specialty products for specific end markets to ensure their profitability. In this segment, there is growing demand for more environmentally sustainable and non-toxic chemicals, as well as those that provide solutions to environmental challenges, such as air and water pollution. This shift towards sustainability has helped to drive the growth of the global oleochemicals market as well as provided an opportunity for increased innovation and production in the field of specialty chemicals.

The Philippines in the Chemicals Global Value Chain

The Philippines participates primarily in the oleochemicals and petrochemicals sub-sectors, with a focus on commodity products, with petrochemicals referring to chemicals derived from oil & gas products and oleochemicals describing those created from bio-based plant and animal materials. In 2014, 69% of the Philippines chemical exports were basic/commodity chemicals, compared to just 15% intermediates, and 14% in specialty chemicals and final products. Exports are driven by a small number of products, with the top 10 accounting for approximately three-quarters of all exports. These products include glycerine and fatty alcohol, based on its older coco-oleochemicals operations, as well as new products such as aromatic petrochemicals and nickel-cobalt sulphide. The oleochemical and petrochemical sub-sectors have the highest value addition, as both operate in several stages of the chain, from input supply, through to semi-processed or processed products.

Exports from the Philippines, and its participation in the chemicals GVC, have been recent, with most progress occurring since the mid-1980s. This growth can be broken down into three distinct areas: (1) oleochemicals, (2) petrochemicals and, finally (3) forays into a variety of basic, intermediate, specialty and final products.

- I. The Philippines longest standing participation in the chemicals GVC has been in the oleochemicals sub-sector. Once a global leader, the industry is under threat from more

competitive vertically integrated firms in Malaysia and Indonesia. Three firms have closed down their operations since 2010. Nine firms continue to produce a range of coconut-based oleochemicals, although primary exports are in glycerine.

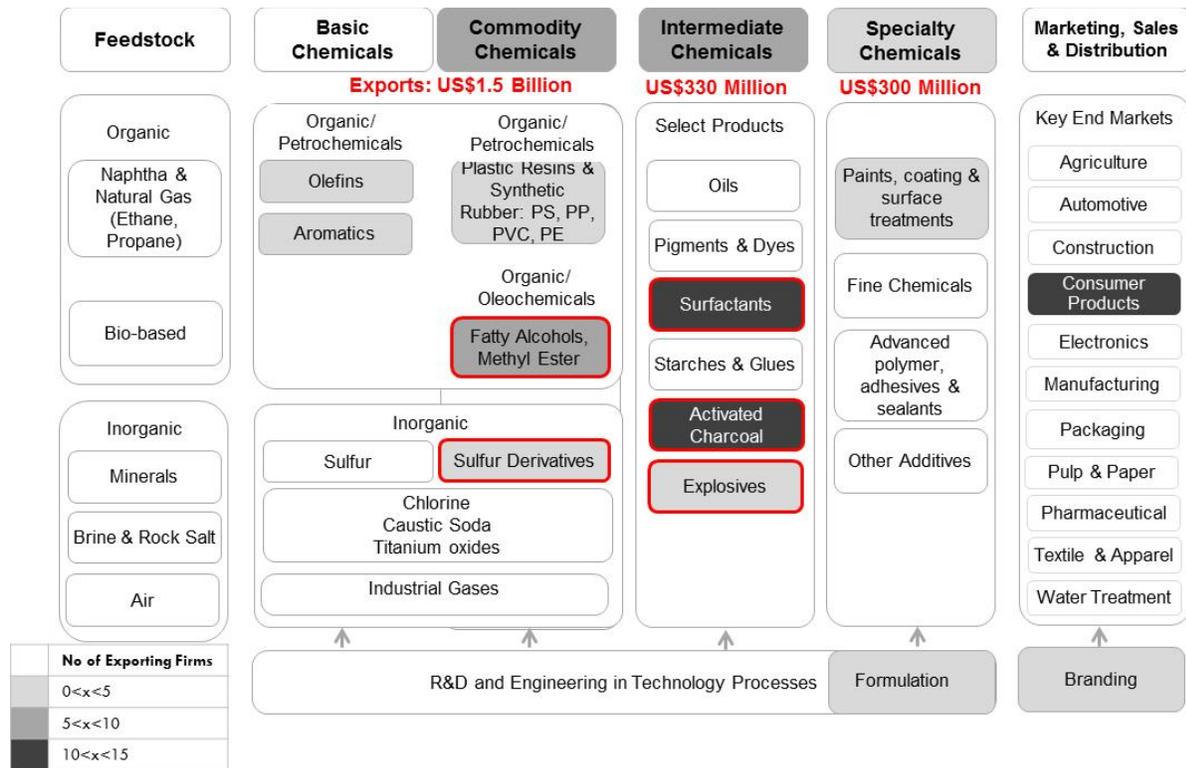
2. The petrochemicals sector developed at the end of the 1990s, with almost all major firms focused on the production of plastic resins. The overarching goal has been to satisfy the domestic demand first before contributing to exports. The sector today comprises seven manufacturers of polyethylene (PE), polypropylene (PP) and polyvinyl chloride (PVC), as well as two cracker plants (Liquid petroleum gas (LPG) and naphtha), which provide feedstock.
3. Very incipient entry into basic inorganic, intermediate and specialty products by a small number of firms. There is relatively little cohesiveness to this latest evolution and products fall into a range of different value chain stages and are directed to different end markets.

The composition of firms engaged in exports from the Philippines is reflective of the global sector. There are relatively few firms in the major export categories and these firms are concentrated in a small number of products, with very little overlap across segments. The specialty and final products segment is more varied, with a higher number of firms. In general, firm origin is mixed in all product categories, with numerous foreign firms investing alongside more established local firms in recent years.

The Philippine exports primarily serve regional value chains in Asia-Pacific. Export destinations are becoming more concentrated with the top 10 destinations accounting for 86% in 2014, compared to 74% in 2007. Japan continues to be the Philippines most important chemicals trading partner, although China is quickly gaining relevance. By 2014, these two markets accounted for 58% of all chemicals exports.

Figure E-1 highlights the Philippine entry into the chemical GVC to date. No shading indicates no participation in the sector. Grey shading represents the number of firms in the segment. Red/dark outlines indicate that the Philippines is a top ten global exporter in the specific product category.

Figure I. Philippine Participation in the Chemical GVC



Source: Authors; Data from PSA (2007-2014), UN Comtrade (2015).

Installed capacity and past sector expertise are two key factors supporting industry competitiveness for upgrading in the chemical GVC. In addition, new initiatives regarding industrial policy formulation for the industry are also contributing to improved positioning of the country.

- Installed Capacity in a Strategic Geographic Location:** The installed idle capacity in both oleochemicals and petrochemicals sub-sectors offers an advantage to rapidly ramp up production for local and regional markets. This can be relatively easily tapped to respond to increased demand for consumer and construction markets in the Asia-Pacific region.
- Human Capital and Sector Expertise:** Low-cost and skilled human capital and expertise in certain segments provides the sector with an important asset. This can be focused for more knowledge-intensive roles in the industry, although turnover is high, and there are gaps between the needs of the export-oriented sub-sectors and the degree of preparation of graduates.
- Supportive Environment for Industry Policy Development:** Recent initiatives have contributed to a more collaborative environment for industry policy development in the chemicals sector. This has been driven by a number of programs put in place by the DTI-Board of Investments through the Industry Development Program and the Manufacturing Resurgence Program. Several chemical sub-sectors were prioritized for investment incentives between 2014 and 2016, including oleochemicals and petrochemicals.

A number of entrenched constraints must be overcome in order to fully leverage these strengths, including strengthening backward linkages, streamlining regulation and standardization, including that of intellectual property protection and infrastructure services. In addition, certain global dynamics threaten specific subsectors. These threats should be considered in policy formulation.

- **Limited local feedstock supply and poor backward linkages.** The petrochemicals sub-sector must rely on foreign naphtha and LPG imports, while the oleochemicals sector has weak linkages to upstream coconut supply. Likewise in the inorganics segment, the production is entirely isolated from the rest of the chemicals industry. This lack of linkages undermines the country's potential to achieve the economies of scale that have generated success in neighboring countries.
- **Regulation and Standardization:** Efforts are underway to align chemical regulation in the Philippines with global best practices to support trade while protecting health, safety and the environment. Key problematic areas under review include a highly restrictive controlled substance regime, and the lack of local standards for chemicals allows for some degree of mislabeling, misclassification, and underreporting of imports and exports.
- **Cost and Availability of Necessary Infrastructure and Services:** Energy, transportation and storage infrastructure and related services constrain sector development and are likely to become more challenging as the economy grows. Low frequency international shipping, port congestion and high domestic shipping costs mean that logistics costs account for up to 53% of wholesale prices in the Philippines compared to less than 20% in other countries in the region, including Malaysia and Indonesia (World Bank, 2015). These constraints contribute to weak backward linkages in the sector, as raw materials tend to be located in different islands from processing capacity.
- **Intellectual Property (IP) Protection:** The Philippines has made impressive gains in improving its IP protection framework in recent years, but the country needs to overcome its poor reputation in this area before foreign companies will be willing to locate sensitive technologies and product operations within its borders. The country was only removed from the US Special 301 Watchlist in 2014 after 22 years (United States Trade Representative, 2014).
- **Substitutes in Oleochemicals:** Coconut oil is at risk of being substituted almost completely in the production of oleochemicals. Palm kernel oil fatty acids are becoming an economic alternative to coconut oil fatty acids, as the composition ranges of the fatty acids are very close. The Philippines is further losing its lead as the supplier of "sustainable" oleochemicals as vertically integrated regional producers steadily obtain Roundtable for Sustainable Palm Oil certification.
- **Global and Regional Overcapacity and Softening Demand:** Rising global and regional capacity in commodities chemicals – in both the oleochemicals and petrochemicals sub-sectors have combined with slowing economic growth to contribute to a potential overcapacity problem in the region. Nonetheless, supply continued to increase in the region in early 2016.

The potential upgrading trajectories recommended in this report focus on building upon comparative advantages in raw materials, accumulated expertise, and growing downstream demand. Trajectories do not include upgrading related specifically to the petrochemicals commodities sub-sector. In the current global context of strong, low-cost petrochemicals production in the US, the Middle East as well as other countries in the region (e.g. China, Malaysia and Singapore), it is difficult to foresee a scenario in which the Philippines can compete in the polymer export market where efforts are not incorporated into indirect exports.

Table I. Upgrading Trajectories for the Philippines in the Chemical GVC

Time Frame	Potential Upgrading Trajectory	Key Benefits	Philippines Challenges
Short Term	Process Upgrading: Improving Coconut Production as a Raw Material for Coco Oleochemicals and Activated Carbon	<ul style="list-style-type: none"> Strengthen backward linkages & local value-add Secure raw materials supply for 2 areas: oleochemicals and activated carbon Employment creation: poverty reduction benefits in undeveloped, rural regions 	<ul style="list-style-type: none"> Aging (40%), diseased (14%) and hurricane-damaged (10%) trees need replacing Limited access to finance for small producers Lack of knowledge amongst producers about new production techniques High transaction costs due to widely dispersed and very small coconut producers
Short to Medium Term	Process Upgrading: Adjust plants to process palm kernel oil for oleochemicals production	<ul style="list-style-type: none"> Improve competitiveness & sustainability of oleochemicals plants Maintain employment 	<ul style="list-style-type: none"> Raw materials must be imported; potential port & logistical challenges Limited access to capital to install new capacity
Short Term	Product & Process Upgrading for Niche Markets	<ul style="list-style-type: none"> Diversify market risk, targeting higher value markets Increased unit value for exports 	<ul style="list-style-type: none"> Limited knowledge of other markets Strict regulatory requirements
Short to Medium Term	Product & Process Upgrading in the Activated Carbon Sub-sector	<ul style="list-style-type: none"> Additional value-add to raw materials otherwise considered waste products Diversify product offerings with potential synergies to other industries Increased export revenue 	<ul style="list-style-type: none"> High logistics costs out of Mindanao High energy costs Limited access to affordable finance
Short Term	Market Upgrading for Niche Green Products	<ul style="list-style-type: none"> Generate export revenue from existing products and R&D Generate higher unit value via exporting to premium markets 	<ul style="list-style-type: none"> Firms lack market information No global recognition of the Philippines as a chemicals producer, green or otherwise Skills gaps exist between university curricula and industry needs
Medium to Long Term	Product Diversification in Basic Inorganic Chemicals	<ul style="list-style-type: none"> Value addition in natural resource extraction Mid-term synergies for e-vehicle manufacturing 	<ul style="list-style-type: none"> Uncertainty in investment environment for long term, capital-intensive operations Heavily bureaucratic (e.g. environmental permitting & indigenous community approval) Transportation and energy supply
	Product Upgrading into New Intermediate and Specialty Chemicals	<ul style="list-style-type: none"> Additional value generation from downstream products Opportunity to leverage low cost commodity inputs Leverage synergies with emerging manufacturing sector Increase indirect exports & improve competitiveness of adjacent industries 	<ul style="list-style-type: none"> Downstream demand must continue to grow to drive necessary economies of scale Skills gaps exist between university curriculum & industry needs Inefficient monitoring of intellectual property Oleos: Upstream competitive advantages have been eroded by lower availability of raw materials

Source: Duke CGGC.