



THE PHILIPPINES

IN THE PAPER GLOBAL
VALUE CHAIN

MAY 2016

This research was prepared by the Duke University Center on Globalization, Governance and Competitiveness (Duke CGGC) on behalf of the USAID/Philippines, through the Science, Technology, Research and Innovation for Development (STRIDE) Program. This study is part of the Philippines Department of Trade and Industry (DTI) Board of Investment (BOI) Roadmap Initiative for the revitalization of the manufacturing industry in the Philippines. The report is based on both primary and secondary information sources. In addition to interviews with firms operating in the sector and supporting institutions, the report draws on secondary research and information sources. The project report is available at www.cggc.duke.edu.

Acknowledgements

Duke CGGC would like to thank all of the interviewees, who gave generously of their time and expertise, as well as Richard Umali of USAID Advancing Philippine Competitiveness (COMPETE) project for his extensive support and feedback on earlier drafts.

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The Philippines in the Paper Global Value Chain

FINAL DRAFT FOR REVIEW

May 2016

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Prepared for

USAID/Philippines

This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of Duke University Center on Globalization, Governance and Competitiveness and do not necessarily reflect the views of USAID or the United States Government.

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Acronyms

| | |
|-------|---|
| 5MHRP | Five Million Hectare Reforestation Plan |
| ABTV | Abaca Bunchy Top Virus |
| APP | Asia Pulp & Paper |
| CHP | Combined Heat and Power |
| DTI | Department of Trade and Industry |
| FAO | Food and Agriculture Organization |
| FOSA | Compañía Forestal S.A. |
| FSC | Forest Stewardship Council |
| FT | Forest Trust |
| GVC | Global Value Chains |
| GSP | Generalized Scheme of Preferences |
| IDB | Inter-American Development Bank |
| ISO | International Organization of Standards |
| IT | Information Technology |
| JV | Joint Venture |
| LUC | land use certificates |
| NES | Paperboard Not Elsewhere Specified |
| NGO | Non-governmental organizations |
| OHSAS | Occupational Health and Safety Management Systems |
| PEFC | Programme for the Endorsement of Forest Certification |
| PEZAs | Philippine Economic Zone Authority |
| PICOP | Paper Industries Corporation of the Philippines |
| PPMAI | Philippine Paper Manufacturing Association Inc. |
| PPP | Public-private partnership |
| REIT | Real Estate Investment Trusts |
| SFE | State Forest Enterprises |
| SFI | Sustainable Forestry Initiative |
| TIMO | Timberland Investment Management Organizations |
| TIPCO | Trust International Paper Corporation |

Executive Summary

This report uses the Duke CGGC Global Value Chain (GVC) framework to examine the role of the Philippines in the global paper industry and identify opportunities for upgrading. The Philippines' paper sector is a domestically oriented industry that provides significant indirect employment opportunities for wide swaths of workers as well as indirect exports for sectors such as electronics, food and beverage, and cosmetics. However, the country's overall participation in the paper GVC is limited, with raw material constraints hindering export development. Abaca pulp production, a niche product category that uses the Manila hemp plant to generate specialized outputs such as tea bags and bank notes, is the country's most dependable export, but even with the export value of abaca pulp approaching an all-time high in 2014, the overall paper industry only generated US\$127 million in export revenue, 54th among 193 countries in the world.

The Paper Global Value Chain

The paper GVC includes five general stages—inputs, milling, conversion, distribution, and waste collection—and has four primary production segments: sawmilling, pulp milling, paper milling, and conversion activities. The overall industry is estimated to be worth between US\$300-\$350 billion, although revenue sources have shifted and, in some cases, stagnated in recent years as manufacturers have grappled with the following changes: 1. Information technology replacing paper as the primary communication medium in established markets; 2. Manufacturing production networks becoming more fragmented, thereby increasing the need for packaging and shipping material in disparate locations; and 3. The improvement of living standards in emerging nations, which has boosted sales of health and hygiene products. Aggregated, these factors have pushed demand for paperboard ahead of paper.

The evolving landscape has reshaped the geography of the industry. The most pronounced trends that can be detected worldwide include:

- **Worldwide trade in key inputs has increased.** Confronted with decreasing demand for its traditional products, lead firms have consolidated operations and sought access to cheaper and more efficient inputs where emerging markets have competitive advantages. From 2005-2014, worldwide exports of woodchips and wood pulp—two critical raw materials for paper products—increased by 38% and 36%, respectively.
- **The jump in trade of woodchips and pulp has created upgrading opportunities for new entrants into the chain.** Against the backdrop of increased trade in inputs, a handful of countries have become important actors in the paper GVC. Although the worldwide export market for woodchips is relatively small, three Southeast Asian countries (Vietnam, Thailand, and Indonesia) have increased their global exports of woodchips, with Vietnam becoming the largest exporter of woodchips as measured by value in 2014. The market for pulp is significantly larger, with South American countries such as Brazil, Chile, and Uruguay taking advantage of their climate to expand fast-growing eucalyptus plantations to become key suppliers of pulp.

- **While actors in upstream segments of the chain have changed, traditional markets remain entrenched in highest-value activities.** The global export market for woodchips was only US\$3 billion in 2014, and worldwide trade in pulp was US\$37 billion; by comparison, trade in paper products was US\$105 billion. The five largest exporters of final paper products are Germany, the US, Sweden, Finland, and Canada, with these countries accounting for roughly 47% of all exports.
- **Asia is driving much of the global industry's growth.** While developed countries still capture much of the value in paper GVCs, the paradigm is shifting, with Asian nations becoming more prominent. Companies with operations in the region have taken advantage of two factors: 1. The region's position as an export base for industries that use paper-based shipping materials; 2. Higher demand for goods that are associated with the increased purchasing power of an expanding middle class: writing paper, and health and hygiene products. China, in particular, has become an important market—it is the world's largest importer of every major category of input (woodchips, pulp, and recovered paper), and both its internal consumption and exports of final products have increased dramatically in the last decade.

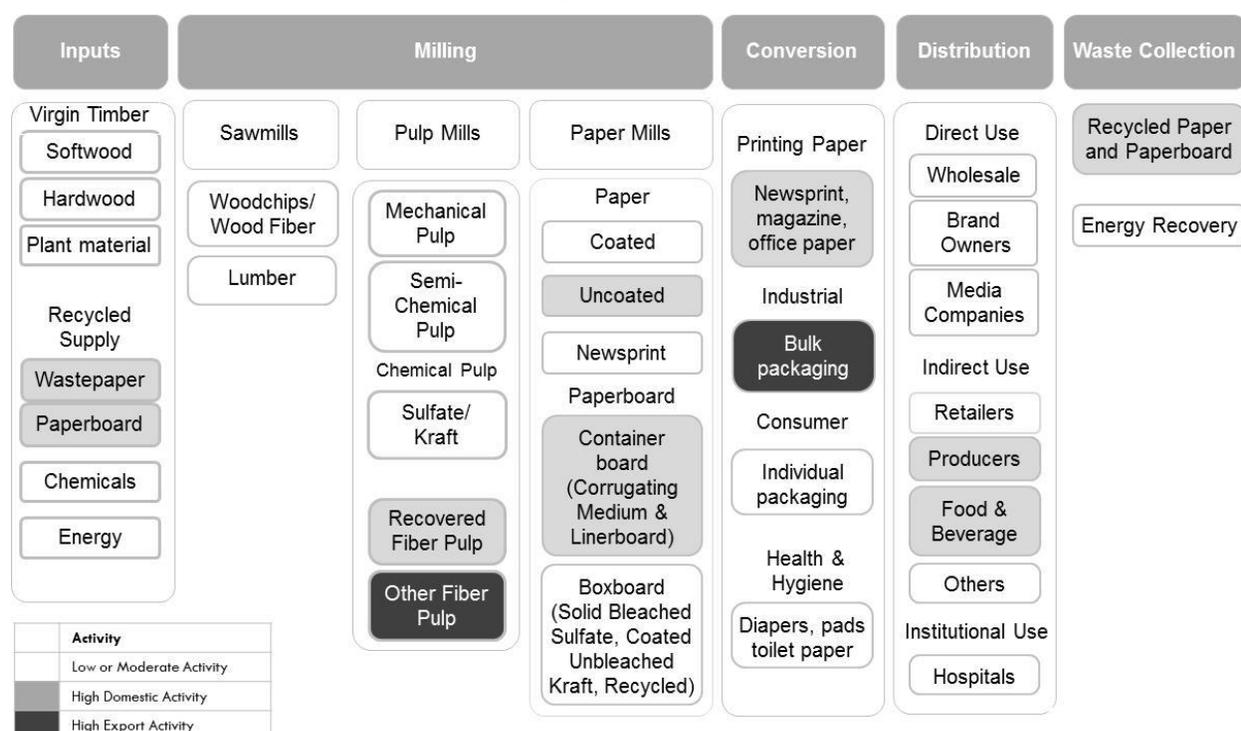
The Philippines in the Paper GVC

The majority of the Philippines' paper production is destined for the domestic market. Exports are minimal and have declined dramatically since hitting an apex of US\$233 million in 2011. While the impact of electronics and information technology on the paper industry took longer to reach Asia than some locations, internet penetration has increased in more recent years, decimating newsprint consumption—the Philippines' exports of newsprint dropped 75% from 2011 to 2012 alone, falling from US\$62 million to US\$15 million. Overall, the paper industry as a whole accounted for roughly 0.002% of the Philippines' total exports in 2014.

The segments of the chain where the Philippines is most oriented toward the export market are abaca pulp production and paperboard conversion. The Philippines is the leading source of abaca fiber worldwide—the country provides roughly 85% of the supply of abaca, and exports of the product generated US\$71.3 million in revenue in 2014, which was a 36% increase from 2005. Abaca production also accounts for the Philippines' most prominent multi-national corporation active in the paper GVC—Glatfelter, which owns a Filipino subsidiary named Newtech Pulp and controls the abaca pulp mill in Lanao del Norte in Mindanao. The American manufacturer of specialty paper is the world's largest consumer of abaca pulp; the company uses the material to make tea bags that the company then sells to companies such as Unilever, which owns Lipton Tea.

In addition, there are approximately 80-90 conversion facilities active in the Philippines. Globally, conversion plants are often located close to final customers to reduce transport costs. In the case of the Philippines, many of the conversion companies are foreign owned and co-located with customers in PEZAs that either need paper or paperboard material as inputs or use the material to ship products to foreign markets. Figure E-1 illustrates the segments of the paper GVC where the Philippines is most active.

Figure E-1. The Philippines' in the Paper GVC



Source: Duke CGGC, based on field interviews and FAO and PPMAI data.

Note: High export activity (dark grey) describes sectors that generate more than US\$50 million in export revenue or have more than 20 businesses geared toward the export market. High domestic activity (light grey) refers to segments where there is similar numbers of actors that sell to the domestic market.

These characteristics lead to a number of strengths for the Philippines as it pursues upgrading trajectories in the paper GVC. These advantages include:

- **World's leading producer of abaca pulp.** The Philippines enjoys a dominant position in abaca pulp production. In addition to being the world's largest source of the fiber, the country also has the only abaca pulp mills in the world, with four facilities that have an estimated annual capacity of 45,000 metric tons per year.
- **Favorable tariff regimes for abaca.** Roughly two-thirds of the Philippines' abaca pulp is shipped to the Europe. Abaca fiber is covered by the EU's Generalized Scheme of Preferences Plus (GSP+) program, which eliminates tariffs entirely. The Philippines' monopoly on abaca pulp production means the low tariffs do not necessarily provide an advantage against other countries; however, it does allow for abaca to remain a cost competitive input for tea bags and coffee filters, which are the two primary outputs of the abaca fiber that is exported to Europe.
- **Policy support from industry stakeholders.** The Industry Development Program, the Manufacturing Resurgence Program, and the Industry Roadmapping Project initiated by DTI provided momentum for the Philippine Paper Manufacturing Association Inc. (PPMAI) to work with the business community to develop an industry road map. That document served

a valuable role in articulating the needs and wishes of the industry as well as offering policy recommendations designed to nurture the sector. Additionally, DTI and the BOI has included virgin pulp as a priority industry in its most recent Investment Priorities Plan, which allows potential investors to receive various incentives.

- **Strong human capital and training programs.** The Philippines has a number of educational institutions that offer support for the paper sector and provide the country with a capable workforce. The University of the Philippines Los Baños has a chemical engineering major in pulp and paper technology. The Forest Products Research and Development Institute that is part of the Department of Science and Technology in Laguna also offers specialized 10-day classes for the technical staff of pulp and paper mills that are designed to train employees in raw material preparation, pulp bleaching, stock preparation, paper making, and product evaluation.

At the same time, the Philippines has location-specific impediments that undermine export competitiveness. The most prominent of these is the lack of raw materials available in the country, although others can be identified.

- **The shortage and insufficient quality of raw materials.** With the closing of the PICOP pulp mill in 2010, the Philippines does not have an operational facility that can produce virgin pulp. The lack of access to raw materials hurts domestic firms in at least two ways: 1. Although market pulp is sold on global markets in increasing volume, it is subject to price fluctuations that can threaten the competitive position of businesses that rely on it as an input; 2. Virgin pulp produces stronger and higher-quality paper grades that can more easily facilitate product upgrading.
- **Uneven adherence to certification for forests and plantations.** Much of the country's forest reserves or abaca plantations lack certification from the environmental organizations that lead firms rely on to ensure they adhere to sustainability standards. Current estimates are that the country has roughly 32,000 hectares of forest plantations that could be used as inputs for virgin pulp, the majority of which are not FSC or PEFC certified. Estimates for abaca pulp compliance are generally below 10%.
- **Inadequate supply of high quality abaca fiber.** The Newtech Pulp mill is the largest abaca pulp mill in the world, with the capacity of 17,200 metric tons per year. While the facility can process close to 2,100 tons per month, the company can only source enough raw material from its domestic network of consolidators and traders on Mindanao and Catanduanes to generate 1,400 tons of pulp per month.
- **High energy costs and inadequate infrastructure.** The Philippines' energy costs are among the highest in Asia, and the power supply is unreliable in certain regions of the country. Moreover, its infrastructure scores worse than regional peers. Both structural challenges have sizeable ramifications for the paper industry—the sector is one of the largest industrial consumers of electricity, and improvements to infrastructure are necessary for lead firms to invest in developing countries.

- **Low quality products means converters must rely on imports.** Much of the paper and paperboard available in the Philippines is of low quality and firms cannot necessarily differentiate themselves through superior products. As a result, large regional firms have an opportunity to penetrate the market by using their internal economies of scale to undercut Filipino producers.

These constraints restrict the country's possible upgrading trajectories. Most immediately, the Philippines' lack of forest resources, processing facilities, and mediocre infrastructure makes following the lead of South American countries and entering the chain through pulp production cost prohibitive. Instead, the upgrading trajectories identified in Table E-I are believed to be the most feasible opportunities.

Table E-I. Possible Upgrading Trajectories for the Philippines in Paper GVC

| Time Frame | Potential Upgrading Trajectory | Key Benefits | Capacities Required of Individual Firms | Philippines Challenges |
|---------------------|--|---|---|---|
| Short – Medium Term | Process upgrading to increase abaca production | <ul style="list-style-type: none"> • Leverages large number of growers to capitalize on Philippines' natural advantages & generate increased export revenue • Positions country to take advantage of possible increased demand for abaca & encourage chain upgrading into energy and automotive sectors | <ul style="list-style-type: none"> • Expertise • Access to inputs/storage facilities • Certifications | <ul style="list-style-type: none"> • Outdated post-harvest technologies • Low levels of grower certifications • Susceptibility of abaca to diseases • Poor storage conditions |
| Medium-Long Term | Functional upgrading into and expansion of conversion capabilities | <ul style="list-style-type: none"> • Provides shipping inputs support for key export industries (electronics and food/beverage) and packaging for cosmetics sector. • Expands presence in high-value segment of Paper GVC | <ul style="list-style-type: none"> • Investments in expensive equipment | <ul style="list-style-type: none"> • Philippines industry traditionally concentrated in upstream segments of chain • Oversupply in region • Moderate demand for final products |
| Short-Medium Term | Product upgrades in paperboard production to enable upgrading in related sectors | <ul style="list-style-type: none"> • Provides inputs for key export industries (electronics and food & beverage) • Employment creation in recycling chain • Environmental benefits • Build reputation and brand for sustainable practices | <ul style="list-style-type: none"> • Investments in expensive equipment • Access to higher quality raw materials • Investments in equipment to accept lower grades of wastepaper | <ul style="list-style-type: none"> • Local paperboard is of low quality, partly due to poor quality inputs from recycling • Inefficient recycling collection process & inadequate processing facilities • Overcapacity & oversupply in region providing cheap alternatives • No domestic sources of virgin pulp |

Source: Duke CGGC.

I. Introduction

While the paper sector in the Philippines has a long history and provides employment to as many as 1.5 million indirect workers, the country does not occupy a prominent position in the global industry. Exports have plunged since hitting an apex in 2011 as the sector has suffered from the lack of raw materials and intermediate processing facilities that provide critical inputs. The country does enjoy competitive advantages with abaca pulp, a niche product category that uses the Manila hemp plant to generate specialized outputs such as tea bags and bank notes. But even with the export value of abaca pulp approaching an all-time high in 2014, the overall paper industry only generated US\$127 million in export revenue, 54th among 193 countries in the world.

Despite the limited export profile, there are still upgrading trajectories that could allow the Philippines to improve its position. A sector where final products are most often consumed in the market where they are created, globalization's most pronounced effect on the paper industry has been two-fold: (1) It has elevated the standing of developing countries into prominent sources of inputs; and (2) It has offered growth segments for packaging material as demand for traditional outputs has waned. Countries such as Vietnam (woodchips) and Uruguay (pulp) have followed the first path to enter and improve their positions in the chain; the Philippines may be able to use its export profile as well as global industry trends to take advantage of the second. Additionally, the country might consider nurturing its strength in abaca pulp production by alleviating supply constraints and addressing technological and logistical shortcomings that have inhibited the sector.

This report continues the process started by the Department of Trade and Industry (DTI) in the Philippines through its road map initiative by using the Global Value Chains (GVC) framework to offer perspective on the currents that have rippled through the industry. The GVC analysis is particularly useful to inform policy makers as it examines the full range of activities that firms and workers around the globe perform to bring a product from conception to production and end use. By assessing the labor inputs, technologies, standards, regulation, products, processes, and geography that define the global sector, it offers insight that will allow domestic stakeholders to understand the factors that have allowed similar countries both to enter and improve their position in the chain. Acknowledging the paper sector's overall economic importance in terms of employment, it also helps inform analysis that can help assist firms within the country to increase their competitiveness.

The report has four sections: First, it analyzes the global industry, including an extended discussion on the key segments of the chain, the countries that participate in each, and how the industry has responded to the destabilizing circumstances associated with falling demand for its largest two traditional products—newsprint and writing paper. Building upon these insights, the report then offers two case studies of how Vietnam and Uruguay have entered the chain by increasing exports of woodchips and pulp; these case examples illustrate the opportunities and challenges faced by developing countries that have fostered strategies to enter the global value chain. This is followed by an assessment of the industry in the Philippines before it concludes by offering three possible upgrading strategies to boost the sector on the global market.

2. The Paper Global Value Chain

The paper GVC is nested in the broader global forestry industry, which also includes lumber destined for the furniture industry. Traditionally, the paper sector has accounted for somewhere close to one-third of the forestry industry's US\$950 billion valuation (Marketline, 2014; Marketline 2012), although revenues within the paper segment have stagnated in recent years—sales from the largest 100 companies in the industry stood at US\$322 billion in 2008 and \$319 billion at the end of 2014 (Pulp & Paper International, 2015; Pulp & Paper International, 2009). By focusing on paper, this report is interested in all inputs used to generate final paper products, which includes all forms of paper itself as well as the various iterations of paperboard, which is primarily used to produce packaging materials.¹

The sector has been described as being a “home market industry” (Hetemäki et al., 2013), with demand often determining where final products are manufactured. There are a number of reasons for this characteristic, including the high costs associated with transportation, and the corresponding low value-to-volume ratio (Marketline, 2014), the unsuitability of paper and paperboard products to long-distance travel (Milne, 2012), and the importance for businesses to exploit economies of scale to overcome high capital costs (Marketline, 2014).²

Three trends have emerged in recent times that have pushed the industry to evolve. The first is the rise of information technology (IT) that has to a significant degree replaced paper as the primary communication medium, especially in established markets. The second is the fragmentation of manufacturing production networks, which has increased the demand for high volumes of packaging and shipping material in disparate locations. Finally, the improved living standards of millions within emerging nations have helped boost consumption of health and hygiene products, such as toilet paper and diapers. Aggregated, these factors have pushed demand for paperboard ahead of paper—2013 was the first year that global exports of all categories of paperboard products exceeded paper (51.6% vs. 48.4%), and the trend gathered momentum in 2014 with paperboard accounting for 52.9% of final product exports (FAOSTAT, 2015).

These changes have reshaped the geography of the industry. Confronted with decreasing demand for its traditional products in established markets, lead firms have consolidated operations and sought access to cheaper and more efficient inputs where emerging markets have competitive advantages. Worldwide trade in key inputs has thus increased.³ This has created opportunities for emerging economies in upstream segments of the industry. In the last

¹ The two primary categories of paperboard are containerboard and boxboard. Containerboard is corrugated material that is used in industrial packaging. Boxboard is more often bleached board that is used in individual packaging for consumer products.

² In an article published in the Financial Times, Jouko Karvinen, the CEO of Stora Enso, said, “Our products are not really global products. Building something in Asia doesn’t mean taking something away. We move where the customer growth is (Milne, 2012).”

³ From 2005-2014, worldwide production of woodchips fell 12%; during that same time period, exports of woodchips around the globe increased by 38% to 67 million metric tons. The dynamic is similar in wood pulp—while production of wood pulp stayed relatively constant in the time period from 2005-2014, global export volumes increased 36% (FAOSTAT, 2015).

decade, Vietnam has become the world's largest exporter of woodchips raw material for the industry, and South American countries such as Brazil, Chile, and Uruguay have taken advantage of their climate to expand fast-growing eucalyptus plantations to become key suppliers of pulp intermediates. While upstream segments of the chain have evolved, traditional markets such as Germany, the US, Sweden, Finland, and Canada remain ensconced in the highest-value activities by exporting final products.⁴

This paradigm has begun to shift, with Asia now driving much of the global industry's growth. Companies with operations in the region have taken advantage of two factors: (1) The region's position as an export base for industries that use paper-based shipping materials; (2) Higher demand for goods that are associated with the increased purchasing power of an expanding middle class: writing paper and health and hygiene products. China, in particular, has become an important market—paper consumption increased by 143% from 2000 to 2010 (Hetemäki et al., 2013). In addition, the country has expanded its share of global exports of final products from 1.6% in 2005 to 6.1% in 2014.

This chapter proceeds by outlining the global value chain for the paper industry. It then discusses the geographic distribution of supply and demand before examining the lead firms in the sector and the manner in which they control the chain. It concludes by providing an overview of human capital needs and by discussing ways companies have improved their positions through various upgrading strategies. By analyzing the global dynamics of the industry, these discussions can help to guide the development of a strategic plan for the paper industry entry and upgrading in the Philippines.

2.1. Mapping the Paper Global Value Chain

While the paper GVC is nested within the larger global forestry industry, this report concentrates on the production processes that yield paper products. Figure 1 provides a visual illustration of the paper GVC. There are five general stages of the chain (inputs, milling, conversion, distribution, and waste collection of the chain), including the four primary production segments: sawmilling, pulp milling, paper milling, and conversion activities. Subsequent sub-sections discuss each in detail. Table A-1 in the Appendix provides complete definitions of the product categories contained within each segment of the chain.

Inputs: The principal raw material in the paper GVC is timber,⁵ accessed either through forest resources or recycled supply.⁶ Virgin timber refers to wood that has never been used in the production process previously; this timber is either hardwood (deciduous trees) or softwood

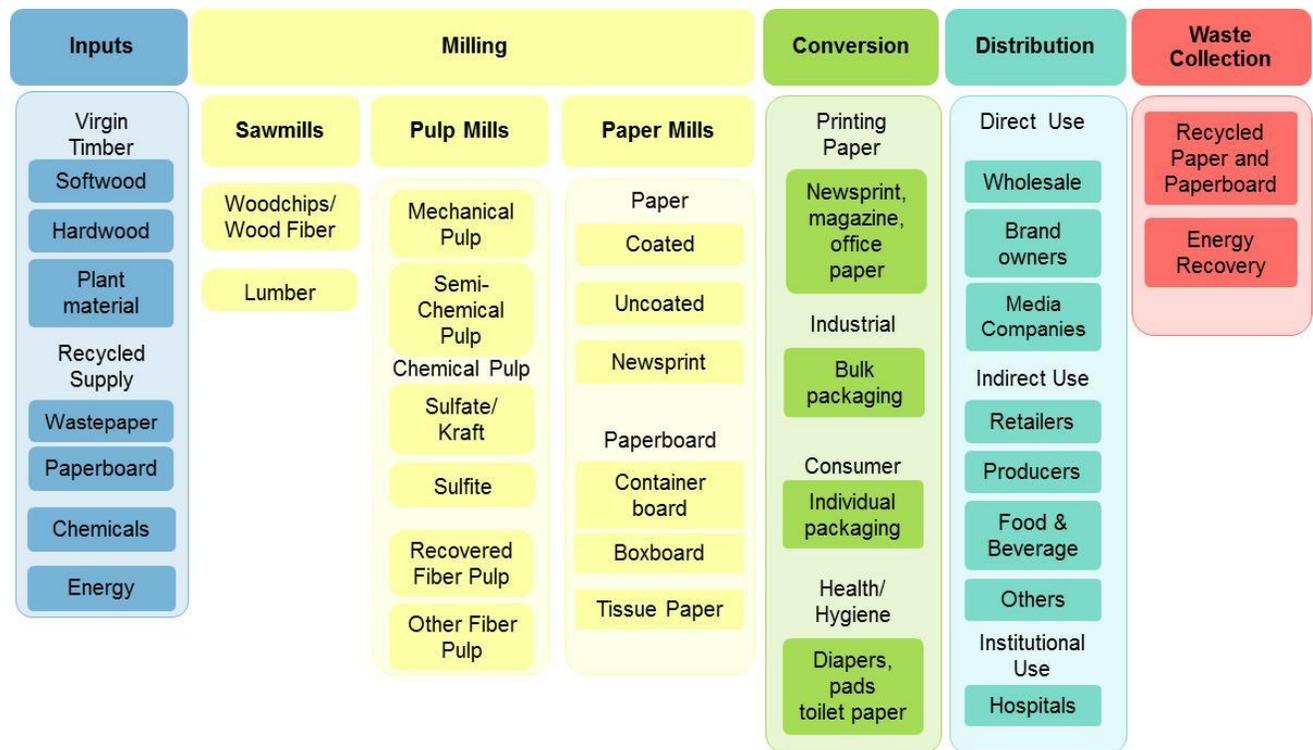
⁴ The global export market for woodchips was only US\$3 billion in 2014, and worldwide trade in pulp was US\$37 billion; by comparison, trade in paper products was US\$105 billion (FAOSTAT, 2015).

⁵ There are also a number of chemicals that are used in the production process, including polypropylene, chlorine, caustic soda, starch, soda ash, lime, sodium bisulfite, ground calcium carbonate and others. There are two terms that are commonly used in the industry to describe different chemical treatments. "White liquor" refers to the mix of chemicals (usually sodium hydroxide) added at the beginning of the pulping process to separate the lignin from the cellulose fibers, while "black liquor" refers to the chemical mixture that remains at the end of the pulping process (RISI, 2010).

⁶ Older technology for pulp and paper production also drew on non-timber agricultural products; however, this is no longer widely used and is largely being phased out around the world.

(needle-bearing or conifer trees). In some geographic locations, there are alternative sources of plant material—bamboo, straw, or abaca—that can be used to generate pulp that is then processed into specialized outputs. While forest resources traditionally have been owned by vertically integrated paper companies or governments, financial investors such as Timberland Investment Management Organizations (TIMOs), Real Estate Investment Trusts (REITs) and institutions have become more prominent actors in this segment of the chain over the last two decades (Flynn, 2015). These financial investors and timberland operators rarely have downstream expertise.

Figure I. Paper Global Value Chain



Source: Duke CGGC

Recycled supply is sourced primarily through recovered wastepaper and paperboard. The broad global trend is to place increased emphasis on recycled paper products as inputs. This trend can be attributed to pressures on land availability for timberlands as well as growing environmental concerns regarding unnecessary waste generation. The recovery rate for paper in the US was 65.4% in 2014, up from 33.5% in 1990 (S&P Capital IQ, 2015), and global production of recovered paper—defined by the FAO as the commodity that exists after the paper has been retrieved following its original use—increased from 114 million tons in 1995 to 221 million tons in 2014 (FAOSTAT, 2015).

Milling: There are three distinct milling stages in the paper GVC: sawmilling, pulp milling, and paper milling. Depending on the size and location of plants, individual facilities may be integrated and perform all activities; however, each stage may also be dispersed geographically. Capital costs are high, and the ability to generate economies of scale is an important consideration.

Transportation costs and energy availability also play a prominent role in location decisions. Each stage is discussed below.

Sawmills: Sawmills are where logs are converted into woodchips and wood fiber or lumber. Woodchips and wood fiber are converted into pulp in downstream phases, while lumber is transformed into wood products for the construction or furniture industries. Sawmills are usually located in close proximity to forest areas to reduce transportation costs.⁷ Ownership of sawmills is split between pulp manufacturers and forestry companies—firms that have lumber divisions are the most likely businesses to have segregated sawmill and pulp facilities.⁸

Pulp mills: Woodchips or wood fibers are used to create pulp, which is the primary ingredient required for the production of paper products. Pulp is made by separating wood or other fibers from lignin, a substance that binds wood together. Pulp is classified in a variety of ways based on the process used, the specific raw material employed, the type of bleaching agent involved, or the yield of the fiber. This report follows the principal categories used by the FAO and other international organizations—mechanical pulp, semi-chemical pulp, chemical pulp, recovered fiber pulp, and other fiber pulp (from vegetable materials such as bamboo, straw and abaca plants).⁹

Each category of pulp has its own advantages. Mechanical pulp, which is generated from virgin fiber, has the highest yield, but it produces lower grade paper and paperboard that is not durable (e.g. newsprint), while chemical pulp produces stronger papers that can be used for magazines and higher quality office papers. Chemical pulp is the most common pulp as measured by volume of world production, with bleached sulfate (kraft) pulp being the single most common variety of chemical pulp (74% of worldwide output in 2014) (FAOStat). Fluff pulp, which is used in the manufacturer of health and hygiene products such as diapers and tissues, is a type of chemical pulp. Many pulp mills only have the capability of working with virgin or recovered fiber pulp, although some are designed to allow for shifting between both (S&P Capital IQ, 2015).

Many of the leading global paper companies are vertically integrated and use their own pulp internally to manufacture paper products. More recently, however, a growing trend has emerged where paper manufacturers purchase pulp from independent producers (pulp that is

⁷ For example, Stora Enso has a sawmill capacity of 5,550,000 cubic meters at 18 facilities in northern Europe, which is where the majority of the company's forest resources are based (Stora Enso, 2015; Stora Enso, 2014a). UPM-Kymmene has four sawmills, all of which are located in Finland, which is the country where the company sourced 68% of its total supply of 26.3 million cubic meters of wood in 2014 (UPM, 2014). All of Svenska Cellulosa's sawmills are located in Sweden, which is where the company has access to 2.6 million hectares of forests.

⁸ Northern European companies Stora Enso, UPM-Kymmene and Svenska Cellulosa Aktiebolaget all have sawmills that provide lumber for their forest products divisions and wood chips for their paper products units.

⁹ The FAO defines mechanical pulp as wood pulp obtained by "grinding or milling" wood fibers. Chemical pulp is created by dissolving fibers in a pressurized chemical bath, while semi-chemical pulp production uses both the mechanical and chemical methods. Chemical pulp has two primary distinctions: sulfate (or kraft) pulp or sulfite pulp. Sulfate (or kraft) pulp is obtained when soda pulp or a mixture of sodium hydroxide and sodium sulfite cooking liquor is used in the cooking process; sulfite is when bi-sulfites such as ammonium, calcium, magnesium, and sodium are used. Dissolving pulp is a variant of chemical pulp and can include sulfate and sulfite pulp. Recovered fiber pulp comes from recycled paper and paperboard, which must be de-inked.

sold on the open market is referred to as “market pulp”). Market pulp has grown in recent years; this can be partially attributed to newly established, stand-alone Chinese paper mills that face shortages of domestic raw materials and must import large quantities of pulp.

Box 1. Energy Consumption in the Paper GVC

Pulp and paper mills are voracious consumers of electricity. Energy costs account for 15-20% of total expenditures in the manufacturing process, and the industry as a whole has been estimated as being the fourth largest industrial consumer of energy around the world.

Energy consumption occurs primarily during three stages: (1) Pulping, (2) Paper Milling and; (3) Paper recycling. Modern technology can help reduce some of the energy consumed, especially during the pulping process; in some cases, pulp mills can end up being net energy producers through at least two methods:

- Facilities can use the heat generated during the process to create steam that then produces power through Combined Heat and Power (CHP) generation technology. There are three primary CHP schemes involving gas-fired broilers, biomass broilers, and combined cycle gas turbines that offer high degrees of efficiency and power generation (Industrial Efficiency Technology Database).
- Black liquor—the liquid that remains after chemical pulping—can be used to create energy that can help power pulp mills through a chemical process that includes adding small amounts of diesel fuel.

Sources: Confederation of European Paper Industries, 2014; International Energy Association, 2008.

Paper mills: Paper mills use pulp to generate a variety of paper-based products. The main categories are paper (coated, uncoated and newsprint), paperboard, and tissue paper. Paperboard can then be split into two broad categories: containerboard—the corrugated containers used to protect goods during shipping—and boxboard, which is the material used for folding cartons or consumer packaging.¹⁰ The products that emerge from the final milling stage are often large rolls of materials weighing several tons.

Conversion: In this segment of the chain, the large rolls of material from the paper mills are cut and shaped into their final form. Many of the leading manufacturers have their own converting plants to perform this activity, although there are smaller, independent companies that do not own paper mills and specialize in conversion.¹¹ Converting plants are not as large as

¹⁰ Containerboard consists of facings called linerboard, and the interior fluting called corrugating medium. Linerboard can be manufactured from both virgin and recycled fibers, with the share of recycled production growing globally. Corrugating medium is produced with semi-chemical and recycled fiber (S&P Capital IQ, 2015). Boxboard are not corrugated and have three primary categories: solid bleached sulfate (SBS), unbleached kraft board, and recycled board (both coated and uncoated). One of the more pronounced trends within these sub-categories is the increasing use of plastic and recycled products at the expense of SBS (S&P Capital IQ, 2015).

¹¹ Data from the Association of Independent Corrugated Converters, an international trade association based in the US, indicates that independent converters’ market share of total corrugated shipments in the US was close to 25% every year between 1996-2011 (AICC, 2013).

milling facilities and are typically located close to the end market.¹² Conversion is one of the higher value stages of the chain—lead firms such as International Paper that have consolidated operations and moved out of upstream segments of the chain have notably maintained a full network of conversion facilities.

The final products that emerge at this stage of the chain can be divided into four broad categories:

- **Printing paper:** Major segments include coated papers (glossy papers), uncoated papers, and newsprint.
- **Consumer packaging:** Bleached paperboard products used for individual packaging for food and beverage, pharmaceutical, and cosmetics industries as well as retail displays. This segment also includes disposable cups and plates, milk cartons, and cigarette and other folding cartons.
- **Industrial packaging:** Corrugated boxes used in industrial packaging and shipping containers.
- **Health and hygiene:** Tissues, diapers, and sanitary products derived from fluff pulp.¹³

Distribution: Distributors channel products to three main groups of actors, which can be categorized by the way they consume the final goods. *Direct use* describes products where the final buyer purchases the goods for personal activities or business. Examples include writing paper, stationary, health and hygiene products, paper plates and cups, and other similar items. It also includes media companies that purchase newsprint or coated paper in high volume. While consumers may, in some cases, purchase these products directly from the manufacturer, they are also sold through wholesalers or separate brand owners. *Indirect use* refers to packaging that is an input for transporting or protecting other categories of goods such as manufactured products, food and beverage goods, cosmetics, and other related materials. *Institutional use* primarily covers health and hygiene products that are sold to hospitals, restaurants or other public-facing clients that offer paper towels, napkins, toilet paper and other similar items as a convenience or serve for guests.

While major firms used to maintain internal distribution divisions,¹⁴ most now rely on third-party distributors. Distribution in mature markets such as the US and France is dominated by large-scale operators¹⁵ that are complemented by networks of smaller handlers. The

¹² International Paper has 177 converting plants in the US (72% of the company's total capacity), which is where the company earned 71.7% of its total revenue in 2014. Smurfit Kappa, based in Dublin, has 183 of its 229 total converting plants in Europe (79%), where it earned 76% of its sales (Smurfit Kappa, 2014).

¹³ Duke CGGC based its categories on FAO and UN Comtrade definitions. Additionally, it consulted an array of industry literature and annual reports of leading companies. Table A-1 in the Appendix provides a complete taxonomy.

¹⁴ International Paper spun off Xpedx, its former distribution company, in 2014, merging it with Unisource to form Veritiv.

¹⁵ For example, Veritiv and Sequana are both multi-billion dollar companies.

distribution networks in countries such as China are less developed, requiring paper product manufacturers to take a more active role in the sale and distribution of their products, although some lead firms companies still rely on third parties (Zhang et al., 2014).

Waste Collection: With the increasing use of recycled fibers as inputs, collecting materials that can be re-purposed has grown in importance. Additionally, biofuels that have higher energy-efficiency are also being investigated by leading companies in the field, although there has not been widespread success to date (Deloitte, 2013).

2.2. Global Trade in the Paper GVC¹⁶

For much of the 20th century, North American and European countries were the largest producers and consumers of paper, with newsprint and writing paper serving as the pillars of the industry. However the spread of computers, tablets and smart phones has decimated the industry in both locations—as of 2015, North American graphic paper consumption had fallen 48% from its 2000 apex (Mahlborg, 2015).

As established markets have been forced to adapt to changing consumer habits, Asia has become the largest market for paper products. Asia's ascension can be partially attributed to strong economic growth.¹⁷ International demand for paper products is often correlated with both GDP and population growth as a result of citizens increasing spending on packaged goods and health and hygiene products as incomes rise (Jarvinen et al., 2012).¹⁸ At the same time, the packaging market segments in Asian nations have benefitted from their countries' entry and upgrading into a wide range of manufacturing value chains, most of which require containerboard or boxboard to ship final assembled products.

Against this backdrop, China has become an important player in the paper industry, driving both demand and supply. Historically, China was only a small producer of paper products, mostly using pulp from non-wood sources (reed, wheat straw, etc.). The old mills associated were often small and environmental liabilities, and new guidelines to deal with these challenges resulted in the widespread shutdown and a significant reduction of mill capacity (Valois, 2014).¹⁹ At the same time, the government embarked on an aggressive campaign to modernize the industry, encouraging foreign direct investment by leading companies in large-scale in paper facilities (Jaakko Pöyry, 2004). As a result of these and other projects, China added 13.7 million tons of modern paper mill capacity from 2004-2008. Capacity expansion has continued following the global economic crisis, with an additional six million tons of boxboard and containerboard capacity coming online in 2012 (Zhao, 2013).

¹⁶ All statistics within these sub-sections are based on FAO data unless otherwise noted.

¹⁷ The IMF estimates that the economies in developing Asia expanded by 8% on annual basis from 2007-2014 (IMF 2015). The IMF's 29-nation "Emerging and Developing Asia" category includes China, Indonesia, Thailand, Vietnam, the Philippines, Cambodia, India, Malaysia, Myanmar, Sri Lanka and others.

¹⁸ The association between expanding GDP and paper consumption is more durable for low-income, emerging countries rather than high-income, OECD nations, especially for regions such as Asia where internet penetration is not as high as North America and Europe (Hetemäki et al., 2013).

¹⁹ Reduction of China's pulp milling capacity was estimated to be some 42 million tons of mill capacity between 2005 and 2014.

While these efforts have helped China become the world's largest paper producer, it is important to note the investments have concentrated in the mid- and downstream processing segments of the chain. Development of upstream segments into sawmilling and pulp production has been limited by insufficient domestic supply of raw materials to support the industry. Although China has the largest forest plantation areas in the world, and international companies such as Asia Pulp & Paper (APP), Oji Paper, Stora Enso, and Weyerhaeuser have made recent investments to boost pulp plantations in the country, these commercial holdings are relatively small—930,000 hectares (Cubbage, 2014)—with only 28% of China's total forest capacity being used for economic purposes (Liu et al, 2014).²⁰ As a result, China's domestic pulp production still skews heavily toward recovered fiber pulp and is suitable for only a small share of its final needs (Zhao, 2013).

Global Demand: As a result of the dynamics described above, global demand for critical inputs such as woodchips, pulp, and recycled materials has become dominated by the Asian countries that both produce final products in high volume and have limited sources of raw materials and intermediate supplies. In many ways, China is the ultimate driver of much of what is happening not only in the Asia-Pacific region but the global industry.

- **Woodchips:** Global import value of woodchips has increased 72% since 2005. Japan is the leading global importer of woodchips (43.3% of total imports), followed by China (29.7% of total imports). There are diverging trends within these countries—the value of Japan's total imports fell marginally from 1998-2013, whereas during the same period, the value of the Chinese imports surged more than 6,600%.²¹
- **Pulp:** Overall, the value of the world's imports of wood pulp increased roughly 68% from 2005 to 2014. As the world's leading importer of wood pulp in 2014, China received 30.4% of the import value of global shipments—three times that of the second largest importer, the United States.
- **Recovered Paper:** China is the largest importer of recovered paper, receiving half of the world's shipments in 2014. However, China's reliance on global markets for recovered paper is slowing as its internal recycling rate of paper increased from 30% in 1994 to 50% in 2014 (Zhao, 2015). The value of its recovered paper imports dropped 14.7% from 2012 to 2014.

Global Supply: In the upstream segments of the chain, countries that have increased their export shares of intermediate goods in recent years have used their competitive advantages to produce inputs for the Chinese market. The situation is reversed in the downstream segments of the chain, with the sheer volume of Chinese paper and paperboard production making it challenging for emerging nations to be competitive in an industry where profitability often

²⁰ Profitable timberland development is constrained by government control, pollution, and widespread geographic distribution as well as poor rural infrastructure and geological conditions that make the land difficult to log (Cubbage, 2014, Dequan & Barr, 2004, Toppinen, 2014).

²¹ Even though China increased its domestic wood chip production by a factor of 10, from 4.3 million metric tons in 1998 to 39.3 million metric tons in 2013, it is still insufficient to meet demand for paper mills.

depends on generating economies of scale. The sub-sections that follow explain the dynamics in additional detail.

Woodchips: Globally, there were 241 million metric tons of woodchips generated in 2014, with the largest three producers, the US, China, and Canada, accounting for 49.2% of total production. The general trend is for much of a country's supply of woodchips to be used domestically. Although the export market for woodchips is relatively small, it has increased 82% from 2005 to 2014. As highlighted in Table I, growth has largely been driven by three Southeast Asian countries that have increased their global exports of woodchips in the last decade. Vietnam has been the fastest growing country and was the largest exporter of woodchips measured by value in 2014 (US\$981 million). Thailand has also elevated its position, increasing its share of global exports from 1.7% to 7.7%. Finally, Indonesia boosted the value of its woodchips exports by 208% over the 10 years. Conversely, Australia and South Africa have seen their market share drop significantly during this period.

Table I. Top 10 World Exporters of Woodchips by Year, 2005-2014

| Country | Export Value (US\$, millions) | | | | | World Share | | | | |
|---------------|-------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | 2005 | 2007 | 2010 | 2012 | 2014 | 2005 | 2007 | 2010 | 2012 | 2014 |
| World | 2,259 | 2,750 | 3,336 | 3,786 | 3,955 | | | | | |
| Vietnam | 103 | 170 | 457 | 808 | 981 | 4.6% | 4.2% | 11.2% | 21.3% | 24.8% |
| Australia | 631 | 834 | 840 | 689 | 756 | 28.0% | 20.3% | 20.5% | 18.2% | 19.1% |
| Chile | 160 | 218 | 333 | 370 | 307 | 7.1% | 5.3% | 8.1% | 9.8% | 7.8% |
| Thailand | — | — | 202 | 350 | 275 | — | — | 4.9% | 9.3% | 7.0% |
| USA | 191 | 243 | 219 | 232 | 254 | 8.5% | 5.9% | 5.3% | 6.1% | 6.4% |
| Indonesia | — | — | — | 117 | 219 | — | — | — | 3.1% | 5.6% |
| S. Africa | 332 | 272 | 212 | 160 | 175 | 14.7% | 6.6% | 5.2% | 4.2% | 4.4% |
| Brazil | 101 | 116 | 110 | 116 | 132 | 4.5% | 2.8% | 2.7% | 3.1% | 3.3% |
| Russia | — | 58 | 109 | 98 | 93 | — | 1.4% | 2.7% | 2.6% | 2.4% |
| Uruguay | 62 | 65 | 130 | — | 88 | 2.8% | 1.6% | 3.2% | — | 2.2% |
| Latvia | 66 | 91 | — | 99 | — | 2.9% | 3.3% | — | 2.6% | — |
| Germany | 117 | 182 | 99 | — | — | 5.2% | 6.6% | 3.0% | — | — |
| China | 92 | — | — | — | — | 4.1% | — | — | — | — |
| Top 10 | 1,859 | 2,253 | 2,716 | 3,044 | 3,283 | 82.3% | 81.9% | 81.4% | 80.4% | 83.0% |

Source: FAOSTAT based on FAO item code 1619. (—) indicates country was not in the top 10 in the given year. Retrieved on December 16, 2015.

Chinese demand is one reason the Southeast Asian countries have improved their competitive positions, with a tight knit regional production network emerging. Vietnam, Thailand, and Indonesia are the largest woodchip suppliers for China, and China is also the largest export market for all three, receiving 61% of Vietnam's exports in 2013, 52% of Thailand's, and 92% of Indonesia's. Additionally, the Southeast Asian countries also benefitted from some structural disadvantages that hurt Australian exporters, including the appreciation of that country's currency as well as high maritime shipping costs (Flynn, 2015). Market dynamics, nonetheless, remain fluid. More recent developments, including the emergence of giant woodchip carriers that dramatically reduce maritime distribution expenses by increasing volume and fuel efficiency as well as weaker currencies in both South Africa and Australia, may allow both countries to regain lost market share (Flynn, 2015).

Pulp: China and the US are the leading global producers of pulp; together, those two countries accounted for 47% of the 271 million metric tons of pulp manufactured around the world in 2014. While China and the US are the largest two producers, they—and other countries with similar natural resources—have different production profiles, which provides important context for the export market.

The majority of China's pulp production (78%) is recovered fiber pulp. Recovered fiber pulp is used almost exclusively as an input in domestic markets and not traded internationally—in 2014, only 0.4% of the total global production volume of recovered fiber pulp was exported, with countries that rely on recycled paper to meet raw materials deficits instead importing large bundles of recycled paper or paperboard that is then processed into pulp in the domestic market.

While recovered fiber pulp is traded internationally only sparingly, varieties of chemical pulp (dissolving, chemical and semi-chemical) that are generated from virgin fiber are exported in much higher volumes.²² The leading pulp exporters—Canada, the US, and Brazil—are countries that produce virgin pulp almost exclusively. These three countries were the largest exporters of pulp in 2014 as measured by value, accounting for 47.5% of global shipments (see Table 2).

Table 2. Top 10 World Exporters of Pulp by Year, 2005-2014

| Country | Export Value (US\$, millions) | | | | | World Share | | | | |
|---------------|-------------------------------|---------------|---------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|
| | 2005 | 2007 | 2010 | 2012 | 2014 | 2005 | 2007 | 2010 | 2012 | 2014 |
| World | 21,124 | 29,248 | 34,846 | 34,918 | 37,557 | | | | | |
| Canada | 5,220 | 6,644 | 6,808 | 6,434 | 6,533 | 24.7% | 22.7% | 19.5% | 18.4% | 17.4% |
| USA | 3,356 | 4,130 | 5,579 | 5,935 | 6,021 | 15.9% | 14.1% | 16.0% | 17.0% | 16.0% |
| Brazil | 2,033 | 3,023 | 4,760 | 4,700 | 5,292 | 9.6% | 10.3% | 13.7% | 13.5% | 14.1% |
| Sweden | 1,890 | 2,373 | 2,630 | 2,491 | 2,641 | 8.9% | 8.1% | 7.5% | 7.1% | 7.0% |
| Chile | 1,204 | 2,347 | 2,393 | 2,534 | 2,606 | 5.7% | 8.0% | 6.9% | 7.3% | 6.9% |
| Finland | 1,030 | 1,661 | 1,626 | 1,740 | 2,124 | 4.9% | 5.7% | 4.7% | 5.0% | 5.7% |
| Indonesia | 905 | 1,068 | 1,466 | 1,545 | 1,794 | 4.3% | 3.7% | 4.2% | 4.4% | 4.8% |
| Netherlands | — | — | — | — | 1,192 | — | — | — | — | 3.2% |
| Russia | 757 | 1,038 | 1,113 | 1,146 | 1,122 | 3.6% | 3.5% | 3.2% | 3.3% | 3.0% |
| Germany | 487 | 838 | 864 | 846 | 999 | 2.3% | 2.9% | 2.5% | 2.4% | 2.7% |
| Spain | 528 | — | 790 | 879 | — | 2.6% | — | 2.3% | 2.6% | — |
| Belgium | — | 894 | — | — | — | — | 3.1% | — | — | — |
| Top 10 | 17,205 | 23,455 | 27,786 | 28,137 | 30,329 | 81.4% | 79.7% | 79.7% | 80.6% | 80.8% |

Source: FAOSTAT based on FAO item code 1875, 1668, and 1609. (—) indicates country was not in the top 10 in the given year. Retrieved on February 17, 2016.

Brazil's ascension over the past decade is part of a larger trend where South American nations are gaining market share at the expense of long-established producers such as Canada and Sweden. Brazil more than doubled the value of its exports from 2005-2014, becoming the world's second largest supplier of pulp. Chile increased its wood pulp exports from US\$1.2 billion in 2005 to US\$2.6 billion in 2014; while Uruguay, which ranks 12th in the world, boosted its exports to US\$0.8 billion in 2014 after entering the market in 2007. The South American

²² For sake of comparison, 38% of the total global production volume of chemical pulp and 35.6% of the total global production volume of semi-chemical pulp was exported.

countries export chemical pulp almost exclusively—100% in the case of Chile and Uruguay, and 93% for Brazil.

A critical factor in the emergence of the South American countries is the suitability of the region to fast-growing eucalyptus plantations. Eucalyptus species have significantly higher yields and mature more rapidly than European hardwoods—plantations in South America can be harvested four times as often, yielding twice as much per as longer-rotation trees in a typical 28 year cycle (Cossalter & Pye-Smith, 2003). Table 3 lists common species of fast-growing trees that are used in the paper GVC. Aspen and birch, which are the hardwoods used for pulp production in northern Europe, take between 20-40 years to mature and are considered slow-growing trees and thus not included.

Table 3. Characteristics of Fast-Growing Trees Used in Paper GVC

| Species | Mean Annual Increment (cubic meters/hectare/year) ²³ | Time to Reach Maturity (Years) | Main Countries (Decreasing Order of Importance) |
|--------------------------------------|---|--------------------------------|---|
| Eucalyptus grandis and other hybrids | 15-40 | 5-15 | Brazil, South Africa, Uruguay, India, Congo, Zimbabwe |
| Other tropical eucalyptus | 10-20 | 5-10 | China, India, Thailand, Vietnam, Madagascar, Myanmar |
| Temperate eucalyptus | 5-18 | 10-15 | Chile, Portugal, Spain, Argentina, Uruguay, South Africa, Australia |
| Tropical acacias | 15-30 | 7-10 | Indonesia, China, Malaysia, Vietnam, India, Philippines, Thailand |
| Caribbean pines | 8-20 | 10-18 | Venezuela |
| Paraserianthes falcataria | 15-35 | 12-20 | Indonesia, Malaysia, Philippines |
| Poplars | 11-30 | 7-15 | China, India, USA, central and western Europe, Turkey |

Source: Cossalter & Pye-Smith, 2003.

Other countries have different pulp portfolios. Chemical pulp accounted for 79% of America's US\$5.8 billion in exports in 2014; however, a portion of the US's exports are dominated by fluff pulp, the key input for absorbent health and hygiene products such as diapers. Softwood pine trees found mainly in the southeastern US are a primary raw material for fluff pulp, giving American companies a competitive advantage.²⁴ Historically, Canada's production of pulp has been split almost evenly between mechanical and chemical pulp; the emphasis on mechanical pulp allowed the country to provide inputs for less durable final products such as newsprint. As newspaper demand has declined and chemical pulp has become the dominant export good, Canada has seen its competitive position erode.

Although the woodchip segment has become fairly concentrated at the regional level, trade in pulp is more globally oriented. That feature is especially apparent among large South American exporters, which ship to a range of Asian, North American and European customers. While

²³ Mean annual increment is the volume of wood growing on one hectare of forest during one year (m³/ha/year) on average since the forest has been established (FAO).

²⁴ FAO data does not disaggregate its statistics to the point it captures data on fluff pulp.

China is the largest market for pulp exported from Brazil (38% of total exports in 2013), Chile (38%), and Uruguay (41%), countries such as the US, Germany, and Italy also receive sizeable volumes of shipments from each.

Box 2. Abaca Pulp in the Paper GVC

Abaca is a plant whose fibers can be used to generate outputs in the paper GVC. The plant, which grows in shaded, hilly areas with little input requirements and is also known as Manila hemp, yields strong fibers that can be used to generate durable goods such as tea bags or bank notes.

The Philippines and Ecuador are the only countries that grow abaca in significant volume. Ecuador is completely concentrated in the upstream segments of the chain, harvesting the plant and extracting fibers. The Philippines, meanwhile, has a monopoly on pulp production, although inefficiencies associated with domestic cultivation meant the country had to import an average of 354 MT of abaca fiber per year from Ecuador from 2008-2012 to meet demand from pulp mills. Table 4 provides further detail on abaca production and exports in recent years.

Table 4. Worldwide Production and Exports of Abaca by Year, 2009-2013

| Category | 2009 | 2010 | 2011 | 2012 | 2013 |
|--|-------------|-------------|-------------|-------------|-------------|
| Abaca Production ('000 MT) | | | | | |
| Philippines | 54.6 | 57.2 | 73.3 | 64.8 | 56.0 |
| Ecuador | 10.4 | 10.2 | 9.6 | 11.4 | 9.4 |
| Other Countries | 1.9 | 1.8 | 2.0 | 2.0 | 2.0 |
| WORLD TOTAL | 66.9 | 69.2 | 84.8 | 78.2 | 67.4 |
| Philippines Abaca Export Quantities ('000 MT) | | | | | |
| Fiber | 7.4 | 11.3 | 9.8 | 4.5 | 3.3 |
| Pulp | 12.0 | 20.9 | 29.8 | 21.5 | 17.6 |
| Cordage | 5.3 | 7.0 | 7.5 | 5.0 | 4.2 |
| Other | 1.3 | 1.6 | 1.4 | 2.4 | 2.0 |
| TOTAL ('000 MT) | 26.0 | 40.7 | 48.5 | 33.3 | 27.2 |
| Ecuador Export Quantities ('000 MT) | | | | | |
| Fiber | 10.4 | 10.2 | 9.6 | 11.4 | 9.4 |
| Pulp | — | — | — | — | — |
| TOTAL ('000 MT) | 10.4 | 10.2 | 9.6 | 11.4 | 9.4 |

Sources: FAO Statistical Bulletin, 2014; PRDP, 2014.

Paper Products: While a slightly higher percentage of paper products (27.9%) were exported in 2014 compared to intermediate goods (woodchips is 27.7% and pulp 21.9%), the majority still remained in domestic markets. Of the leading producers, Asian countries such as China, Japan, and Indonesia were especially oriented toward local consumers, with less than 10% of their total production volume of paper products being exported.

There is, however, variance in the export profile of the individual product categories that compromise the paper value chain. Newsprint and writing papers are shipped across international borders in higher frequency than other paper outputs—in 2014, 44.1% of the global production volume of newsprint and 42% of the global production volume of writing

paper were exported; by comparison, 22.4% of the production volume of paperboard and 9.5% of health and hygiene products were traded internationally.

Although close to 95% of Chinese production is used by domestic customers, it is important to note that China has increased its share of exports from 1.6% of the world market in 2005 to 6.1% in 2014. Much of this jump can be attributed to the number of investments in the mid- and downstream portions of the chain described earlier. The sheer volume has led to “over supply and over capacity” in the domestic market (Wall Street Journal, 2015),²⁵ and Chinese manufacturers have pushed writing paper and paperboard to regional destinations on the export market to shed surplus.²⁶

The tradability of the industry’s traditional goods can also be detected by analyzing the top global exporters of paper and paperboard products. The largest are predominantly northern European nations (Germany, Sweden and Finland) or North American (the US and Canada) countries (see Table 5). However, the preeminence of these countries is tied to newsprint or writing paper—Canada historically has been the leading exporter of newsprint, while Germany has for writing paper.

Table 5. Top 10 World Exporters of Paper and Paperboard by Year, 2005-2014

| Country | Export Value (US\$, millions) | | | | | World Share | | | | |
|---------------|-------------------------------|----------------|---------------|---------------|----------------|--------------|--------------|--------------|--------------|--------------|
| | 2005 | 2007 | 2010 | 2012 | 2014 | 2005 | 2007 | 2010 | 2012 | 2014 |
| World | 88,175 | 103,079 | 99,210 | 99,654 | 105,509 | | | | | |
| Germany | 11,452 | 14,169 | 13,360 | 13,375 | 14,684 | 13.0% | 13.7% | 13.5% | 13.4% | 13.9% |
| USA | 7,297 | 8,888 | 8,511 | 9,994 | 10,090 | 8.3% | 8.6% | 8.6% | 10.0% | 9.6% |
| Sweden | 8,144 | 9,545 | 8,909 | 8,991 | 8,966 | 9.2% | 9.3% | 9.0% | 9.0% | 8.5% |
| Finland | 8,458 | 10,778 | 9,228 | 8,986 | 8,907 | 9.6% | 10.5% | 9.3% | 9.0% | 8.4% |
| Canada | 10,360 | 8,217 | 7,047 | 6,433 | 6,515 | 11.8% | 8.0% | 7.1% | 6.5% | 6.2% |
| China | — | — | 3,236 | 4,748 | 6,401 | — | — | 3.3% | 4.8% | 6.1% |
| France | 5,043 | 5,419 | 4,875 | 4,535 | 4,466 | 5.7% | 5.3% | 4.9% | 4.6% | 4.2% |
| Italy | 2,726 | 4,395 | 3,282 | 3,426 | 3,799 | — | 4.3% | 3.3% | 3.4% | 3.6% |
| Austria | 3,030 | 3,793 | 3,399 | 3,468 | 3,746 | 3.4% | 3.7% | 3.4% | 3.5% | 3.6% |
| Indonesia | — | — | 3,570 | 3,345 | 3,267 | — | — | 3.6% | 3.4% | 3.1% |
| Netherlands | 2,687 | 3,180 | — | — | — | 3.0% | 3.1% | — | — | — |
| Belgium | 2,629 | 3,057 | — | — | — | 3.0% | 3.0% | — | — | — |
| Top 10 | 61,830 | 71,444 | 65,423 | 67,305 | 70,846 | 70.1% | 64.6% | 65.9% | 67.5% | 67.1% |

Source: FAOSTAT based on FAO item codes 1671, 1674, 1675. (—) indicates country was not in the top 10 in the given year. Retrieved on December 16, 2015.

2.3. Lead Firms in the Paper Global Value Chain

The evolving industry dynamics have changed how firms operate, with three noticeable trends emerging: (1) Consolidation among lead firms, albeit with changes in top players; (2) Fragmentation of the value chain; and (3) Financialization of timberlands. Due to the strong

²⁵ The glut has prompted some international lead firms to sell Chinese assets—after two years of flat sales, International Paper sold its shares in its Chinese JV in the fall of 2015 and will supply the market from Russian and American production bases (Wall Street Journal, 2015).

²⁶ While many Chinese executives do not consider the US a target market as transport costs are too high (Zhu & Yao 2014), American producers have twice filed a case in the ITC against China (and Indonesia) (Maine, 2014).

regional nature of the industry—most lead firms’ sales are concentrated within one primary region²⁷—reactions to the global shifts have followed slightly different patterns by region, with leading firms in the Americas tending towards consolidation around core strengths, European firms continuing to operate as vertically integrated operations, and the rising Asian firms, unconstrained by legacy operations, following a mixed sourcing approach. Each trend is discussed in further detail below.

I. Consolidation among Lead Firms, albeit with Changes in Top Players: While the final products industry continues to concentrate with the top ten suppliers by volume controlling almost 50% of the market, the composition of the top ten players has changed. Much of the lead firms’ power can be attributed to the industry’s scale. Broadly speaking, paper production is characterized by large barriers to entry (and exit) due to the considerable capital costs of milling facilities combined with the lack of product differentiation. Companies must generate high volume to exploit economies of scale within production and distribution and create return on investments. This has contributed to a generally consolidated global market, with the top ten firms by revenue generally controlling between 40-42% sales over the past decade. Table 6 below lists the top 10 global producers by 2014 sales.

Table 6. Top 10 Firms in the Paper GVC by 2014 Sales

| Rank | Company | Headquarters | Sales of (US\$, millions) | Employees | Leading Division (% of total sales) | Leading Region (% of total sales) |
|------|---------------------|-------------------|---------------------------|-----------|-------------------------------------|-----------------------------------|
| 1. | International Paper | Memphis, USA | 23,617 | 58,000 | Industrial (62%) | North America (72%) |
| 2. | Procter & Gamble | Cincinnati, USA | 20,950 | 118,000 | Health & Hygiene (100%) | Unavailable |
| 3. | UPM-Kymmene | Helsinki, Finland | 12,732 | 20,000 | Printing Paper (59%) | Europe (67%) |
| 4. | Oji Paper | Tokyo, Japan | 12,731 | 17,345 | Industrial (41%) | Asia (57%) |
| 5. | Stora Enso | Helsinki, Finland | 11,084 | 27,000 | Printing Paper (38%) | Europe (74%) |
| 6. | Smurfit Kappa | Dublin, Ireland | 10,728 | 42,000 | Industrial (100%) | Europe (76%) |
| 7. | Svenska Cellulosa | Stockholm, Sweden | 10,714 | 44,000 | Health & Hygiene (85%) | Europe (65%) |
| 8. | Kimberly-Clark | Dallas, USA | 10,033 | 43,000 | Health & Hygiene (83%) | North America (48%) |
| 9. | Rock Tenn* | Richmond, USA | 9,531 | 26,600 | Industrial (69%) | North America (100%) |
| 10. | Nippon Paper Group | Tokyo, Japan | 8,755 | 13,107 | Unavailable | Unavailable |

Source: PPI, 2015a; authors based on annual reports.

Note: The sales figure column captures only paper products—companies such as Procter & Gamble have a diverse array of non- paper products that are not included in the total listed above; however employee numbers are for the total of the company. * = Rock Tenn and MeadWestvaco merged in 2015 to form WestRock.

²⁷ Of the 10 largest companies measured by revenue, Kimberly-Clark is the only business not to receive the majority of its sales in one specific region. This can be attributed to the fact that Kimberly-Clark’s primary products are health and hygiene goods that have a more global market.

There has been fluctuation in the identity of the largest producers measured by annual output of paper or paperboard. Five of the leading firms by volume in 2005 were no longer present in the top ten by 2014. These changes include the rise of firms focused on industrial packaging as well as several Asian firms, such as Oji Paper and Nippon Paper (Japan), Nine Dragons (China), and APP (Singapore).²⁸ Chinese companies figure more prominently into volume as opposed to revenue metrics for at least three reasons: (1) The Asian market is relatively unconsolidated compared to North America and Europe, with new businesses continuing to enter the market in attempts to meet rising demand (Fisher, 2015); (2) The primary output of Nine Dragons, China's largest company, is lower-value containerboard product; and (3) The higher value product segments in China have higher participation from global lead firms such as International Paper, Stora Enso, UPM-Kymmene, and Svenska Cellulosa Aktiebolaget. Table A-2 in the Appendix lists the leading companies from 2005-2014 by production volume.

2. Fragmentation of the Value Chain: Historically, paper firms have been vertically integrated and regionally focused, deriving their market power from economies of scale at all stages of the chain. Some firms, such as those headquartered in Europe, continue to operate in this manner; however, others have begun to consolidate around core functions to facilitate transitions to high demand and higher value products to remain competitive. The fragmentation of these operations has allowed for the entrance of new actors into the chain at both the woodchip and pulp supply stages of the chain. Market power, nonetheless, remains focused in the capital-intensive paper milling segment of the value chain.

North American lead firms have been especially proactive in concentrating on core business activities, with companies such as International Paper, Rock Tenn, MeadWestvaco, Abitibi, and Weyerhaeuser all undergoing restructurings that have affected their positions within the value chain. These have included both firms consolidating in the upstream and downstream segments of the chain. The most prominent developments include the world's largest paper company, International Paper, divesting itself of its distribution and building products divisions in 2012. The company has then used the capital raised from the transactions to expand its paper and paperboard production. Additionally, Weyerhaeuser and Abitibi Consolidated (now Resolute Forest Products) have both exited paper milling and have focused on timber-based products such as lumber, woodchips and pulp (Carlton, 2008). Many of these North American paper and paperboard manufacturers have also divested themselves of forest holdings.²⁹

The European lead firms have all remained vertically integrated companies with relatively diverse and overlapping product divisions. Nordic companies such as Stora Enso, UPM, Svenska Cellulosa Aktiebolaget have maintained their lumber divisions and sawmills, which remain important segments of their businesses—all three earned at least 16% of their total revenue from timber products in 2014. Those companies also have vast forest resources in Northern Europe that they have more direct control over than their North American counterparts, who are concentrating on core business activities. Lack of industry rationalization is partially the result of European competition legislation (PWC, 2011) as well as the overall regionalization

²⁸ APP is a private company and does not make financial or production data publicly available.

²⁹ In 1981, the 12 private companies with the largest forest reserves owned at least 15.5 million hectares; in 2014, only two of those same companies (Weyerhaeuser and Potlatch) still had forest holdings (Flynn & Pakkasalo, 2015).

observed in the industry. Nonetheless, as discussed below, these firms are also increasingly turning towards market pulp to complement their internal supply.

Several South American companies have emerged as important low-cost pulp manufacturers, taking advantage of their region's competitive advantages—suitable growing conditions for fast-growing eucalyptus plantations as well as low labor and land costs—to develop a strong market presence in the pulp milling segment of the GVC. By 2014, the four largest global producers of market pulp by volume were based in Brazil or Chile (see Table 7). These businesses continue to expand their production. For example, Suzano, a Brazilian company, is the world's second largest producer of bleached eucalyptus pulp (4.7 million tons of annual pulp capacity) and just opened its massive Maranhao pulp mill in 2014 (Rodden, 2015). These firms have typically focused on market pulp production with minimal expansion into the paper and paperboard segments. Most downstream investments have primarily served domestic markets.

Table 7. Top 10 Pulp Companies by 2014 Production

| Rank | Company | Headquarters | 2014 Sales (US\$, millions) | Employees | Market Pulp Production (MT, '000) |
|------|--------------------------|-------------------|-----------------------------|-----------|-----------------------------------|
| 1. | Fibria Celulose | Sao Paulo, Brazil | 3,012 | 13,204 | 5,274 |
| 2. | Arauco | Santiago, Chile | 2,188 | 13,576 | 3,269 |
| 3. | Suzano Papel e Celulose | Sao Paulo, Brazil | 3,088 | 7,000 | 2,982 |
| 4. | Empresas CMPC | Santiago, Chile | 3,923 | 16,824 | 2,647 |
| 5. | UPM-Kymmene | Helsinki, Finland | 10,106 | 20,000 | 2,200 |
| 6. | Metsä Group | Espoo, Finland | 5,729 | 10,410 | 1,900 |
| 7. | Weyerhaeuser | Federal Way, USA | 1,936 | 12,800 | 1,859 |
| 8. | Resolute Forest Products | Montreal, Canada | 3,661 | 7,700 | 1,700 |
| 9. | International Paper | Memphis, USA | 24,000 | 58,000 | 1,611 |
| 10. | Eldorado | Sao Paulo, Brazil | 1,063 | 3,000 | 1,568 |

Source: PPI, 2015.

Relationships between pulp mill operators and paper manufacturers have tended to be loosely defined due to the lack of product differentiation. Market pulp is generally traded on global markets as a commodity (Marketline, 2014), and contracts between buyers and sellers are uncommon since lead firms attempt to source pulp at the lowest possible price. However, the strong demand for these intermediate inputs from Chinese mill operations, combined with pressure on availability and sustainability of global forest resources and the capital intensity of establishing new pulp operations, has led to greater coordination between stages of the chain. Joint Ventures (JVs) between major paper producers and pulp mills are one way this trend has manifested itself—Fibria Celulose has a JV with Stora Enso in Brazil on the Veracel pulp mill, and Arauco, based in Chile, also formed a JV with Stora Enso to build a production facility in Uruguay that opened in 2014.

3. Financialization of Timberlands:³⁰ While businesses that produce large quantities of market pulp are most likely to own or control forest plantations for woodchip production, vertically integrated firms in the sector—particularly those from the US—have divested out of

³⁰ The discussion in this section is based on Flynn & Pakkasalo (2015) and Flynn (2015).

forest properties. In what has been described as a “profound” break from the past (Flynn & Pakkasalo, 2015), TIMOs and REITs have stepped into the void. TIMOs are companies that manage forests on behalf of institutional investors such as pension funds, foundations or endowments; generally, they only manage the timber and do not own the forests. REITs, meanwhile, earn 75% of income from the sale of timber, 90% of which is distributed to investors. Although some of the largest REITs include actors such as Weyerhaeuser that also sell forest products, the sale and processing of timber are separate activities.

Worldwide, financial investors control at least 52 million hectares of timberland. Globally, that is close to 20% of the estimated 246 million acres of the total private ownership of forests. In some countries such as the US—where REITs control 16.6 million hectares—Australia, and New Zealand, financial investors control as much as 50% of forest plantations. As opportunities in those markets recede, REITs and TIMOs are pursuing new investments in locations in Latin America, Europe, and Asia. Table 8 outlines the 10 largest private forest owners by type and region. In countries in Asia, the government owns much or all of available timberland but provides private companies with harvesting rights.

Table 8. Ten Largest Private Forest Owners by Type and Region, 2014

| Type | North America | Europe | Latin America | Oceania | Africa | Asia |
|-------------------|---------------|--------|---------------|---------|--------|------|
| TIMOs | 6 | 2 | 2 | 7 | 2 | 0 |
| REITs | 3 | 3 | 0 | 0 | 0 | 0 |
| Listed Companies | 0 | 0 | 8 | 1 | 2 | 2 |
| Private Companies | 1 | 5 | 0 | 1 | 6 | 8 |
| Tribal | 0 | 0 | 0 | 1 | 0 | 0 |

Source: Flynn, 2015. TIMOs = Timberland Investment Management Organizations; REITs = Real Estate Investment Trusts.

The rise of REITs and TIMOs has important implications for lead firms. Under these arrangements, financial investors do not own processing equipment, instead selling wood to vertically integrated paper firms. This has the effect of eroding some of the power of leading producers; financial investors’ primary motivation is to maximize returns in an 8-12 year period, which minimizes the desire to undertake research and development activities—for instance, experimenting with trees that may produce more efficient pulp fiber—that may reduce short-term profits. Additionally, paper makers that rely on the open market may be forced to pay higher prices for inputs.

By way of summary of the global trends, Table A-3 in the Appendix provides an indication of the market dynamics for each segment of the value chain. It also includes some of the largest companies that provide goods or services in each division as well as market notes and trends.

2.4. Standards and Institutions

As firms have globalized and increased their outsourcing of operations, a host of standards have emerged to help govern the sector and facilitate transactions between companies at different stages of the chain, such as ISO 9000, I4000 and OHSAS 1800.³¹ In addition, firms—particularly those from Europe, such as Stora Enso and UPM—have established corporate codes of conducts covering workplace and labor rights as well as business ethics and workplace safety.

While these are significant, the more important standards are environmental certifications in supply chain management that have emerged in response to pressure from powerful environmental non-governmental organizations (NGOs). Some of the more prominent NGOs include the Forest Stewardship Council (FSC),³² the Programme for the Endorsement of Forest Certification (PEFC) International, the Sustainable Forestry Initiative (SFI) and the Forest Trust (FT) as well as broader environmental organizations such as Greenpeace. These organizations have helped to increase awareness regarding deforestation, illegal logging, and pollution generated in pulp and paper milling. Not all markets have adopted these standards, however. For example, the Chinese market to date has been less discerning with respect to environmental standards and do not require FSC and PEFC certifications (Kaplinsky, 2011).

Increasingly, NGOs and paper companies are collaborating to form close arrangements that signal the firms' dedication to environmental sustainability both to consumers as well as supply chains. These are manifest in the development of agency certifications that cover three broad categories: (1) **Forest management:** Where forest managers and owners are evaluated on their adherence to best practices associated with sustainability; (2) **Chain of custody:** Where companies receive certification after their entire supply chain is analyzed to ensure compliance with forest management and wood certification guidelines, and (3) **Wood certification:** Where ensures firms are certified to ensure they do not use wood that has been illegally harvested or is from other non-compliant sources.

2.5. Human Capital and Workforce Development

The global forestry industry employs an estimated 13.7 million workers in the formal sector, with significant numbers of informal workers participating in the timber production state of the value chain. Globally, China accounts for 26% of all forestry workers in the formalized sector, with the industry shedding workers in many developed countries as the industry shifts to Asia (ILO, 2011). Even with the mill closures in certain locations providing a surplus of available workers, specific job categories face skill scarcities, including machine operators, artisans/skilled trades, and professional and associate professionals (Institute for Economic Research on

³¹ **ISO 9001:** ISO 9001 helps businesses create effective quality management systems to improve internal work processes. **ISO 14001:** ISO 14001 outlines requirements for environmental management systems. "It helps organizations improve their environmental performance through more efficient use of resources and reduction of waste (ISO, 2015)." While the ISO outlines standards, it does not perform certifications, instead relying on third-party organizations. **OHSAS 18001:** Ensures that companies have occupational health and management systems in place that adhere to international best practice.

³² The Rainforest Alliance is the organization that helped to found the FSC, which is the non-profit international body that manages the standard the sustainability standard.

Innovation, 2008). Table 9 outlines the primary professions in the paper GVC and their corresponding educational and training requirements.

Table 9. Educational Requirements for Jobs in Paper GVC

| Education Level | Job |
|---------------------|--|
| University Degree | Forest Professionals/Forest Management |
| | Forestry Technicians and Technologists |
| High School Diploma | Supervisors, Logging & Forestry and Forest Products Processing |
| | Papermaking and Coating Control Operators |
| | Sawmill Machine Operators |
| | Pulp Mill Machine Operators |
| | Papermaking and Finishing Machine Operators |
| | Other Wood Processing Inspectors and Graders |
| | Woodworking Machine Operators |
| | Laborers in Pulp and Paper Processing |
| Some High School | Logging Machine Operators |
| | Silviculture and Forestry Workers |
| | Logging and Forestry Laborers |
| | Other Wood Products Assemblers and Inspectors |

Source: Canadian Forest Services, 2007

2.6. Upgrading Trajectories in the Paper GVC

As the industry globalizes, there are critical factors that determine whether countries are able to participate in the paper GVC. In upstream stages of the chain, suitability for fast-growing plantations; strong, cost effective domestic transportation infrastructure and access to ports; and low labor costs are essential. Mid- and downstream stages in pulp and paper production respectively depend significantly on political stability and low electricity costs (Rushton, 2015). Due to high transportation costs relative to value and volume, distance from end-market use is a driver of competitive advantage in paper mills and conversion operations.

There are two primary entry points into the chain, both of which require access to forest resources: (1) Woodchips production; and (2) Pulp production. A few countries that have developed manufacturing capabilities and boosted exports of woodchips and pulp have also begun to upgrade into paper milling such as Brazil and Chile, although these goods are most often targeted for the domestic market.³³ Few countries have exhibited the upgrading trajectory pursued by China of strong upgrading into downstream paper milling and conversion segments chain without upstream woodchip or pulp production, although the presence of export-oriented industries such as electronics or food and beverage that use packaging material in high volume does provide some opportunity. Regional distinctions can be made between common upgrading strategies—North American companies have been more proactive in engaging in functional upgrading, while European firms have been more ambitious in attempting chain upgrades into chemicals and bio-refining.

³³ Suzano, the Brazilian pulp and paper company, received 15% of its pulp revenue from the domestic market in 2014; by comparison, the company earned 71% of its final product revenue from Brazil (Suzano, 2014).

I. Functional Upgrading

Entry into sawmilling for woodchip production: Countries such as Vietnam and South Africa that have entered into the upstream woodchip production segment of the paper GVC in recent years have relied on competitive advantages in low cost labor and cheap land and importantly, fast-growing eucalyptus and acacia forests. These can be harvested roughly seven years after planting, compared to 20-30 years for aspen and birch varieties. These countries are often also engaged in the export of lumber products. The capital costs associated with sawmills is high—construction often costs between US\$50-\$70 million, and integrated facilities that can produce more elaborate wood products cost between US\$100-\$150 million (S&P Capital IQ, 2015).

From sawmilling into pulp production: Since 2005, countries such as Uruguay and Chile have pivoted from being leading exporters of woodchips into increasing their share of pulp exports. Achieving this upgrading is a lengthy engagement; even with mature plantations, the lifecycle for development of integrated mills that convert timber into woodchips and pulp at the same location is often 7-9 years. The planning process takes 3-4 years as companies identify potential sites, engage local stakeholders, address potential environmental concerns, and work with design and engineering firms. Construction can then be expected to take roughly 3-4 years.³⁴ After the mill opens, there is a roughly nine-month ramp-up period before full capacity can be reached. Furthermore, establishing a competitive pulp mill requires significant access to capital, which can run into billions of dollars not only for the operations and timberlands, but also to meet other needs such as power-generation, port facilities, and improvements to road and rail infrastructure. This may require coordination between firms, the national government, and international financing organizations. For example, the Inter-American Development Bank (IDB) helped the Uruguayan government finance the construction of two port facilities as well as a power-generating plant as part of the Montes del Plata project. In Brazil, the government built 28-kilometer rail extension to connect Suzano's Maranhão mill to a larger network.

2. Product Upgrading

Improving quality or specializing in high-value products: Mohawk Fine Paper's entry into the specialty paper segment provides a representative example of improving product quality. Amidst declining sales of paper for brochures and reports, the US manufacturer of paper expanded its production of fine stationery and boosted sales to digital companies from \$10 million in 1998 to \$100 million in 2013 by forging strong bonds with Shutterfly and other companies that produce personalized holiday cards (Rosman, 2014).

For the latter strategy of switching product lines, many companies have converted paper facilities into containerboard and boxboard productions plants. In the US alone, more than 120 mills and 24.9 million tons of paper-making capacity has been closed down since 2000 (Mahlburg, 2015; Center for Paper Business and Industry Studies). Meanwhile, in Europe, manufacturers are following a similar trajectory, with the conversions of newsprint mills to

³⁴ For example, Suzano's construction of the US\$2.3 billion Maranhão pulp mill in northern Brazil began in early 2010 and concluded in 2013; while Stora Enso and Arauco started construction on their \$1.9 billion Montes del Plata joint operation commenced in 2011 before it opened in 2014.

packaging facilities projected to reduce newsprint capacity by 7.4 million tons in 2015 and 2016 (RISI, 2015).

International Paper has been one of the most aggressive in switching production and conversion facilities into sites that can manufacture more lucrative outputs. In the paperboard segment, it has leveraged its size to obtain exclusive supplier deals, such as that for industrial packaging with Amazon. This has helped International Paper to develop a 35% market share within the containerboard market segment in the US (Rosman, 2014). International Paper has a similar deal to produce coffee cups for Starbucks. The company has also re-configured many of its mills to produce higher volumes of fluff pulp (McWhirter, 2012). These changes will allow it to produce 1.4 million tons each year beginning in 2016 of the critical input for health and hygiene products, representing roughly one-quarter of the world's total supply (Stynes, 2015).

3. Process Upgrading

Adhering to sustainability guidelines in supply chain: Collaboration between environmental NGOs and paper companies is one of the more prominent examples of process upgrades in sourcing operations with a shift towards sustainable production techniques—companies such as APP, APRIL, 3M and others have built partnerships with organizations such as FSC, PEFC, Greenpeace, and the Forest Trust to ensure their supply chain harvests timber sustainably. Process upgrading of this nature is not limited to company efforts. In order to improve its competitive edge, Uruguay requires that its plantations adhere to its national Forest Certification Scheme, which was recognized both by PECP or FSC (Uruguay Investment and Export Promotion Agency, 2014). Other examples of process upgrading in the milling stages include increased automation and digitization of capital equipment. The shift of Chinese pulp mills from non-timber inputs to modern, recycled and virgin pulp mills is illustrative of national-scale process upgrading in the milling segments.

Table 10. Examples of Upgrading in Paper GVC

| Type of Upgrading | Examples | Key Factors or Constraints |
|-------------------|---|---|
| Entry | → Woodchips or pulp production | — Access to raw materials — Infrastructure (Port, rail, road, energy) — Low labor costs |
| Product | → Improving paper or paperboard quality → Converting paper mills into facilities that generate containerboard or boxboard | — Access to finance — Access to consumers |
| Process | → Forest certifications | — Education |
| Functional | → Moving from sawmill to pulp production → Consolidating business divisions to concentrate on core activities → Offering client-facing services | — Infrastructure (Port, rail, road, energy) — Access to finance — Domestic demand for product |
| Chain | → Moving into chemical or textile GVCs | — R&D capabilities |

Sources: Authors.

4. Chain Upgrading

Adding bio-refining capabilities: Leading European companies have been proactive in leveraging existing knowledge to diversify into new value chains. Businesses such as UPM and Stora Enso have recently established bio-refining divisions—these units accounted for more than 10% of their revenue in 2014.³⁵ Biomaterials and dissolving pulp can be used in a wide range of industries, including textile and automotive GVCs. This chain upgrading into biomaterials segments has required significant commitments to R&D. For example, in 2014, UPM spent US\$155 million or 21.1% of its operating budget on R&D work (UPM, 2014); by comparison, International Paper spent US\$16 million on R&D in the same year (International Paper, 2014).

3. Lessons for Value Chain Entry and Upgrading—Vietnam and Uruguay

The fragmentation of the paper GVC has allowed a number of developing countries to enter the chain in upstream segments to provide critical raw materials for the industry. Two of these countries—Vietnam and Uruguay—were selected for inclusion in this report as case studies to illustrate how policy actions may be used to facilitate and upgrading within the chain. Over the last decade, Vietnam has increased its annual export of woodchips from US\$104 million to US\$981 million, while Uruguay has attracted significant FDI from foreign lead firms Stora Enso and UPM-Kymmene to boost the country’s exports of pulp. Both countries share certain characteristics with the Philippines—none had an established history of robust participation in paper GVCs, while each has a climate that allows for cultivation of fast-growing eucalyptus or acacia mangium plantations.

3.1. Vietnam: Lessons for Chain Entry

In 2014, Vietnam’s participation in the paper GVC generated US\$1.13 billion export revenue, dominated by its position as the world’s leading exporter of woodchips. Table 11 below outlines the industry profile within the country—woodchips account for 87% of all exports and have increased more than 200% in the period from 2005 to 2014.

Recent growth has been driven by several factors, the key drivers being: (1) Rapidly rising regional demand for woodchips, especially from China; (2) Low levels of capital, technology, and skill requirements of woodchip processing; and (3) Plantation expansion spurred by the Vietnamese government policies since the late 1980s, in the context of ‘Doi Moi’ which marked the country’s transition from a centrally planned to a market economy (To & Richer, 2013). The policy initiatives have particularly focused on reversing deforestation, devolving management of timber production from state to private firms, households and communities, and restructuring of the woodchip sector. The woodchip industry³⁶ had 16 enterprises, operating 112 woodchips processing factories with a total nominal capacity of eight million tons

³⁵ In an article in the *Financial Times*, the CEO of Stora Enso emphasized this shifting focus by saying, “We want to be the renewable materials company, not the forestry company (Milne, 2012).”

³⁶ Comprehensive statistics about the wood-processing industry structure is limited, and often inconsistent, owing to industrial restructuring over the last decade.

of dry woodchips per year in 2012 (Roda & Rathi, 2005; To & Rathi, 2013). On the other hand, Vietnam's pulp and paper manufacturing has stagnated. Local pulp mills have found it progressively difficult to secure raw material supply in domestic markets owing to the rapidly growing demand by the more competitive export-oriented woodchips industry as well as the furniture industry in Vietnam.

Table 11. Vietnam's Paper Industry Exports, By GVC Stage 2005-2014

| Category | 2005 | 2007 | 2010 | 2012 | 2014 |
|--------------------------------------|------------|------------|------------|------------|--------------|
| Production Quantity ('000 MT) | | | | | |
| Woodchips | 1,100 | 1,920 | 3,000 | 3,312 | 3,312 |
| Recovered Paper | 175 | 77 | 120 | 120 | 120 |
| Wood Pulp | 352 | 265 | 295 | 460 | 460 |
| Paper | 908 | 1,333 | 1,601 | 1,737 | 1,742 |
| Import Quantity ('000 MT) | | | | | |
| Woodchips | — | 2 | 177 | 275 | — |
| Recovered Paper | 168 | 480 | 591 | 697 | 637 |
| Wood Pulp | 105 | 132 | 155 | 230 | 229 |
| Paper | 378 | 648 | 871 | 976 | 1,258 |
| Export Quantity ('000 MT) | | | | | |
| Woodchips | 2,300 | 3,597 | 7,542 | 11,300 | 13,834 |
| Recovered Paper | — | — | 2 | 13 | 15 |
| Wood Pulp | — | — | 13 | 39 | 45 |
| Paper | 23 | 24 | 70 | 47 | 99 |
| Export Value (US\$ millions) | | | | | |
| Woodchips | 104 | 171 | 458 | 808 | 981 |
| Recovered Paper | — | — | — | 1 | 2 |
| Wood Pulp | — | — | 8 | 17 | 20 |
| Paper | 20 | 25 | 81 | 56 | 130 |
| TOTAL EXPORTS | 124 | 196 | 547 | 882 | 1,133 |

Source: FAOSTAT based on FAO item codes 1619, 1669, 1875, 1876. Retrieved on January 7, 2016.

Industry Development

Spurred by a mix of global factors—the general fragmentation of paper GVCs—and local circumstances—vast raw materials, cheap labor and extensive industry restructuring—processor firms have targeted Vietnam for fast-growing plantations and export-oriented investment in woodchip processing facilities (Barney, 2005). Including JV arrangements between local actors and regional firms, the total number of enterprises in the country increased roughly 18% per year from 2000 to 2009. Woodchip exporters have maintained long-term supply contracts with their parent investors. Although difficult to specify the sub-sector categories due to lack of disaggregated statistical reporting on investment flows, enterprises from Taiwan (183), Republic of Korea (38), UK (29), Japan (27), and China (26) have been major investors in the Vietnamese wood processing sector since the 1990s (Quyen & Nghi, 2011).

The industrial reorganization strengthened linkages between the emerging private firms in the wood processing industry and the largely smallholder household-dominated plantations. JVs and contractual arrangements instigated by the rising demand for woodchips from the Asian countries have helped foster integration of smallholder plantations in the value chain.

Established in 1993, VIJACHIP, a joint venture between Japanese-owned SOJITZ and five Vietnamese forest companies, has established contractual arrangements that integrated smallholders into its supply chain using four different cost-sharing and credit provision models. These value chain linkages were critical to support commercialization of credit-constrained smallholder plantation holders. Over 1993-2001, the JV has succeeded to establish 13,062 hectares of eucalyptus and acacia plantations, which supplied feedstock to VIJACHIP woodchip processing plants and subsequent export of woodchips (Quyen & Nghi, 2011).

Private household plantations largely replaced the State Forest Enterprises (SFEs) in plantation management. Already by 2003, some 3.7 million hectares of forest land had been allocated to households although most of them had very small plots (de Jong, 2006). In 2010, the forest land leased out to farmers and entrepreneurs, supplied about 50% of the industrial needs (Sandewall et al, 2010).

The initial rapid restructuring in the upstream plantation segment was also extended to the processing sector. Whereas local pulp mills have sought to set up reliable domestic sources of raw material supply, they have not been able to compete with the furniture and particularly the export-oriented woodchips processors. Sawmills that generate woodchips need lower capital investment than pulp or paper mills, and their operating cost also is lower. For the farmers and other private producers, sawmills have often been the most preferred alternative market because they collect raw materials in a wider range or buy it at better prices.

As a result, imported pulp supplied on an average 45% of the input to Vietnam's paper mills, and 60 to 65% of their production costs (Roda & Rathi, 2005). Although the Five Million Hectare Reforestation Plan (5MHRP) has also targeted capacity expansion in the paper industry by 2010, the industry has added little to no capacity since 2000. From the 22 main pulp and paper mills that were part of the initial export-oriented industrial development plan, 12 were cancelled, seven were adapted, and three were postponed indefinitely (Roda & Rathi, 2005).

Policy Support

The recent exponential growth of Vietnam's woodchips industry has been founded on national reforestation strategies. After an extended period of rapid deforestation,³⁷ Vietnam has managed to reverse the trend over the last two decades. In 1992, the country banned export of logs and sawn wood and reduced harvesting quota by 88%; simultaneously, it launched two large scale reforestation programs based on national tree planting targets of five million hectares by 2010 (Barney, 2005). First, the Program 327, implemented during 1992-1998, as the first major effort to develop industrial plantations, focused on 're-greening the barren hills' and establishing plantations of fast growing eucalypts and acacias trees. It was followed in 1998 by a much more ambitious program—the 5MHRP—that allowed for reforestation of the degraded forest land, natural regeneration of logged forest areas and effective forest protection (Putzel et al., 2012). Key components of the 5MHRP program were reforestation of the degraded forest land, natural regeneration of logged forest areas and effective forest protection.

³⁷ Vietnam lost natural forest cover at a rate of 185,000 hectares per year from 1976 until 1990 (Barney, 2005).

Since 1992, the area of plantation forests has expanded by 6.5% per year, three times faster than the 2% world average, and it reached approximately 3.5 million hectares in 2010 from just one million hectares in 1990 (FAOSTAT, 2015; Sandewall et al., 2015). The natural forest protection mechanisms have also helped boost the total forest area available for logging, called the production forest, which was estimated 6.3 million hectares in 2010 (Quyen & Nghi, 2011). The production forest is the supply source for the industry to produce wood and wood-based products (Quyen & Nghi, 2011; Sandewall et al., 2015).

The SFEs were first opened for private investment in the early 1990s around the same time that reforestation strategies were implemented. The privatization program involved selling off equity interest in SFEs with the goal of converting them to limited liability or shareholding companies (Artemiev, 2003). Prior to that reform, SFEs generally harvested wood from natural and plantation forests and operated processing factories, but they were only marginally profitable. That meant they lacked the investment funds to renovate the allocated plantations (To et al., 2012). In response to the resulting deforestation crisis, the government restructured the forestry from forest exploitation to forest production and conservation, and engaged private sector actors (Barney, 2005).

Land tenure and forest protection policies, which stipulated allocation of property rights to individual households and private sector actors, have also made up the key elements of the policy framework. In accordance with the market reforms, the Land Law in 1993 granted farmers land use certificates (LUCs) to lease, exchange, inherit, transfer and use land as collateral. Initially, from 1993 to 1998, LUCs, also called Management or Protection Contracts, have issued five-year land use rights to households (Quyen & Nghi, 2011). Whereas LUCs still imposed numerous restrictions including its temporary nature, permanent LUCs or 'Red Books' replaced them as the most secure land document for the rural households in Vietnam (Sandewall et al., 2010). 'Red Book' certificates still did not permit full ownership, but they accorded the recipient 50-year use rights, which were transferable, exchangeable and available for use in leasing arrangements and as loan collateral. Further, the government's Decree 23 in 2006 provided the policy framework for renting and leasing of land to individuals and organizations (Quyen & Nghi, 2011). The land tenure policy initiative created the framework for expanding private sector investment in Vietnam's forestry sector.

Outside the forestry sector, the government of Vietnam has initiated a wider economic policy change since 1986, known as the "Doi Moi" (renovation), which was followed by a wave of market and land tenure reforms (UNCTAD, 2008). Furthermore, the country joined bilateral and multilateral trade agreements, including accession to the World Trade Organization (WTO) in 2007 (UNCTAD, 2008). Investment policy has focused to level the playing field for domestic and foreign investors and attract foreign investment; the 2005 Investment Law has allowed 100% foreign ownership (OECD, 2009). The 2003 Corporate Income Tax Law simplified the tax code by introducing a single corporate income tax rate of 28% for all business, regardless of structure and ownership; it also adopted a modern approach in determining taxable income, allowing companies to deduct the standard business-related expenses such as depreciation of fixed assets, research and development (R&D) costs, training, advertisement and marketing costs (UNCTAD, 2008).

3.2. Uruguay: Lessons for Upgrading

Uruguay's participation in the paper GVC generated US\$1.02 billion in export revenue in 2014. Critically, pulp has replaced woodchips as Uruguay's dominant export product, allowing the country to upgrade its position in the chain. With two large-scale facilities coming online in the last decade, Uruguay has increased its exports of wood pulp from US\$8 million in 2007 to US\$905 million in 2014; in that same year, pulp accounted for 88% of the country's exports in the chain (see Table 12). After production from the newest pulp mill reached full capacity in 2015, Uruguay's forest industry was expected to account for 14% of the country's total exports and 4.5% of GDP (Uruguay Investment and Export Promotion Agency, 2014a).

The country's upgrading within the paper GVC can be attributed to two prominent factors: (1) The suitability of the region to fast-growing eucalyptus plantations; (2) The favorable investment regime created by the Uruguayan government and supporting international institutions through the implementation of tax incentives designed to encourage certified forest plantations, the formation of free trade zones, and—perhaps most importantly—the construction of critical infrastructure. With global lead firms such as UPM and Stora Enso attracted by the possibility of accessing critical inputs at lower costs, FDI in Uruguay's forestry sector tripled from 2006 to 2013. The following case study outlines the factors that contributed to Uruguay's ascension within paper GVCs in further detail while also identifying impediments to the sector's further development.

Table 12. Uruguay Production and Trade in the Paper GVC, by Stage, 2005-2014

| Category | 2005 | 2007 | 2010 | 2012 | 2014 |
|--------------------------------------|------------|------------|------------|------------|--------------|
| Production Quantity ('000 MT) | | | | | |
| Woodchips | 1,298 | 1,280 | 2,274 | 905 | 974 |
| Recovered Paper | 15 | 17 | 21 | 39 | 12 |
| Wood Pulp | 34 | 131 | 1,116 | 1,154 | 1,500 |
| Paper | 98 | 90 | 96 | 140 | 122 |
| Import Quantity ('000 MT) | | | | | |
| Woodchips | — | — | — | — | — |
| Recovered Paper | 9 | 9 | 15 | 5 | 4 |
| Wood Pulp | 15 | 10 | 17 | 22 | 27 |
| Paper | 66 | 77 | 83 | 68 | 65 |
| Export Quantity ('000 MT) | | | | | |
| Woodchips | 1,298 | 1,280 | 2,274 | 904 | 963 |
| Recovered Paper | 15 | 17 | 14 | 15 | 11 |
| Wood Pulp | — | 11 | 1,109 | 1,150 | 1,497 |
| Paper | 42 | 38 | 38 | 40 | 43 |
| Export Value (US\$, millions) | | | | | |
| Woodchips | 62 | 65 | 130 | 73 | 68 |
| Recovered Paper | 1 | 2 | 3 | 3 | 3 |
| Wood Pulp | — | 8 | 812 | 737 | 905 |
| Paper | 38 | 36 | 40 | 46 | 52 |
| TOTAL EXPORTS | 101 | 111 | 985 | 859 | 1,028 |

Source: FAOSTAT based on FAO item codes 1619, 1669, 1875, 1876. Retrieved on January 7, 2016.

Industry Development

Three domestic companies, Fanapel, Pamer, and IPUSA, dominated Uruguay's paper industry for much of the 20th century and early 2000s. Together, these firms accounted for the majority of the roughly 35,000 metric tons of pulp and 90-100,000 metric tons of paper and paperboard that Uruguay produced annually from 2000-2005 (Lima-Toivanen, 2012; FAOSTAT, 2016). The trio focused mostly on the domestic market, with the country's exports reaching only US\$100 million in 2005, 62% of which came from woodchips.³⁸

The geographic composition of Uruguay's industry began to evolve when two European companies, Finland's Botnia and Spain's Ence, began to study the feasibility of eucalyptus plantations in the country; eucalyptus have higher yields and mature more rapidly than European hardwoods, making them attractive inputs for European lead firms looking to diversify their raw material base (Cossalter & Pye-Smith, 2003).

Botnia's investment came first (see Table 13). The pulp producer founded *Compañía Forestal S.A. (FOSA)* in 1991, originally owning a 40% stake along with Royal Dutch Shell, which controlled the other 60%. The initial aim of the JV was to study potential uses in collaboration, but once the utility of eucalyptus for pulp production became apparent, Botnia bought Shell out of the arrangement (Rodden, 2008). Over time, Botnia built one of the largest forest reserves in Uruguay (180,000 hectares) and also constructed the Fray Bentos plant that opened in 2007.

Table 13. Major Foreign Investments in Pulp Mills in Uruguay

| Mill | Original Investors | Current Investors | Output | Opened | Capacity |
|--------------------|--------------------------|---|------------------------------|--------|-------------------------|
| Fray Bentos Mill | Botnia/Royal Dutch Shell | UPM | Bleached hardwood kraft pulp | 2007 | 1.3 Million MT per year |
| Punta Pereira Mill | Ence | Montes del Plata (Stora Enso/Arauco JV) | Bleached hardwood kraft pulp | 2014 | 1.3 Million MT per year |

Sources: RISI, company websites.

UPM then bought Botnia in 2009 and assumed control of the mill. Production capacity is 1.3 million metric tons per year, which accounted for 100% of Uruguay's pulp exports and 63% of its forest exports before the Montes del Plato mill came online in 2014 (Uruguay Investment and Export Promotion Agency, 2014a). The facility sources 70% of its wood from FOSA's plantations; the remaining 30% comes from local farmers who are part of a cooperative "Fomento" program implemented by UPM that engages private landowners and encourages them to plant FSC or PEFC-certified forests (Rodden, 2008).

³⁸ Uruguayan companies still sell most of their products domestically. Fanapel is the largest exporter of the domestic firms, but it accounted for only 4% of the total exports in Uruguay's forest sector in 2013 (Uruguay Investment and Export Promotion Agency, 2014). Fanapel's emphasis is on paper and paperboard products and it is the largest producer in the country.

Ence, the Spanish company, followed a similar path as Botnia and created a subsidiary in Uruguay in the early 1990s that concentrated on securing forest reserves (Lima-Toivanen, 2012). Ence eventually sold its Uruguayan assets to Montes del Plata, which is a JV between Stora Enso and Arauco, a Chilean company that was the world's second-leading producer of pulp in 2014 (Pulp & Paper International, 2015).³⁹ Montes del Plata then built the Punta Pereira Mill, which opened in 2014 and, with 1.3 million tons, doubled Uruguay's pulp capacity.

While UPM, Arauco, and Stora Enso's investments in Uruguay were motivated by the economic benefits associated with fast-growing eucalyptus plantations as well as favorable investment climates, there are different company strategies associated with the mills. UPM is using the pulp to serve as an input for its Chinese paper and paperboard plants. Stora Enso, meanwhile, is using the 650,000 tons it generates from Montes del Plata each year to support the company's increasing emphasis on market pulp—the jointly owned plant reached full capacity in 2014 (Stora Enso, 2014c). Finally, Arauco is using the investment as part of diversification strategy away from its dependence on pine trees as inputs (Pappens, 2000).

Policy Support

The Uruguayan government and other institutions have facilitated the development of the country's paper sector in a number of critical ways. The most significant include forest and investment policies, the creation of special free trade zones (FTZ), and infrastructure development. Education for workers remains a barrier to upgrading for the sector and is the focus of attention for industry stakeholders. The ensuing section unpacks each of these elements in greater detail.

Forest and Investment Policy: Government regulation of the national forests in 1987 paved the way for FDI in Uruguay by Botnia and Ence. Forestry Law 15939 attempted to increase forest coverage and protect native timber by defining forest priority zones and introducing tax exonerations, subsidies, and credits for local landowners (Olmos & Siry, 2009). The law also established a Forestry Bureau (DGF) within the Ministry of Livestock, Agriculture and Fishing (MGAP) and established the following tax incentives for investors in forest priority areas:

- Income from the reserves is not included in corporate income tax calculations;
- The value or size of plantations is not subject to wealth taxes;
- Forest property is exempted from rural real estate taxes (Uruguay Investment and Export Promotion Agency, 2014).

Partially as a result of that law, Uruguay's forest plantations increased from 97,000 hectares in 1990 to 751,000 in 2006 (Olmos & Siry, 2009). In more recent years, the DGF has mapped the land by soil type and expected productivity, which allows landowners to access data that can be used to ensure tax exemptions for lands that have certain soil types and low fertility (Rodden, 2008).

³⁹ The Montes del Plata JV control about 190,000 hectares of eucalyptus forest in southern and central regions of the country, 140,000 of which are plantations (Uruguay Investment and Export Promotion Agency, 2014). The capacity of the Punta Pereira mill is equal to that of UPM's Fray Benton plant—1.3 million tons per year, with both Stora Enso and Arauco entitled to equal share.

Economic Zones: The creation of FTZs for the Fray Bentos and Punta Pereira mills were critical factors in attracting foreign lead firms (Lima-Toivanen, 2012). Special economic zones in Uruguay impart a variety of economic benefits, including exemptions on national, dividend, social security, and value-added taxes as well as custom duties (Uruguay Investment and Export Promotion Agency, 2014b). Whereas pulp from the Montes del Plata facility is exported directly from the Punta Pereira economic zone, the geography and infrastructure associated with the UPM plant requires the fiber to be processed in the Fray Bentos economic zone before being shipped to the Nueva Palmira economic zone, where it is then exported to global markets (Uruguay Investment and Export Promotion Agency, 2014). Those three economic zones—Punta Pereira, Fray Bentos, and Nueva Palmira—accounted for 97% of Uruguay’s merchandise exports to FTZs in 2014 (Uruguay Investment and Export Promotion Agency, 2014b), although the Nueva Palmira also ships goods other than pulp.

Infrastructure Development: The Inter-American Development Bank (IDB) provided a loan of US\$21 million to help finance construction of a US\$35 million port facility on the River Uruguay associated with the Fray Bentos mill. The IDB also provided US\$200 million worth of loans and helped secure an additional US\$250 million of financing from private banks to help pay for the construction of a port terminal with two docks, an oceanic vessel dock for large vessels, and a barge dock for incoming timber as part of the US\$2.27 billion Montes del Plata facility (IDB, 2011; IDB). Uruguay generally has mediocre road infrastructure, ranking 95th out of 140 countries globally (World Economic Forum, 2015), which is a constraint for the paper industry. The government has attempted to improve the nation’s highways through a public-private partnership (PPP) contracting system that is making investments to enhance seven corridors for US\$1.1 billion (Uruguay Investment and Export Promotion Agency, 2014a).

Education: The shortage of qualified professionals in the paper sector has been identified as a critical impediment for the development of Uruguay’s industry (Lima-Toivanen, 2012). Graduate or undergraduate course in forestry subjects have only recently been added to university curriculums, with the Helsinki University of Applied Sciences collaborating with the Universidad de la República’s Department of Forest Products Engineering to offer a master’s degree in pulp and paper science (Lima-Toivanen, 2012). In addition, in order to promote smooth labor relations once workers enter the labor force, the government created a public-private forestry council in 2010 for the development of the sector. Led by the Ministry of Industry, Energy and Mining, the tripartite council includes representatives from the public and private sectors as well as labor. These councils negotiate issues such as working conditions and minimum wages.

Box 3. Energy Efficiency of Uruguayan Pulp Mills

As highlighted in the chapter on the global industry, modern pulp mills can be designed to be net energy producers (see Box 1). Mills in Uruguay have used the techniques described with success, with many selling energy to Uruguay’s National Utility Company (UTE)—Montes del Plata’s Punta Pereira mill generates roughly 170 megawatts (MW) per month and sells about 80 back to UTE; UPM’s Fray Bentos Mill produces about 130 MW each month and sells 40 back to UTE; and Weyerhaeuser generates 10 MW each month and contributes 4 MW to the national grid.

Sources: Industrial Efficiency Technology Database; Uruguay Investment and Export Promotion Agency, 2014.

4. The Philippines and the Paper Global Value Chain⁴⁰

The Philippines' participation in the paper GVC is limited, with the majority of paper production destined for the domestic market. Taking advantage of favorable environmental factors,⁴¹ the country's most dependable export product since 2009 has been abaca pulp, which is valuable for the production of durable goods such as tea bags and bank notes. Otherwise, exports are minimal, confined largely to specialty grades of paperboard such as cigarette paper and packaging material. The industry generated US\$127 million in export revenue in 2014, which represented roughly 0.002% of the Philippines' total exports and ranked 54th among 193 countries in the world (see Table 14). This is well below its peers in the region.

Table 14. Southeast Asia Exporters in Paper GVC in 2014

| Global Rank | Country | Export Value (US\$, millions) | Leading Product (% of total exports) |
|-------------|--------------------|-------------------------------|---|
| 7. | China | 6,519 | Paperboard (52.2%) |
| 9. | Indonesia | 5,284 | Writing Paper (47.2%) |
| 25. | Thailand | 1,311 | Writing Paper (41.5%) |
| 27. | Vietnam | 1,132 | Woodchips (86.6%) |
| 42. | Malaysia | 309 | Paperboard (52.9%) |
| 54. | Philippines | 127 | Other Fiber Pulp (Abaca) (56.1%) |
| 112. | Cambodia | 2 | Recovered Paper (80.5%) |

Source: FAOSTAT based on FAO item codes 1619, 1668, 1669, 1875, 1876. Retrieved on February 15, 2016.

Exports have plunged since hitting an apex of US\$233 million in 2011, a steep decline that in some ways mimics trends seen elsewhere in the world. Demand for newsprint, the country's key traditional export product, has been on a downward trajectory for decades. While the spread of electronics and IT took longer to reach Asia than some locations, internet penetration has increased in more recent years (Hetemäki et al., 2013), decimating newsprint consumption—the Philippines' exports of newsprint dropped 75% from 2011 to 2012 alone, falling from US\$62 million to US\$15 million, and has subsequently not recovered.

The Philippines has location-specific impediments that have undermined export competitiveness. The most prominent of these is the lack of raw materials available in the country—with the closing of the PICOP integrated pulp mill in 2010, the Philippines cannot produce the virgin fiber pulp required for higher quality and value downstream products. There are also other factors at play. High energy costs and congested infrastructure have increased costs for companies, which has impeded their ability to invest in products or manufacturing processes that could facilitate upgrading into higher value segments of the chain.

⁴⁰ The information in this section of the report is based partially on an industry road map developed by the DTI together with the industry association, PPMAL, as well as confidential in-country interviews conducted in November 2015 and January 2016. Where details are extracted from publicly available material, there is a specific citation; otherwise, the information comes from either interviews or the road map.

⁴¹ Abaca plants are indigenous to the Philippines. The top-producing provinces are Catanduanes, Northern Samar, and Leyte (PRDP, 2014).

Table 15. Production and Trade within Philippines' Paper Industry, 2005-2014

| Category | 2005 | 2007 | 2010 | 2012 | 2014 |
|--------------------------------------|------------|------------|------------|------------|------------|
| Production Quantity | | | | | |
| Woodchips ('000 MT) | — | — | — | — | — |
| Recovered Paper ('000 MT) | 326 | 326 | 970 | 854 | 854 |
| Pulp ('000 MT) | 212 | 212 | 212 | 20 | 25 |
| Paper ('000 MT) | 1,097 | 1,097 | 1,097 | 815 | 803 |
| Import Quantity | | | | | |
| Woodchips ('000 MT) | 6 | 5 | — | — | — |
| Recovered Paper ('000 MT) | 282 | 173 | 119 | 58 | 58 |
| Pulp ('000 MT) | 92 | 62 | 53 | 46 | 69 |
| Paper ('000 MT) | 548 | 433 | 507 | 552 | 558 |
| Export Quantity | | | | | |
| Woodchips ('000 MT) | — | — | — | — | — |
| Recovered Paper ('000 MT) | 1 | 20 | 78 | 71 | 55 |
| Pulp ('000 MT) | 24 | 20 | 23 | 23 | 23 |
| Paper ('000 MT) | 199 | 167 | 128 | 34 | 19 |
| Export Value (US\$, millions) | | | | | |
| Woodchips | — | — | — | — | — |
| Recovered Paper | — | 3 | 14 | 13 | 11 |
| Pulp | 52 | 45 | 73 | 75 | 71 |
| Paper | 91 | 86 | 100 | 54 | 44 |
| TOTAL | 144 | 135 | 187 | 142 | 127 |

Source: FAOSTAT based on FAO item code 1875, 1668, and 1609. (—) indicates country did not produce at least 1,000 units in a given year. Retrieved on February 17, 2016.

To cope with its raw material deficits, the country has improved its collection and production of recycled materials through a robust chain of waste collectors, junk shops, consolidators, and processors—production of recovered paper jump 162% in the decade from 2005 to 2014. While that increase has sizeable implications for the health of the domestic industry, much of the recovered fiber is used for the domestic market and offers only limited export potential. Table 15 provides a detailed list of production, import, and export data for the Philippines.

This section proceeds by first assessing the development of the Philippines' paper sector, including recent developments and the activities of lead firms. It then highlights where Filipino firms are concentrated, discussing product specialization. From there, it offers a brief outline of the human capital features and the most prominent challenges facing the industry. It closes with potential upgrading trajectories as well as recommendations to achieve those targets.

4.1. The Development of the Philippines' Paper Industry

The paper industry in the Philippines is a mature sector populated with companies that have been active in the country for decades. Since 1990, however, the sector has steadily seen its competitive position erode on account of a decline in raw materials as pulp producers lost out to cheaper imports from global producers, the country's inadequate port and road infrastructure, and the high cost of energy. These constraints have reduced the profitability of Filipino firms, which, in turn, has made investments in new technologies or production processes impractical.

The result has been the closing of at least half of the production plants, with 25 pulp and paper mills shuttering operations since 1990. Of the 27 companies with operational milling facilities that remain in the Philippines, only a small handful have made the investments necessary to be competitive on a large scale moving forward (PPMAI, 2014). Table 16 lists the companies that can generate at least 70,000 metric tons of paper or paperboard products annually.

Table 16. Mills with Largest Production Capabilities in the Philippines

| Company | Location | Output | Capacity (MT/year) |
|---|---------------|--|--------------------|
| Trust International Paper Corporation (TIPCO) | Pampanga | Newsprint, writing paper | 230,000 |
| United Pulp and Paper Company | Bulacan | Corrugating medium, testliner | 230,000 |
| Bataan 2020 | Baesa & Samal | Writing paper, newsprint, corrugated medium, testliner | 121,000 |
| Container Corporation of the Philippines | Quezon City | Corrugating medium, testliner, brown paper | 89,000 |

Source: PPMAI, 2014.

Against this backdrop, it is perhaps not surprising that global lead firms are not especially active in the Philippines.⁴² The most prominent exception relates to abaca fiber pulp. Glatfelter is the largest multi-national corporation with operations in the country—the manufacturer of specialty paper is the world’s largest consumer of abaca pulp, using the material to make tea bags that the company then sells to companies such as Unilever, which owns Lipton Tea (Glatfelter, 2014). Glatfelter, which is the world’s largest producer of both tea bags and coffee filters, acquired an abaca pulp mill in Lanao del Norte in Mindanao in 1998 as part of its purchase of Schoeller & Hoesch, a German company that had Filipino assets. After Glatfelter formed a Filipino subsidiary—Newtech Pulp—the company upgraded the Lanao del Norte facility in 2003 to improve its technical prowess and to increase production volume (PPI, 2001). Additionally, Nippon Kodoshi Corporation, a Japanese firm, bought Albay-Agro Industrial Development Company (Alindec) late in 2015, giving it control of the Philippines’ second-largest abaca pulp mill (Reuters, 2015c).

The other foreign companies that have upstream facilities in the Philippines are regional players focused on the domestic market. Siam Cement Group, which is based in Thailand and controls United Pulp and Paper Philippines, has a plant in Bulacan that generates roughly 230,000 metric tons of containerboard (corrugating medium and linerboard). Trust International Paper Corporation (TIPCO), which has Taiwanese and Canadian owners, has a mill in Pampanga that produces a similar amount of newsprint and writing paper.

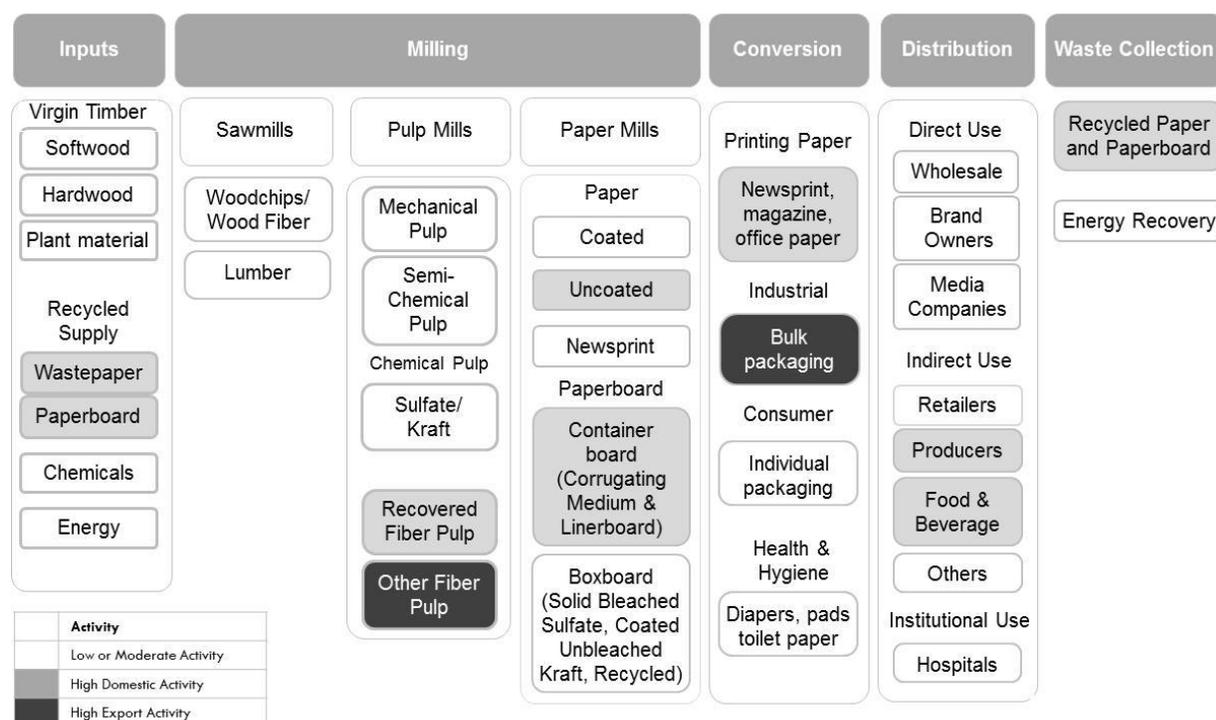
4.2. The Philippines Current Participation in the Paper GVC

The country is currently participating primarily in the conversion stage of the GVC, as there is no domestic virgin pulp production and the quality of the paperboard production is too low for

⁴² Svenska Cellulosa Aktiebolaget (SCA) and Kimberly Clark had plants in the Philippines that produced health and hygiene products, but both companies closed these facilities between 2008 -2011. Industry observers said high energy and other input costs ultimately made the Philippines less competitive than other regional locations.

the export market. With the winnowing of paper manufacturers as well as the closing of the country’s last virgin pulp mill, the upstream businesses that remain are mostly in the milling segment of the chain where they produce a spectrum of paper and paperboard grades. The industry road map reported the country had total production capacity of 950,000 metric tons at the end of 2011, 49% of which was containerboard and boxboard, 27% was writing paper, 18% was newsprint, 3% was health and hygiene products, and 3% was specialty grades. Figure 2 illustrates the stages in which pulp and paper companies are active. Overall, the highest number of firms is concentrated downstream activities such as conversion and waste collection, although most of these businesses are small.

Figure 2. The Philippines in the Paper GVC



Source: Duke CGGC, based on field interviews and FAO and PPMAI data.

Note: High export activity (dark grey) describes sectors that generate more than US\$50 million in export revenue or have more than 20 businesses geared toward the export market. High domestic activity (light grey) refers to segments where there is similar numbers of actors that sell to the domestic market.

The segments of the chain where the Philippines is most oriented toward the export market are abaca pulp production and conversion. Abaca fiber pulp is the “other fiber pulp” depicted in dark grey in Figure 2. The Philippines is the leading source of abaca fiber worldwide—the country provides roughly 85% of the supply of abaca pulp on global markets (PDRP, 2014), and exports of the product generated US\$71.3 million in revenue in 2014, which was a 35.6% increase from 2005 (see Table 17). The jump is the result of higher prices for the product—the country’s overall abaca pulp production capacity actually decreased in that time on account of the closing of the Canlubang mill and some of the constraints described in the Challenges section that follows.

Table 17. The Philippines' Paper Exports by Product Category, 2005-2014

| Product Category | Export Value (US\$, millions) | | | | | Share of Total Country Paper Exports | | | | |
|----------------------------------|-------------------------------|---------------|---------------|---------------|---------------|--------------------------------------|--------------|--------------|--------------|--------------|
| | 2005 | 2007 | 2010 | 2012 | 2014 | 2005 | 2007 | 2010 | 2012 | 2014 |
| TOTAL | 144.00 | 135.44 | 187.99 | 142.50 | 127.03 | | | | | |
| Other Fibre Pulp (Abaca pulp) | 52.56 | 45.60 | 73.05 | 75.24 | 71.31 | 36.5% | 33.7% | 38.9% | 52.8% | 56.1% |
| Paperboard NES (Cigarette Paper) | 11.25 | 18.63 | 32.22 | 37.26 | 34.15 | 7.8% | 13.8% | 17.1% | 26.2% | 26.9% |
| Recovered Paper | 0.12 | 3.10 | 14.06 | 13.06 | 11.43 | 0.1% | 2.3% | 7.5% | 9.2% | 9.0% |
| Newsprint | 66.05 | 59.32 | 67.59 | 15.58 | 7.68 | 45.9% | 43.8% | 36.0% | 10.9% | 6.0% |
| Health & Hygiene | — | — | — | — | 1.23 | — | — | — | — | 1.0% |
| Paperboard | 13.35 | 8.51 | 0.59 | 0.81 | — | 9.3% | 6.3% | 0.3% | 0.6% | — |
| Top 5 | 143.72 | 135.18 | 187.53 | 141.96 | 125.83 | 99.8% | 99.8% | 99.8% | 99.6% | 99.1% |

Source: FAOSTAT based on FAO item codes 1619, 1655, 1656, 1668, 1669, 1671, 1674, 1676, 1681, 1683. (—) indicates product was not in the top 5 in the given year. Retrieved on February 17, 2016.

There are at least 59 paper or paperboard conversion companies operating in industrial parks or PEZA EPZs throughout the Philippines, with 20-30 other conversion businesses located in other regions, according to interviews with industry stakeholders. Conversion plants are often located close to final customers to reduce transport costs. In the case of the Philippines, many of the conversion companies are foreign owned and co-located with customers in PEZA EPZs who use the material to ship products to foreign markets. Tann Philippines is an example of one such firm. The subsidiary of Austrian-based Tann-Papier Gesellschaft has a conversion plant in Batangas, where it converts rolls of cigarette tipping paper into their final form. Cigarette paper, a niche paperboard product that can loosely be classified as specialized boxboard, the category accounted for close to 27% of the Philippines exports in 2014 and has seen its value increase by 203% since 2005.

4.3. Employment and Workforce Development

The industry road map estimated the paper industry directly employed 6,000 workers in 2012. The majority of these can be grouped into two broad categories: technical professionals and skilled workers. Firms interviewed for this project generally reported that 80-90% of their employees were lower-skilled workers with high school diplomas or technical degrees who worked at the mills; the remaining 10-20% were college-educated employees who worked office positions that required either engineering or business degrees. While these jobs have upward mobility with the possibility of moving into upper management, there is some difficulty finding higher-skilled workers, with engineers and other talented professionals sometimes leaving to pursue opportunities in the Middle East or Southeast Asia. Turnover was reported to be less of an issue at the technical level.

The two segments of the chain that employ the highest number of workers in the Philippines are raw materials for abaca pulp and waste collection for recovered fiber. Abaca plants are grown on small plots of land throughout the country—an estimated 180,000 total hectares are

cultivated by approximately 114,000 farmers (PRDP, 2013). Meanwhile, the industry road map estimated there were between 1.2-1.5 million workers indirectly employed in wastepaper collection and sorting. Otherwise, the other segments of the chain, especially mills and conversion plants, have a high degree of automation, with individual facilities most often employing between 100-375 workers.

4.4. Advantages and Challenges for GVC Participation and Upgrading

While the Philippines' paper sector has significant weaknesses and challenges, the industry has advantages that can help enable future upgrading. Table 18 summarizes many of these in the form of a SWOT analysis. The most prominent strengths and challenges (both weaknesses and threats) are then outlined in the section that follows. The potential upgrading section expounds on the potential opportunities.

Table 18. The Philippines in the Paper GVC 'SWOT' Analysis

| Strengths | Weaknesses |
|---|---|
| <ul style="list-style-type: none"> • World's leading producer of abaca pulp • Favorable tariff regime with Europe for abaca • Policy support from industry stakeholders • Strong human capital and training programs | <ul style="list-style-type: none"> • Critical gaps in supply chain (timber and virgin pulp) • High energy costs and inadequate infrastructure • Mediocre quality of paper and paperboard • Inadequate supply of high quality abaca fiber • Uneven adherence to certification for forests and plantations |
| Opportunities | Threats |
| <ul style="list-style-type: none"> • Strong presence of exporters (electronics & food and beverage) that require packaging material & projected growth in Asian market for packaging • Demand for abaca pulp projected to grow over medium term • Improving recovery rate and processes to boost recycling value chain • Climate in Philippines suitable for fast-growing eucalyptus and acacia mangium plantations | <ul style="list-style-type: none"> • General industry headwinds (reduced demand for paper) • Overcapacity and oversupply in the Asia-Pacific region flooding the market with cheap final product • Increased use of synthetic fibers in bank notes could reduce demand for abaca pulp |

Source: Authors.

4.4.1. Advantages

The Philippines' most pronounced strengths in the paper GVC relate to its natural resources in abaca pulp as well as its collaborative institutional environment. The most prominent include the following:

I. World's leading producer of abaca pulp: The Philippines enjoys a dominant position in upstream segments of the abaca value chain. The country is the world's largest producer of abaca pulp, generating roughly 85% of total global supply. It also has the only abaca pulp mills in the world, with four facilities that have an estimated annual capacity of 45,000 metric tons per year (see Table 19). Ecuador is the only other country that cultivates abaca in high volume, although it plans on reducing its production capacity of abaca fiber by 7,000 MT per year because of its lack of downstream processing facilities (PRDP, 2014).

Table 19. Abaca Pulp Mills in the Philippines

| Company | Location | Capacity (MT/year) |
|---|-------------------------|--------------------|
| Newtech Pulp Inc. (Glatfelter subsidiary) | Iligan, Lanao del Norte | 18,000 |
| Albay-Agro Industrial Development Company | Albay | 12,500 |
| Specialty Pulp Manufacturing Incorporated | Baybay, Southern Leyte | 12,000 |
| Pulp Specialists | Albuera, So. Leyte | 2,500 |

Source: PPMAl, 2014; Glatfelter, 2014.

2. Favorable tariff regimes for abaca: Roughly two-thirds of the Philippines abaca pulp is shipped to the Europe, with Germany, France, and the United Kingdom being the largest markets within the EU (PRDP, 2014). Notably, Glatfelter’s downstream processing facilities for its abaca pulp are all located in Europe, with large recent capital investments being made to improve production processes (Glatfelter, 2014). While the Philippines is eligible for Generalized Scheme of Preferences (GSP), which provides favorable tariffs to certain countries that export to the continent, abaca fiber specifically⁴³ is covered by the GSP+ program, which eliminates tariffs entirely. The Philippines’ monopoly on abaca pulp production means the low tariffs do not necessarily provide an advantage against other countries; however, it does allow for abaca to remain a cost competitive input for tea bags and coffee filters, which are the two primary outputs of the abaca fiber that is exported to Europe. Similarly, the Philippines has a free trade agreement with Japan, which is its second leading export market for abaca pulp (WTO, 2016).

3. Policy support from industry stakeholders: Over the past five years, there have been strong initiatives to develop a supportive and collaborative environment for industry policy development in manufacturing sectors in the Philippines. These country-wide efforts have helped shape the institutional environment in the paper industry. Specifically, the Industry Development Program, the Manufacturing Resurgence Program, and the Industry Roadmapping Project initiated by DTI helped provide momentum for the Philippine Paper Manufacturing Association Inc. (PPMAI) to work with the business community to develop a comprehensive industry road map.⁴⁴ That document served a valuable role in articulating the needs and wishes of the industry as well as offering a series of policy recommendations designed to nurture the sector. Finally, DTI and the BOI has included virgin pulp as a priority industry in its most recent Investment Priorities Plan for 2014-2016, which allows potential investors to receive a number of incentives, including tax holidays, tax credits, duty exemptions, and other benefits while selling to the domestic market.⁴⁵

4. Strong human capital and training programs: The Philippines has a number of educational institutions that offer support for the paper sector and provide the country with a capable workforce. The University of the Philippines Los Baños has a chemical engineering

⁴³ HS code 530500.

⁴⁴ The PPMAl is one of two significant industry associations serving the paper industry. While it focuses on representing the industry in discussions with policy makers, the Technical Association of the Pulp and Paper Industry (TAPPI) provides scientific and technical assistance.

⁴⁵ Virgin paper pulp is defined as “pulp integrated with forest plantation, research & development, and technical vocational education and training institutions (DTI, 2015).”

major in pulp and paper technology that is credited with being the only undergraduate program of its kind in Southeast Asia (PPMAI, 2014). The Forest Products Research and Development Institute that is part of the Department of Science and Technology in Laguna also offers specialized 10-day classes for the technical staff of pulp and paper mills that are designed to train employees in raw material preparation, pulp bleaching, stock preparation, paper making, and product evaluation. Additionally, industry professionals highlighted the University of Batangas as having courses covering pulp and paper engineering.

4.4.2. Challenges

The Philippines' competitive challenges in the paper sector are especially formidable in upstream segments of the chain, leaving domestic downstream actors vulnerable to regional trends. The following section outlines the most prominent constraints for the Philippines' paper sector.

1. The shortage and insufficient quality of raw materials: With the closing of the PICOP pulp mill in 2010, the Philippines does not have a facility in operation that can produce virgin pulp. The lack of access to raw materials hurts domestic firms in at least two ways: (1) Although market pulp is sold on global markets in increasing amounts, it is subject to price fluctuations that can threaten the competitive position of firms that rely on it as an input. (2) Virgin pulp produces stronger and higher-quality paper grades that can more easily lead to product upgrading.

While the country has developed and refined its ability to recover wastepaper as a response, collection rates are still not sufficient to meet internal demand. Although FAO data reported the country imported less than 10% of its total recovered paper demanded in 2014 (FAOStat, 2015), prominent manufacturers indicated they had to import significantly higher percentages of inputs for paper or paperboard production. Additionally, stakeholders said the quality of the recovered wastepaper generated in the Philippines generally lags behind American, European, or Australian varieties, which is cleaner and contains higher strength fibers.

2. High energy costs and inadequate infrastructure: The country's energy costs are among the highest in Asia, and the power supply is unreliable in certain regions of the country. At the same time, its infrastructure scores worse than regional peers. Both structural challenges have sizeable ramifications for the paper industry. The sector is one of the largest industrial consumers of electricity. While modern pulp mills have the ability to be a net exporter of power onto the national grid, facilities in the Philippines do not have such technology. Infrastructure is just as important an upgrading consideration—improvements to ports, roads and railroads were critical considerations for investments made in Brazil and Uruguay.

3. Low quality products forces converters to rely on imports: Much of the paper and paperboard available in the Philippines is of low quality, with many indicating it is commodity grade. As a result, large regional firms have an opportunity to penetrate the market by using their internal economies of scale to undercut Filipino producers, who cannot differentiate themselves with superior products. The Philippines' import data reinforces these qualitative

observations. From 2005 to 2013 (the last year partner data is available), the Philippines' import value of final paper products increased 133%, with the share of Chinese final paper products in the market jumping from 4.2% of all imports to 15.5% (FAOSTAT, 2015).⁴⁶ Indonesian exporters also boosted their market share over the same time period (see Table 20). Additionally, industry stakeholders reported in interviews that Oji Paper has attempted to gain market share in more recent years as the Japanese yen has depreciated.

Table 20. Top Exporters to the Philippines of Final Paper Products, 2005-2013

| Country | Import Value (US\$, millions) | | | | | World Share | | | | |
|----------------|-------------------------------|---------------|---------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|
| | 2005 | 2007 | 2010 | 2012 | 2013 | 2005 | 2007 | 2010 | 2012 | 2013 |
| World | 218.35 | 378.68 | 489.35 | 504.06 | 509.86 | | | | | |
| USA | — | 93.30 | 91.86 | 97.58 | 79.99 | — | 24.6% | 18.8% | 19.4% | 16.6% |
| China | 9.24 | 33.88 | 50.38 | 57.73 | 74.78 | 4.2% | 8.9% | 10.3% | 11.5% | 15.5% |
| Indonesia | — | 42.69 | 58.69 | 74.12 | 73.58 | — | 11.3% | 12.0% | 14.7% | 15.3% |
| South Korea | 16.39 | 12.16 | 34.04 | 45.20 | 51.95 | 7.5% | 3.2% | 7.0% | 9.0% | 10.8% |
| Finland | 30.35 | 35.32 | 34.70 | 41.56 | 34.98 | 13.9% | 9.3% | 7.1% | 8.2% | 7.3% |
| Germany | 20.46 | 18.61 | 28.27 | 33.16 | 34.71 | 9.4% | 4.9% | 5.8% | 6.6% | 7.2% |
| New Zealand | 22.47 | 27.73 | 24.28 | 23.73 | 25.14 | 10.3% | 7.3% | 5.0% | 4.7% | 5.2% |
| Australia | 16.11 | — | 23.86 | 32.58 | 21.42 | 7.4% | — | 4.9% | 6.5% | 4.4% |
| Japan | 19.16 | 19.60 | 31.18 | 15.34 | 16.91 | 8.8% | 5.2% | 6.4% | 3.0% | 3.5% |
| Sweden | 20.71 | — | — | 16.84 | 13.84 | 9.5% | — | — | 3.3% | 2.9% |
| Singapore | 9.62 | 20.78 | 23.61 | — | — | 4.1% | 5.1% | 4.5% | — | — |
| Thailand | 9.75 | 11.16 | — | — | — | 4.1% | 2.8% | — | — | — |
| Top Ten | 174.83 | 317.23 | 386.02 | 421.05 | 413.50 | 73.5% | 78.5% | 74.0% | 80.0% | 81.1% |

Source: FAOSTat based on FAO item codes 1671, 1674 and 1675. (—) indicates country was not in the top 10 in the given year. Retrieved on February 22, 2016.

4. Inadequate supply of high quality abaca fiber: The Newtech Pulp mill has the capacity of 17,200 metric tons per year (Glatfelter, 2014). While the facility can process close to 2,100 tons per month, the company can only source enough raw material from its domestic network of consolidators and traders on Mindanao and Catanduanes to generate 1,400 tons per month (PRDP, 2014). The result is that businesses such as Glatfelter are vulnerable to shortages.⁴⁷

The poor productivity of abaca in the Philippines has been attributed to a range of factors, from poor farming techniques, inferior planting materials, abaca bunchy top virus (ABTV), and natural disasters (PRDP, 2013, PRDP, 2014). From the perspective of a value chain analysis, it is significant that pulp producers require the highest quality abaca fibers.⁴⁸ Abaca fiber traders—which Ching Bee Trading Corporation, based in Manila, is the world's largest—report difficulty in finding premium fiber on the market because of shortages in the mechanized stripping and drying facilities that first process the harvested plant as well as poor storage conditions (PRDP, 2014). Table 21 summarizes the challenges, actors and competitive advantages that can be detected at each stage of the abaca value chain in the Philippines.

⁴⁶ In 2005, the Philippines imported US\$218 million in final paper products; in 2013, it imported US\$509 million.

⁴⁷ In the company's annual report, it notes that "in the event of a disruption of supply from our Philippines mill, there is no guarantee that we could obtain adequate amounts of abaca pulp from alternative sources at reasonable prices or at all (Glatfelter, 2014)."

⁴⁸ Other uses for abaca include cordage and rug manufacturing—they prefer lower quality material (PRDP, 2014).

Table 21. Abaca Industry Profile in the Philippines by Value Chain Segments

| Farming | Grading, Trading | Pulp Mills (capacity, annual MT) | Processing |
|---|--|--|---|
| Actors | | | |
| — Farmers | — GBEs (Grading Baling Establishments) — Trading companies (Ching Bee Trading Corporation, Tag Fiber, etc.) | — Newtech Pulp (Glatfelter subsidiary) (17,200) — Albay-Agro Industrial Development Corp. (12,500) — SPMI (Ching Bee affiliate) (12,000) — Pulp Specialists (2,500) | — Tea bag manufacturers (Glatfelter) — Currency manufacturers (Japan National Printing Bureau) — Cigarette filter manufacturers |
| Competitive Advantages | | | |
| — Indigenous plant — Low input requirements | — Established networks: Ching Bee is largest abaca trading company in world and has five branches spread through country | — Philippines has only abaca pulp facilities in world | — Potential economies of scale |
| Challenges | | | |
| — Disease prone — Access to fertilizers — Insufficient certifications | — Outdated postharvest technologies in drying and stripping processes — Poor storage conditions | — Infrastructure — Abaca-producing region prone to political instability | — No downstream domestic processing facilities |

Sources: Authors based on PRDP (2013, 2014), Glatfelter (2014), Japan National Printing Bureau, FAO.

5. Uneven adherence to certification for forests and plantations: Much of the country's forest reserves or abaca plantations lack certification from the environmental organizations that lead firms rely on to ensure they adhere to sustainability standards. Current estimates are that the country has roughly 32,000 hectares of forest plantations that could be used as inputs for virgin pulp, the majority of which are not FSC or PEFC certified. The issue is a more pronounced concern with respect to abaca pulp. Unilever, which owns Lipton Tea and is a major client of Glatfelter, recently announced that it was requiring 100% of the material in its tea bags be sourced from FSC-certified farms.⁴⁹ However, major abaca producing regions of the Philippines fall far short of that standard, with as little as 5% of annual production volume in Catanduanes receiving Rainforest Alliance certification (Campos, 2015).

4.5. Comparing the Philippines in the Paper GVC with Selected Countries

The Philippines had higher exports in the paper sector in 2005 than both Uruguay and Vietnam;⁵⁰ however, in the decade since, Uruguay's exports increase by 917% and Vietnam's jumped by 813% while the Philippines fell by 11% (see Table 22). The preceding section highlighted the factors that have contributed to the Philippines' malaise; in order to provide a

⁴⁹ As highlighted in the global certification in the Global Standards and Institutions section, the Rainforest Alliance created the FSC to manage supply chain standards. Thus, the Rainforest Alliance and FSC terms are synonymous.

⁵⁰ The Philippines exported US\$144 million in total goods in the paper GVC in 2005, Vietnam had US\$124 million in total exports, and Uruguay had US\$101 million.

full perspective on the country's position and potential in the paper GVC, it is useful to compare it against the two emerging nations that were highlighted in the case study section.

Table 22. The Philippines, Uruguay, and Vietnam in the Paper GVC

| Total Exports in 2014 | Leading Export (World Share) | Export Growth Rate (2005-2014) | Factors that Influenced Country-Level Upgrading |
|-----------------------|------------------------------|--------------------------------|--|
| Philippines | | | |
| \$127 million | Abaca pulp (56%) | -11% | — N/A (see following section) |
| Uruguay | | | |
| \$1,028 million | Wood pulp (88%) | 917% | <ul style="list-style-type: none"> — Suitability of region to fast-growing eucalyptus plantations — Rising global demand for pulp — Modifications to forest and investment policies — Creation of special export processing zones — Infrastructure development — Widespread forest certification programs |
| Vietnam | | | |
| \$1,133 million | Woodchips (86%) | 813% | <ul style="list-style-type: none"> — Suitability of region to fast-growing eucalyptus plantations — Rising regional demand for woodchips — Modification to forest policy to encourage plantation expansions — Strengthening of linkages between private firms and smallholder plantations — Low technology demands required for farmers |

Sources: Authors, FAOSTAT, 2015.

Uruguay's increased exports can be attributed to FDI from two of the largest global lead firms: UPM-Kymmene and Stora Enso. Underpinning these investments were a mixture of favorable environmental and market conditions—mainly, the suitability of Uruguay's geography for fast-growing eucalyptus plantations, and increased demand for market pulp. Additionally, the Uruguayan government took a series of prescient steps to facilitate the development of the sector, including changes to the forest and investment laws, expansive investments into new infrastructure, the creation of special export processing zones, and comprehensive efforts to certify farmers in the supply chain according to FSC and PEFC standards. Meanwhile, Vietnam's ascension is the result of similar dynamics, including regional market demand for woodchips along with broad changes to the country's forest policy to allow for larger plantations. firms.

The Philippines shares some characteristics with these two countries, with the most obvious being its suitable climate for eucalyptus or acacia mangium trees. Beyond that, however, the similarities are less pronounced—the Philippines has had little investment by foreign lead firms outside the abaca sector, and the country generally has not made the regulatory overhauls regarding large-scale forest ownership that would lead to favorable conditions that would attract the largest of these actors.⁵¹

⁵¹ It should be noted that DTI-BOI have included virgin pulp as part of its 2014 Investment Priorities plan, which provides potential investors with a number of incentives, including tax holidays, tax credits, duty exemptions, and other benefits.

Vietnam's government strategy of boosting efficiency from its vast network of smallholder plantations could also provide insight for the Philippines. Specifically, the country's 1993 Land Law as well as its 2006 land tenure policy reform that allowed for the renting and leasing of lands to individuals and organizations both served as catalysts for the sector (see Section 3.1 for further detail).

4.6. Potential Upgrading Trajectories

Opportunities for direct exports emanating from the Philippines' paper GVC are limited, which restricts the country's possible upgrading trajectories. The roughly 36% increase in the value of abaca pulp exports from 2005 to 2014 during a period when overall export quantities stagnated suggests process upgrades to increase abaca supply may yield measurable results. Furthermore, increasing the quantity of conversion facilities could generate indirect exports, while improving the quality of paperboard available may allow conversion companies to reach new end markets. In addition to outlining possible steps to boost exports, this section also outlines upgrading trajectories with respect to recycling to improve the competitiveness of all businesses in the chain, regardless of whether they wish to pursue export markets.

1. **Process upgrading to increase abaca production:** Even though the Philippines is the world's largest producer of abaca pulp, insufficient domestic production of abaca fiber means that pulp mills in the country must augment their supply by importing the material from Ecuador. With Ecuador planning on reducing its production capacity of abaca fiber, it is critical that the Philippines boosts domestic production of abaca to provide input for the country's pulp mills. The technical challenges associated with increasing supply have been studied at length, with a number of recommendations for process upgrading offered in various reports, including increasing the availability of disease resistant planting materials, improving soil and fertilizer usage, communicating best agronomic practices to a wider audience, and boosting access to modern postharvest technologies in the drying and stripping processes (PRDP, 2013; PRDP, 2014).
2. **Functional upgrading to expand conversion capabilities:** The conversion segment of the paper GVC is a high-value activity in which facilities are typically located in close proximity to end-users. Considering the fact that two of the Philippines' leading export industries—electrical machinery and edible fruit—require packaging material for shipment,⁵² there is opportunity for conversion facilities to provide packaging materials to support those and other sectors via indirect exports. Leading electronics exporters interviewed for this project reported using local suppliers whenever possible, and fresh fruit and vegetables was identified as one of the highest growth end markets in a survey of paperboard converters, ranking second behind beverage products (AICC, 2013). Additionally, the Asia-Pacific region is projected to have the largest increase worldwide in demand for packaging for food and beverage, beauty, and cigarette products over the

⁵² Electrical machinery, equipment, and parts generated US\$23.1 billion in export value in 2014 and was the Philippines' top export product. Edible fruits and nuts was the country's seventh largest export, creating US\$1.7 billion in export value.

next five years (Marketline, 2015). While conversion facilities already exist in the Philippines—there are 59 paper businesses registered in the country’s PEZA zones, many of which have co-located in the zones with lead firms—the country still imported US\$558 million of final paper products in 2014.⁵³

- 3. Product upgrades in paperboard production to increase access to new end markets:** By and large, the domestic market neither produces nor demands the specialized, higher-quality products demanded by the more sophisticated export market. Philippines paperboard is considered to be commodity grade by most stakeholders. While domestic clients do not demand specialized product in high volume, export-oriented clients have higher expectations. For example, industry stakeholders said that food and beverage retailers in Vietnam and Thailand are more concerned about quality of paperboard than their Filipino counterparts since they use the corrugated materials that items such as bananas are shipped in to display the produce in markets and stores, which necessitates more durable crates and boxes.
- 4. Process and product upgrading in recycling value chain to improve quality and quantity:** While the Philippines is not in position to export recycled paper in high volume, the recovery and processing of used paper material is an important domestic economic activity, indirectly employing as many as 1.5 million workers while providing mills with the majority of their inputs. At the same time the country has lost its ability to produce virgin pulp, it has improved its recycling efficiency—production of recovered paper increased 161% from 2007 to 2014, while the recovery rate of improved from 49% in 2011 to 53% in 2014 (FAOSTAT, 2015; PPMAl). The recycling sector has a network of actors who coordinate with each other and add value to create final recycled products that are used by paper mills throughout the country, including collectors, junk shops, consolidators and recyclers (the “value chain” is presented in Figure A-1 in the Appendix). Most recovered paper pulp is sold to domestic paper and paperboard mills. No paper or paperboard mills surveyed sold recovered fiber as market pulp—all was used for internal consumption.

There are constraints at each stage of the recycling chain that inhibit recovery rates and compromise quality. The most prominent included poor segregation at the source, junk shops prioritizing newsprint and cartons and rejecting other materials, and consolidators and processors using outdated technologies.

⁵³ It should be noted that FAO data aggregates the output of paper mills and conversion facilities, thus making it difficult to determine if the imports are converted in the Philippines or abroad.

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6. Appendix

Table A-I. Industry Product Categories, Based on FAO Data Classifications

| VC Stage | FAO Code | Product Description | End Market |
|-----------------|----------|--|--|
| Recycled Supply | 1669 | RECOVERED PAPER: Waste and scrap of paper or paperboard. This commodity includes paper and paperboard which has been used for its original purpose and residues from paper conversion. This includes waste and scrap collected for re-use as a raw material for the manufacture of paper and related products. | Printing Paper Industrial Consumer |
| Sawmills | 1619 | CHIPS AND PARTICLES: Wood that has been deliberately reduced to small pieces from wood in the rough or from industrial residues, suitable for pulping, for particle board and fibreboard production, for fuelwood or for other purposes. | All |
| Pulp | 1654 | MECHANICAL WOOD PULP: Wood pulp obtained by grinding or milling: coniferous or non-coniferous rounds, quarters, billets, etc into fibres or through refining coniferous or non-coniferous chips. Also called groundwood pulp and refiner pulp. It may be bleached or unbleached. It excludes exploded and defibrated pulp, and includes chemi-mechanical and 50hermos-mechanical pulp. | Printing Paper |
| | 1655 | SEMI-CHEMICAL WOOD PULP: Wood pulp, chemi-mechanical and semi-chemical Wood pulp obtained by subjecting coniferous or non-coniferous wood to a series of mechanical and chemical treatments, none of which alone is sufficient to make the fibres separate readily. According to the order and importance of the treatment, such pulp is variously named: semi-chemical, chemi-groundwood, chemi-mechanical, etc. It may be bleached or unbleached. | All |
| | 1667 | DISSOLVING WOOD PULP: Wood pulp, dissolving grades chemical pulp (sulphate, soda or sulphite) from coniferous or non-coniferous wood, or special quality, with a very high alpha-cellulose content (usually 90% and over), readily adaptable for uses other than paper making. These pulps are always bleached. They are used principally as a source of cellulose in the manufacture of products such as synthetic fibres, cellulosic plastic materials, lacquers, explosives | All |
| | 1656 | CHEMICAL WOOD PULP: Sulphate (kraft) and soda and sulphite wood pulp except dissolving grades, bleached, semi-bleached and unbleached. — <i>1660: Unbleached Sulphite Pulp:</i> Wood pulp obtained by mechanically reducing coniferous or non-coniferous wood to small pieces which are subsequently cooked in a pressure vessel in the presence of a bi-sulphite cooking liquor. Bi-sulphites such as ammonium, calcium, magnesium and sodium are commonly used. The class includes semi-bleached and unbleached pulps. — <i>1661: Bleached Sulphite Pulp:</i> Same as unbleached sulphite pulp except this class includes bleached pulp. — <i>1662: Unbleached Sulphate Pulp:</i> Wood pulp, sulphate (kraft) and soda, except dissolving grades. Wood pulp obtained by mechanically reducing coniferous or non-coniferous wood to small pieces which are subsequently cooked in a pressure vessel in the presence of sodium hydroxide cooking liquor (soda pulp) or a mixture of sodium hydroxide and sodium sulphite cooking liquor (sulphate pulp). The class includes semi-bleached and unbleached pulps. — <i>1663: Bleached Sulphate Pulp:</i> Same as unbleached sulphate pulp except this class includes bleached pulp. | All |
| | 1668 | OTHER FIBER PULP: Pulp of fibrous vegetable materials other than wood. Including straw, bamboo, bagasse, esparto, other reeds or grasses, cotton linters, flax, hemp, rags, other textile wastes. Used for the manufacture of paper, paperboard and fibreboard. | Printing Papers |
| | 1609 | RECOVERED FIBER PULP: Pulp from recovered paper materials. | All |
| Paper Mills | 1671 | NEWSPRINT: Uncoated paper, unsized (or only slightly sized), containing at least 60% (percentage of fibrous content) mechanical wood pulp, usually weighing not less than 40 g/square m and generally not more than 60 g/square m of the type used mainly for the printing of newspapers. | Printing Papers |
| | 1674 | PRINTING & WRITING PAPER: Other printing and writing paper Paper, except newsprint, suitable for printing and business purposes, writing, sketching, drawing, etc., made from a variety of pulp blends and with various finishes. Included are such papers as those used for books and magazines, wallpaper base | Printing Papers |

| VC Stage | FAO Code | Product Description | End Market |
|----------|----------|--|---------------------|
| | | stock, box lining and covering calculator paper, rotonews, duplicating, tablet or block, label, lithograph, banknote, tabulating card stock, bible or imitation bible, stationary, manifold, onionskin, typewriter, poster, etc. | |
| | 1675 | <p>OTHER PAPER AND PAPERBOARD: Includes construction paper and paperboard, household and sanitary paper, special thin paper, wrapping and packaging paper and paperboard and other paper and paperboard not elsewhere specified.</p> <p>— <i>1676: Wrapping and Packing Paper and Paperboard:</i> Paper or paperboards included are the following: vegetable parchment, greaseproof and glassine paper. Papers made from pure chemical wood pulp or from mixture of chemical wood pulp, cotton fibre pulp, treated (e.g. highly hydrated or hard beaten) to render the resulting paper resistant to oil, grease and water. They are used primarily for packaging frozen, moist or greasy materials such as butter, margarine, meat or fish, linerboard; paper or paperboard used as facing material on corrugated or solid paper or paperboard boxes and containers. Fluting medium: paper or paperboard used as medium when combining paper and paperboard for conversion into a corrugated board. Sack kraft paper: strong paper made from sulphate pulp and used in the manufacture of single, or multiwall, sacks. Other kraft wrapping paper: all other wrapping and packaging papers made principally from sulphate pulp. Folding boxboard: all types of paperboard used in the manufacture of folding boxes. Other wrapping and packaging paper and paperboard.</p> <p>— <i>1683: Other Paper and Paperboard Not Elsewhere Specified:</i> Includes kraft papers for waxing, asphaltting, water proofing, laminating, impregnating, spinning or twisting, gumming, etc. Paper manufactured principally from furnishes other than sulphate pulp not included elsewhere, such as rope and jute paper, folder stock, blotting paper, filter paper, photographic sensitizing paper, etc., and paperboards not included elsewhere such as shoe board, gasket board, transformer board, press textile board, index pressboard, panel board (automotive) trunk and suitcase board, matrix board.</p> | Industrial Consumer |
| | 1676 | <p>HOUSEHOLD AND SANITARY PAPER: Household and sanitary paper includes absorbent paper, creped or uncreped, sometimes embossed, made from bleached or unbleached chemical wood pulp, sometimes with a mixture of pulp from waste paper and mechanical pulp. Included are towelling, napkin, facial tissue, toilet tissue, wadding disposable tissues.</p> | Health & Hygiene |

Source: Authors depiction of the industry; definitions from FAO, http://faostat.fao.org/portals/_faostat/documents/forestproductsdefinitions.htm#4.

Table A-2. Top 10 Companies in Paper GVC by Production Volume, 2005-14

| Firm | Production Volume (Million Tons) | | | | | Share of Production | | | | |
|--------------------------------|----------------------------------|----------------|----------------|----------------|----------------|---------------------|--------------|--------------|--------------|--------------|
| | 2005 | 2007 | 2010 | 2012 | 2014 | 2005 | 2007 | 2010 | 2012 | 2014 |
| TOTAL | 186,135 | 194,311 | 185,976 | 190,635 | 205,724 | | | | | |
| International Paper | 15,756 | 14,406 | 11,922 | 12,901 | 22,492 | 8.5% | 7.4% | 6.4% | 6.8% | 10.9% |
| Nine Dragons | — | — | 7,280 | 10,450 | 12,260 | — | — | 3.9% | 5.5% | 6.0% |
| Oji Paper | 8,184 | 8,158 | 6,861 | 10,721 | 12,027 | 4.4% | 4.2% | 3.7% | 5.6% | 5.8% |
| UPM | 10,223 | 11,389 | 9,914 | 10,700 | 10,280 | 5.5% | 5.9% | 5.3% | 5.6% | 5.0% |
| Stora Enso | 14,319 | 12,459 | 10,812 | 10,268 | 9,513 | 7.7% | 6.4% | 5.8% | 5.4% | 4.6% |
| RockTenn | — | — | — | 8,075 | 8,528 | — | — | — | 4.2% | 4.1% |
| Sappi | 4,900 | — | 6,900 | 7,705 | 7,524 | 2.6% | — | 3.7% | 4.0% | 3.7% |
| Smurfit Kappa | 4,656 | 7,000 | 7,640 | 6,900 | 7,000 | 2.5% | 3.6% | 4.1% | 3.6% | 3.4% |
| DS Smith | — | — | — | — | 6,080 | — | — | — | — | 3.0% |
| Nippon Paper Group | 7,788 | 7,745 | 7,292 | 5,590 | 5,757 | 4.2% | 4.0% | 3.9% | 2.9% | 2.8% |
| Mitsubishi Paper | — | — | — | 5,917 | — | — | — | — | 3.1% | — |
| Svenska-Cellulosa Aktiebolaget | 6,820 | — | 8,948 | — | — | 3.7% | — | 4.8% | — | — |
| Smurfit-Stone | 7,450 | 7,700 | 5,896 | — | — | 4.0% | 4.0% | 3.2% | — | — |
| Abitibi | — | 8,746 | — | — | — | — | 4.5% | — | — | — |
| Weyerhaeuser | 8,914 | 6,686 | — | — | — | 4.8% | 3.4% | — | — | — |
| Norske Skogindustrier | 6,153 | 6,415 | — | — | — | 3.3% | 3.3% | — | — | — |
| Georgia-Pacific | 9,750 | — | — | — | — | 5.2% | — | — | — | — |
| Top 10 | 95,357 | 90,704 | 86,465 | 89,227 | 101,461 | 51.2% | 46.7% | 44.9% | 46.8% | 49.3% |

Source: PPI, 2006-2015. (—) indicates country was not in the top 10 in the given year. Share of production is measured against other companies manufacturing at least 1 million tons of paper and paperboard. Georgia-Pacific was bought by Koch Industries, a private company, in 2005 and no longer publishes production volume.

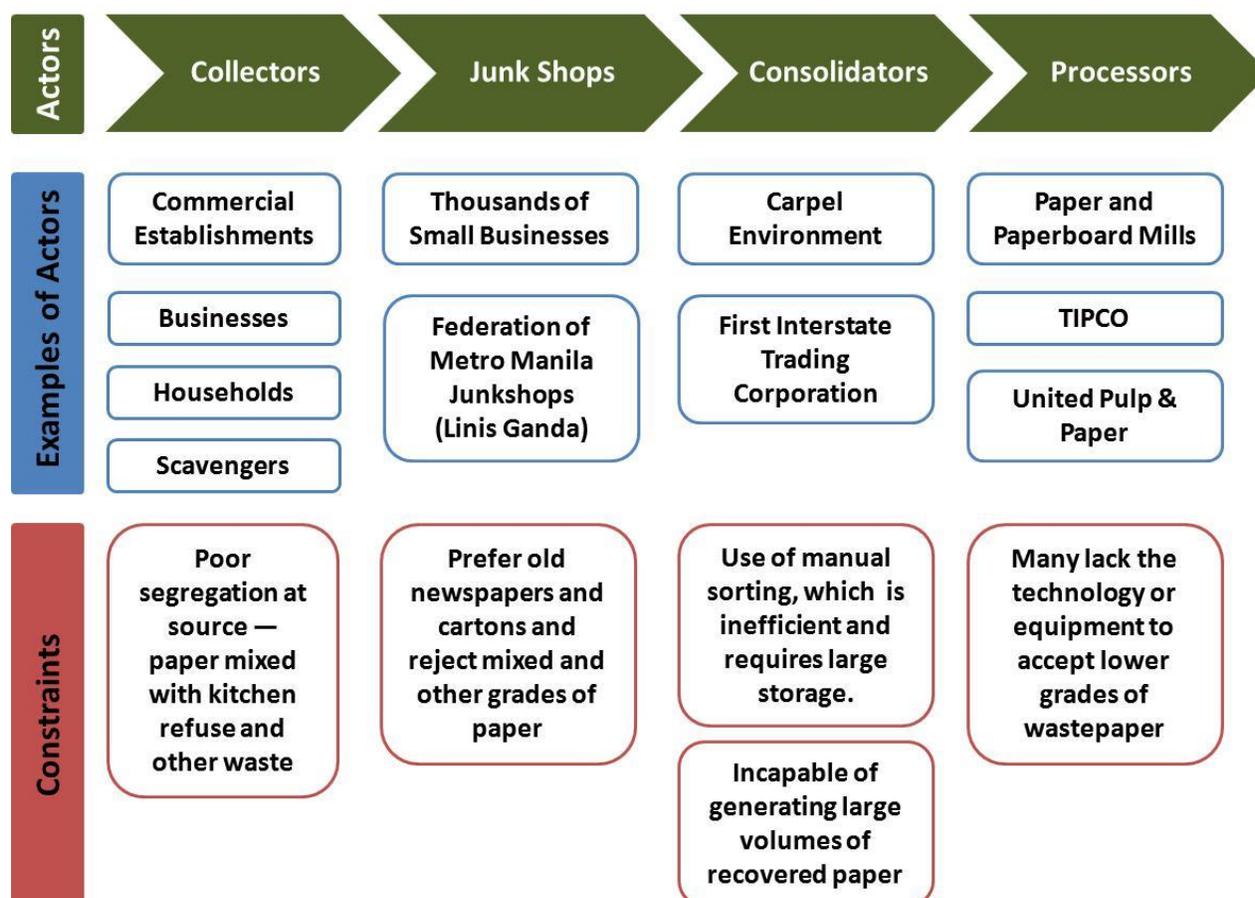
Table A-3. Major Companies and Market Dynamics in Paper GVC

| Value Chain Stage | Output | Major Companies | Market Notes | Market Trend |
|-------------------|--------------------------|--|--|--------------|
| Virgin Timber | Hardwood, softwood | TIMOs (Brookfield Timberlands Management, BTG Pactual), REITs (Weyerhaeuser, Plum Creek) | * Financial investors especially active in US, Canada; expanding reach elsewhere | Up |
| Sawmills | Wood fiber and woodchips | Weyerhaeuser, Resolute Forest Products, West Fraser Timber, | * Demand dependent on pulp/paper and construction industries | Neutral |
| Pulp Mills | Market Pulp | Fibria Celulose, Arauco, Suzano Papel e Celulose, Empresas CMPC, UPM | * Demand cyclical * Prices fluctuate on supply and demand | Up |
| Paper Mills | Coated Paper | Verso Paper, Sappi, UPM, Stora Enso, APP, Nippon Paper, Oji Paper | * Demand from media companies hurt by spread of electronic media | Down |
| | Uncoated Paper | Domtar, International Paper, Portucel, Mondi, Stora Enso, Nippon Paper, APP | * Office customers are using email for communication | Down |
| | Newsprint | Resolute Forest Products, White Burch, Kruger | * Newspaper demand hurt by lower circulation | Down |

| | | | | |
|------------------|------------------|--|---|------------|
| | Containerboard | International Paper, WestRock, Smurfit Kappa, DS Smith, Nine Dragons, Oji, Lee & Man | * Demand tied to industrial production and shipments | Up |
| | Boxboard | International Paper, WestRock, Stora Enso | * Consumer spending drives demand | Up |
| Conversion | Health & Hygiene | Procter & Gamble, Kimberly-Clark, Svenska Cellulosa Aktiebolaget, Georgia-Pacific, APP | * Consumption tied to GDP growth rates | Up |
| Distribution | N/A | Veritiv, Sequana | * Lead firms often outsource to third parties | Neutral |
| Waste Collection | Recovered Paper | America Chung Nam | * China the leading market, although increase in Chinese domestic recovery rate hurting global market | Up/Neutral |

Source: Duke CGGC based on PPI, 2015; S&P Capital IQ, 2015; Stora Enso, 2014; PWC, 2014; Fisher, 2015; Flynn & Pahkasalo, 2015.

Figure A-I. Wastepaper Collection Value Chain in the Philippines



Source: Duke CGGC, based on interviews with industry stakeholders.