The tropical timber industry in Gabon: a forward linkages approach to industrialisation

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Making the Most of Commodities Programme (MMCP)

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MAKING THE MOST OF COMMODITIES PROGRAMME

Like many other developing economy regions, Africa is benefitting from a sustained boom in commodities prices. Received wisdom has been that commodities production is an inherently enclave activity and that it undermines the viability of industry. The Making the Most of Commodities Programme challenges this negative view of the commodities sector. It's research analyses the determinants of backward and forward linkages, identifying policy responses which will broaden and deepen them. In so doing it contributes both to achieving sustainable growth and the spreading of benefits to a wider population. By incorporating younger researchers, building a research network, and dialogue with policymakers, the MMCP also seeks to build analytical and policy capacity, and to influence policy outcomes.

The MMCP focuses on a diverse range of commodity sectors in a number of African economies, as well as on key infrastructural determinants of effective linkage development. A number of common factors are identified which will increase linkages beneficially and which lend themselves to policy intervention - the role of ownership, the nature and quality of infrastructure, the national system of innovation, spillover of skills to and from the commodities sector, linkages in regional economies and the nature and consistency of policies directed towards the commodities sectors.

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A MMCP Synthesis Monograph is currently being written by the MMCP Project Leaders: Raphael Kaplinsky (Open University), David Kaplan and Mike Morris (UCT).

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Abstract:

The breadth and depth of forward linkages in the tropical timber industry of Gabon is a result of three inter-acting drivers: the nature of final markets, ownership of production, and sector-specific policy. The Forestry Code set explicit domestic processing targets built on the trajectory of French processors. Still, while this is theoretically in line with European market demands for wood products, the forced beneficiation resulted in Chinese, Malaysian, and Gabonese producers, whose prime activity is the exploitation of logs for processing industries in China, to limit their participation in forward linkages to the sawnwood sub-sector, characterised by low entry barriers and negative producer margins.

Gabon's comparative advantage lies in the exploitation of its natural resource tropical timber for export markets. Logging is also a 'superior' technology allowing the appropriation of resource rents. These are largely diluted in processing due to production cost penalties such as high reservation wages, inadequate infrastructure, lack of skills, and the political economy of Gabon. The conflict between the envisaged forward linkages approach to industrialisation (in light of falling oil reserves), industry actors' market focuses, motivations, and capabilities, as well as conclusions drawn about comparative advantages and linkage-blockages, has significant consequences for industrial development.

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Executive Summary

The Making the Most of Commodities Programme investigates the 'economic' power of linkages in selected African resource sectors. This report focuses on forward linkages in the tropical timber industry of Gabon. The industry is comprised of the extractive sector and forward linkages to the sawnwood, veneer sheet and plywood processing sub-sectors. Historically, the extraction and exportation of logs is the dominant industry activity. The organisation of the industry is largely a result of French industry influences during and post colonialism. Until recently, the state played a minor role in the formal regulation of the industry, because the government's focus was directed towards the higher rent-earning oil industry.

The analysis identified three main drivers for the creation and expansion of forward linkages in Gabon's tropical timber industry: the nature of final markets, ownership of production, as well as sector-specific policy. French-owned companies established processing sub-sectors as a reaction to rising demand for wood products from the North in general and Europe in particular (and a simultaneous fall in demand for logs). This segment of Gabon's processing industry produces sawnwood, veneer sheets and dominantly plywood parallel to their extractive activities.

Built on the trajectory of French processors and on the belief of a forward linkages approach to industrialisation, the Government of Gabon introduced a new legislative framework, the Forestry Code, for the timber industry in 2001. Since its introduction, the production and export of wood products increased noticeably. However, the rise is foremost a result of an expansion of sawnwood processing activities, especially by Chinese, Malaysian and Gabonese processors. Some of these processors have relatively lower processing capabilities that are currently only sufficient for sawnwood production. Other processors in this group are less motivated to create forward linkages because their activities are closely linked to export markets in Asia, particularly China, which generally demands logs instead of wood products.

The report also reveals that the sawnwood and veneer processing sub-sectors are relatively inefficient eroding existing resource rents appropriated through logging. The inefficiencies are a result of high production costs caused by a scarcity of skilled domestic workers, a comparatively high (reservation) wage level, poor physical infrastructure, inadequate soft infrastructure (banking system, electricity) and a generally unfavourable business climate, as well as the political economy of Gabon, characterised by corruption and rent-seeking. These factors are blocking an expansion of existing linkages as they are cost penalties to processing.

Currently, the 'economically' superior technology in the tropical timber industry is the extraction and exportation of logs, whereas 'adding-value' through forward linkages is only achieved on the back of high economic costs. The current comparative advantage in logging of the timber industry is enforced by Chinese industry demands that have recently started to dominate the global tropical timber industry. Industrialisation through forward linkages is only possible by adjusting industrial policy, by creating a stable and supportive business environment, by supporting the creation of dynamic capabilities amongst all industry actors, and possibly by targeting specific export markets.

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1. Introduction

The Making the Most of Commodities Programme is placed within a context of a manufacturing-led development path. The newly industrialised countries set positive examples for other developing countries that manufacturing-based growth through factor accumulation (labour and capital) can work in general and outward-orientated industrialisation in particular. However, a number of countries, especially in Africa, continue to export primarily commodities (Farfan, 2005; Wood and Mayer, 2001). It was found that these countries grew slower in the 1980s and 90s than manufacturing-focused developing countries in the same period (e.g. Birdsall and Hamoudi, 2002).

UNCTAD (2003, p. 2) summarises, "Price volatility, arising mainly from supply shocks and the secular decline in real commodity prices, and the attendant terms-of-trade losses have exacted heavy costs in terms of income, indebtedness, investment, poverty and development". Furthermore, concerns about commodity dependency rest on the notion of low-productivity, decreasing returns, and lack of stimulating impacts associated mainly with agricultural and primary sectors. In essence, manufacturing is believed to be more catalytic than low-productivity primary industries, because of its impact on technological progress, innovation, skills, diffusion of knowledge, and dynamic comparative advantage (Farfan, 2005; Szirmai and Verspagen, 2010).

The prevailing scepticism was further substantiated by growth regression results inversely relating natural resource abundance to economic growth (e.g. Sachs and Warner, 1995). Numerous social (funding of civil wars) and political factors (institutional quality, political economy, rent seeking) are associated with resource-rich developing economies, too (Auty, 2001; Collier and Hoeffler, 2005). The so-called resource curse asserts that resource-rich countries not only face adverse terms of trade movements and price volatility, but also are prone to Dutch disease effects and a crowding out of manufacturers prolonging infant industry protection and thus the transition towards competitive industrialisation. Moreover, extractive industries, particularly point resource sectors most often studied in the resource curse literature, were observed to fail to diversify.

Still, a growing number of scholars question the notion that there is an inherent curse-like quality to all natural resources (e.g. Lederman and Maloney, 2007). It is argued that the econometric results are sensitive to the choice of independent variables (Brunnschweiler and Bulte, 2008), that macroeconomic policy tools exist to mitigate Dutch disease effects, and that countries, which struggled because of a fall in commodity prices did so due to debt overhang and inappropriate risk management (Davis, 1995). It is further argued that policy failure or the political economy of a country rather than the resource per se is the crux of the problem (Gunton, 2003; Rosser, 2006). Overall, studies confirm that natural resource sectors can decisively foster economic development.

Based on 'new' trade theory and recent case studies, de Ferranti et al. (2002) demonstrate that countries like Chile, Mexico and Brazil use their existing resource base as a starting point to foster economic growth. The authors summarise, "… the key to success is to complement natural resource wealth with good institutions,

human capital, and knowledge. Natural resources and knowledge are a proven growth recipe" (p. 4). Similarly, Reinhardt (2000) reports that resource-based manufacturing sectors in Malaysia and Thailand contributed significantly to these countries' growth success as resources are used as inputs into higher value-added productions.

One of the key elements highlighted in today's resource-based industrialisation literature as pointed out above, yet also crucial to the staple thesis[1] formulated based on resource-based growth experiences in Canada, is the existence and creation of linkages. Hirschman (1981, p. 65) specifies, "Backward linkages lead to new investment in input-supplying facilities and forward linkages to investment in output-using facilities". The same diversification of activities around the resource sector is described by Watkins, who asserts that given technology "a number of things follow: demand for factors; demand for intermediate inputs; possibility for further processing; and the distribution of income" (1963, pp. 144-5).

For instance, long-term economic growth in Canada and the United States depended on the formation of complementing resource-based activities and knowledge industries. As de Ferranti et al. write, "Mining was the 'national learning experience' in the United States that led to building a strong technological system from which modern manufacturing developed" (2002, p. 4). Similarly, Stijns (2006) shows that economic growth and resource abundance are further correlated with human capital accumulation. Owens and Wood's (1997) analysis of the 'exportability' of the Asian export success revealed that the outcome depends critically on the inclusion of processed primary products and the labour forces' skill levels.

In short, the growth-enhancing qualities of natural resources are conditional on the diversification of activities through backward linkages, further processing and/or the channelling of resources into domestic manufacturing industries (forward linkages), as well as on complementary factor accumulation. Next, it is also dependent on policy, because "a state's institutional capacities and effectiveness exert a critical influence over whether extractive economies work in the interest of development" (Bridge, 2008, p. 393). De Ferranti et al. (2002, p. 4) conclude, "natural resource based activities can have high productivity growth, technical spillovers, and forward and backward linkages, as much as modern manufacturing".

1.1. Research hypothesis: making the most of commodities

With respect to the Making the Most of Commodities Programme (MMCP), the research hypothesis is that resource-rich countries in Sub-Saharan Africa (SSA) can take advantage of their resource base not only by exploiting and exporting primary resources (especially given the current Sino-driven commodity boom) but, more importantly, by achieving further economic gains through the creation and/or expansion of Hirschman-type linkages. These linkages may include forward linkages

[1] The staple thesis postulates that staples (raw materials) can initially be exported in exchange for absent domestic factors of production (mainly capital but also know-how). Sustained economic development is achieved by a diffusion of activities around the export base, i.e. the flow of investments into complementary activities (see e.g. Bertram, 1967; Buckley, 1958; Watkins, 1963).

and backward linkages to complementarity industries and knowledge intensive services.

The overall aim is to identify the nature and extent of linkages in SSA resource-based sectors, as well as to identify the main blockages and drivers of them. The drivers of linkages might be ownership (of resource extracting, foreign-owned firms), infrastructure, skills, the national system of innovation, regional capabilities, the nature of final markets, sector-specific policy, and/or other drivers. The overall research focuses on mining and oil industries, which are largely controlled by transnational corporations (TNCs) with specific core competences. Activities and services outside of their core competences are outsourced and thereby provide the possibility of linkages to complementary domestic sectors and services.

1.2. Research focus: tropical timber industry

The case study selected for this research is the tropical timber industry in Gabon, a coastal Central African country located between Cameroon and the Republic of the Congo. The reasons for focusing on Gabon's tropical timber sector are twofold: First, other studies produced by the MMCP research project investigate backward linkages in the mining, gas, and oil industries. This case study focuses on forward linkages, the reasons for the emergence of the former, current barriers to the expansion or creation of new linkages, and its distributional consequences. Although it is acknowledged that the timber industry (forestry, logging and processing activities) can stimulate the formation of so-called forest clusters, characterised by a wide network of backward linkages (see below), the realities of Gabon and the nature of the dominant driving forces that shape the industry make the analysis of processing activities a more interesting case. Focusing on tropical timber hence complements other MMCP reports.

Second, the current commodity boom is largely a result of the resource-intensive growth of China. Tropical timber is of strategic interest to China, because, in line with Chinese demands for other commodities, wood is fuelling domestic processing industries. As a group they are now often referred to as the 'wood workshop of the world'. Total tropical timber input requirements in China have outstripped domestic wood production capacities (additionally constraint by a government forest protection programme) to such an extent that China is depending on imported wood. Sun et al. (2008, p. 16) summarise, "… no other country has ever, in human history, developed a re-export-orientated forest industry based primarily on imported wood, and certainly not at this scale". Chinese industries source a dominant share of their tropical log imports from five countries: Malaysia, Papua New Guinea, Gabon, Myanmar and Indonesia. Gabon is the largest African export location of tropical timber consumed in China. This case study is hence suitable to also consider recent global economic changes.

1.3. Outline of report

The subsequent section provides background information on the tropical timber industry both through a global perspective and through the introduction of Gabon and its tropical timber industry. The third section specifies this report's research questions and gives an overview of the data collection process. The fourth section introduces

existing forward linkages in Gabon's tropical timber industry. Key features with respect to factor utilisation, activities' value-added and profit margins are discussed, too. The subsequent fifth section explores if and to what degree the previous observations are a function of one or more of the MMCP linkage drivers. The final section iterates the main findings in light of research questions and the MMCP hypothesis. The section further discusses the developmental implications of this analysis and states policy recommendations.

2. The tropical timber industry

Hirschman's (1958) unbalanced-growth model of economic development asserted that investments into one or few key sectors with (the potential of) extensive backward and forward linkages would have a stimulating effect on the rest of the economy. In the early 1960s, Westoby identified forest industries as a linkages-intensive resource sector that can play a decisive role in the industrialisation process. To be precise, in a paper published in 1962, he considered the forward linkages of timber industries to be considerable if the sector develops vertical processing industries of high-value products. Similarly, Vincent and Binkley (1972) as well as Douglas (1983) underlined that trade in forest products can be an important source of employment and income. Vincent and Binkley substantiate that the development of downstream industries has to be market-driven (exploiting its comparative advantage), and needs to take place in an environment of macroeconomic stability and good sector-specific policy.

The importance of these factors is demonstrated in an example from Finland, where "both markets and policies were essential elements in promoting forest-based development in its early stages …" (Palo and Uusivuouri, n.d., p. 12). Finland is a success story in line with the linkages approach as the forest sector there has resulted in a forest cluster including linked industries such as machinery and equipment manufacturing, chemicals production, engineering and consulting, biotechnology, research, consulting and education activities, next to the vertically integrated forest sectors like pulp and paper producers, printing and publishing houses, as well as solid wood product processors. The forest sector in Finland is export-driven, capital intensive and labour saving (with substantial investments being made in modern technology).

2.1. The global tropical timber industry

In comparison to Finland in particular and Northern industries collectively, timber industries in developing countries have often failed to develop. Around 70% of the global log production takes place in industrialised countries, whereas the 'tropical' producers' share is a mere 15% (at an almost equal distribution of forests)[2]. The production of tropical logs is concentrated with slightly more than 70% of total production taking place in the top-five producer countries Brazil (20%), Indonesia (16%), Malaysia (16%), India (15%), and Nigeria (5%). Gabon (3%) is the seventh

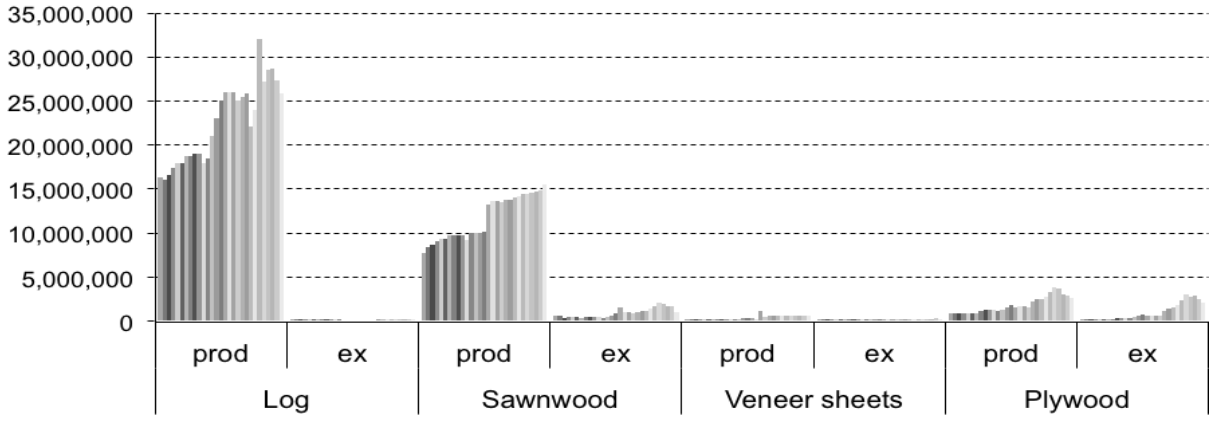
[2] All data in this section, unless otherwise specified, extracted from ForesSTAT (http://faostat.fao.org) accessed August 2010 and January 2011; forest area data extracted from FAO (2010).

largest tropical log producer. The total global production of tropical logs has increased over time.

The dominant producer countries of logs are now most often also the major consumer of their output, i.e. logs are the input for domestic primary wood processing industries producing sawnwood, veneer sheets, plywood, and boards. In aggregate, in South America 99% and in the Asia-Pacific region 90% of all logs are converted into primary products. In 'tropical' Africa the rate of domestic conversion is lower and fell from 82.2% in 2006 to 80.5% in 2007[3]. These cumulative rates conceal the fact that many developing countries, including Gabon, continue to export the dominant share of their resources in unprocessed form. In 2008, logs made up 88% of Gabon's total export volume of all forest products measured in roundwood equivalent volumes (RWE[4]).

Differences in the degree of domestic consumption between countries are visualised below (Figures 1-3). Brazil and Malaysia each export smaller volumes of logs and primary products relative to the respective total production volume. In other words, domestic demand for logs from primary sectors and for wood products by secondary processing industries (wood furniture, mouldings, window frames, etc.) increased over time. Gabon produces insignificant volumes of secondary wood products (not captured by the available data) and relatively small volumes of primary wood products. For instance, whereas Malaysia (with a similar forest stock) produces 9% of sawnwood, 21% of veneer sheets and 48% of plywood of global tropical primary production, Gabon's share is less then half a percent of sawnwood and veneer, and four percent of global tropical plywood production.

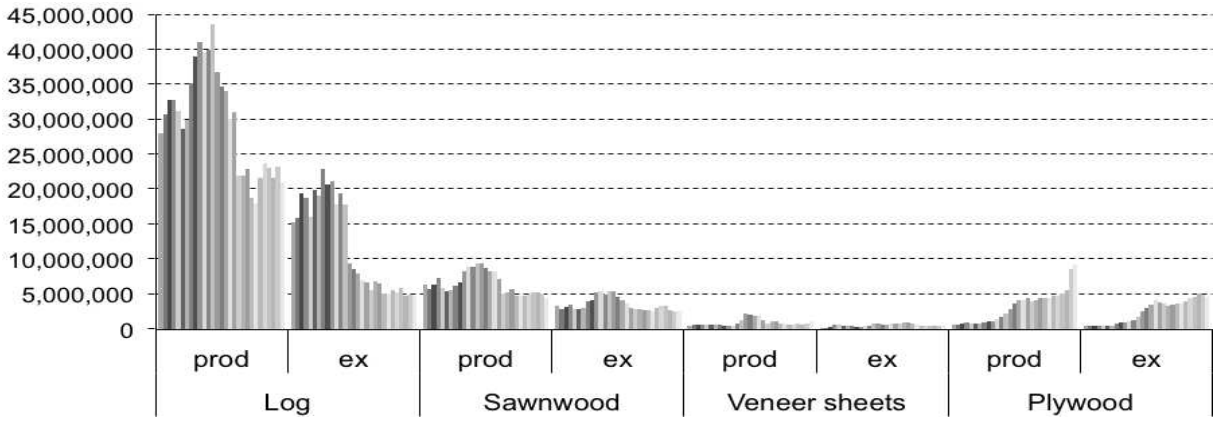
Figure 1: Production and export of logs and selected wood products - Brazil (CUM, 1980-2008)



Source: Data extracted from ForesSTAT (http://faostat.fao.org) accessed January 2011

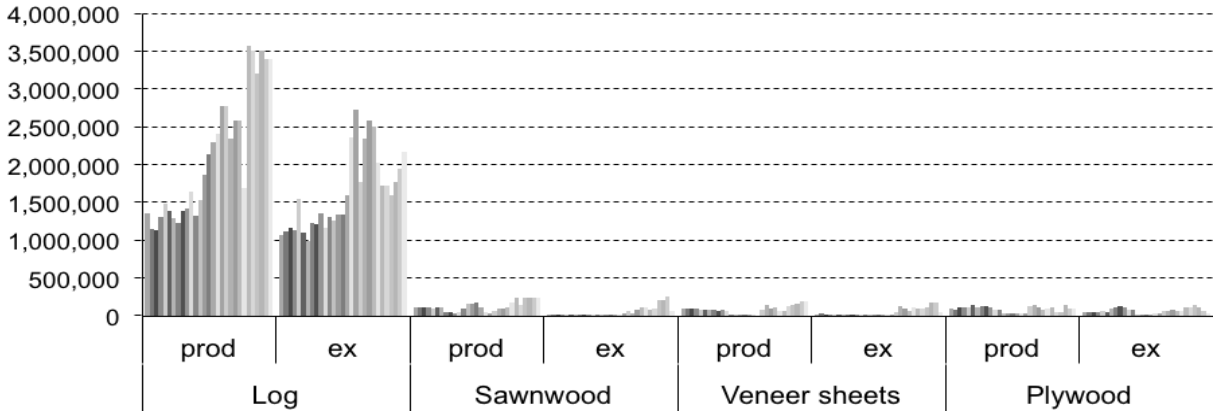
[3] ITTO (2008, 2009a)
[4] The volume of logs used for the production of wood-based products.

Figure 2: Production and export of logs and selected wood products - Malaysia (CUM, 1980-2008)



Source: Data extracted from ForesSTAT (http://faostat.fao.org) accessed January 2011

Figure 3: Production and export of logs and selected wood products - Gabon (CUM, 1980-2008)

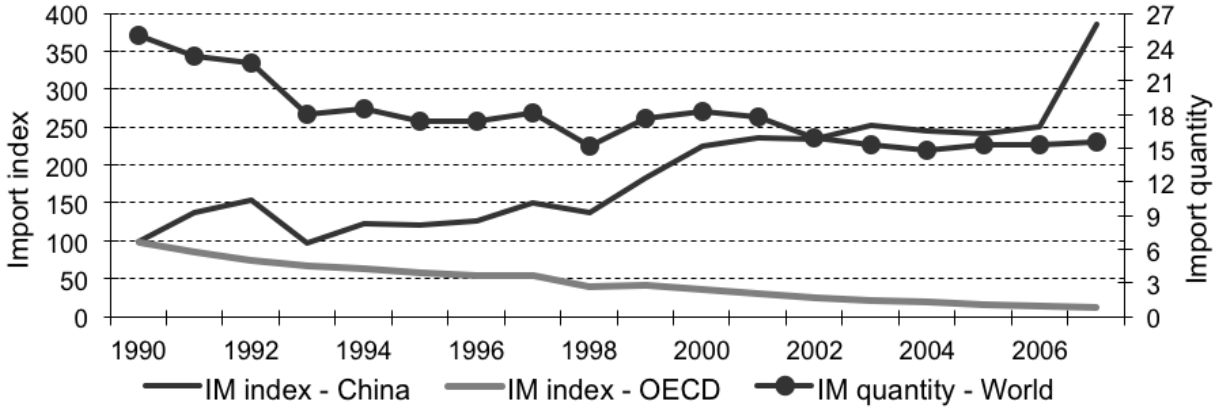


Source: Data extracted from ForesSTAT (http://faostat.fao.org) accessed January 2011

On a global scale, higher rates of domestic conversion have led global tropical log exports to decrease, whilst the export volume of tropical processed wood products is increasing (see ITTO, 2009a). The observed progress in domestic wood utilisation can partly be ascribed to Southern producers' ability to develop dynamic capabilities. Yet, changes in the structure of exports are equally a result of consumption patterns of dominant importers (Figure 4). The OECD countries in aggregate imported around 80% of the global trade of tropical logs in 1990 (20 million cubic metres). Yet, since the mid 1990s the North started to outsource primary processing activities to the South, thus reducing its demand for logs (2 million cubic metres in 2007). The latter is partly a result of rising domestic wage levels and the associated loss of competiveness to the South, as well as due to consumer pressures on the sustainability of tropical log imports and residing resource needs in light of substitution possibilities[5].

[5] See Bowyer et al. (2004), Kaplinsky et al. (2010), and Section 2.2 of this report

Figure 4: Total world tropical log import quantity (CUM million), and the tropical log import index for China and the OECD (1990 = 100)



Source: Data extracted from ForesSTAT (http://faostat.fao.org) accessed October 2009 and April 2010

OECD tropical log imports fell by 87% between 1990 and 2007. Over the same period, China's imports grew by close to 300% (Figure 4). Chinese processing industries currently consume around 68% of the global tropical log trade volume (11% OECD). China has thus replaced the OECD as the dominant consumer of logs. Moreover, its import volumes are significantly large (14 million cubic metres in 2007) to counterbalance falling log requirements from OECD countries, thus haltering the decreasing trend of world import volumes (Figure 4). The shift in markets and the change in the major trade flow of logs, now directed from the South to China instead of the OECD, is of particular relevance to tropical forestry industries like Gabon with rather weak processing capabilities albeit large forest stocks. These industries are faced with falling log requirements though increasing demand for wood products from the North, next to strong demand for wood raw materials from China.

2.2. Gabon and its tropical timber industry

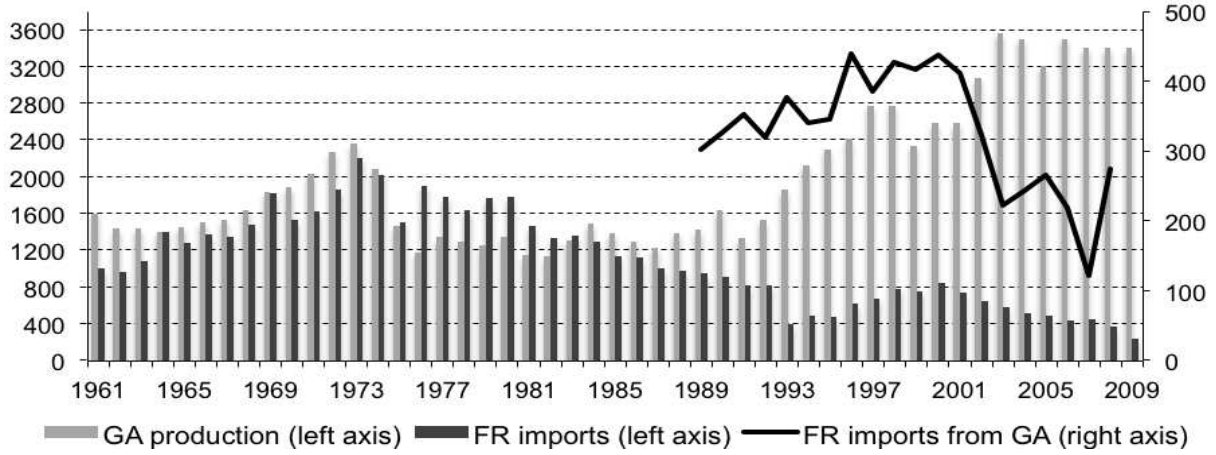
Gabon holds vast amounts of natural resources such as oil, timber, manganese, copper, as well as precious stones. Yet, for the longest time the state mainly focused on the exploitation of its oil reserves to earn foreign exchange. In 2008, around 80% of total export earnings and 65% of total government revenue were derived from the oil industry. More than 80% of Gabon's exports are made up of crude oil; the respective shares of other top exports are 9.4% for manganese and 6.2% for logs (OECD, 2009). Its oil resources have made Gabon a rich country with a nominal GDP of $14.4 billion in 2008. Given the small population of 1.45 million, this translates into a current GNI per capita rate of $7,240 (World Bank, 2009). The countries' riches have not trickled down to society as poverty is widespread and the income inequality level remains high (UNDP, 2005).

Gabon possesses around 23 million hectares of forests, which cover nearly 85% of its total land mass and make it the second most heavily forested country in Africa. Gabon's forests are part of the second largest global tropical ecosystem the Congo

Basin, which covers nearly 180 million hectares and stretches across six countries[6] (FAO, 2005, 2007). In Gabon, the timber sector was once a cornerstone of economic activity before it was drained of its strength by the overpowering oil industry and rent-seeking activities. The industry's contribution to GDP is less than three percent (Wunder, 2003; OECD, 2009). However, in contrast to the enclave oil industry, the relatively more labour-intensive timber industry is the second largest employer after the state. The sector absorbs an estimated 28-30% of the active labour force[7].

Over long periods, the timber industry received little political attention and remained largely unregulated. This vacuum was filled by French industry demands to which Gabon retained its strong economic ties after independence. In fact, because of the 'politically' enabled access to Gabon's resources, in particular Okoumé[8], industries in France specialised in the processing of this species into plywood. Gabon's forestry sector in turn applied the so-called *Méthode Okoumé* silviculture system, characterised by highly selective logging activities and by a reliance on natural regeneration to secure future timber supplies (Collomb et al., 2000; Forests Monitor, 2001). Based on available trade data, up to 75% of total tropical log imports to France were provided by Gabon[9]. In turn, France used to be the dominant export market for tropical logs exploited in Gabon. Gabon's annual log production moved more or less in line with France's annual log imports until the late-1990s (Figure 5).

Figure 5: Log production and trade - Gabon and France (CUM thousand)



Source: Calculated from ForesSTAT and Forestry Trade Flows (http://www.fao.org) accessed January 2011 and trade flow data extracted from Collomb et al. (2000)

China began to import significant volumes of Gabon's total log productions in 1995/6. Export volumes to China grew very rapidly from a very small base of around 12,300

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6 Cameroon, Central African Republic, Republic of the Congo, Democratic Republic of Congo, Equatorial Guinea, and Gabon.

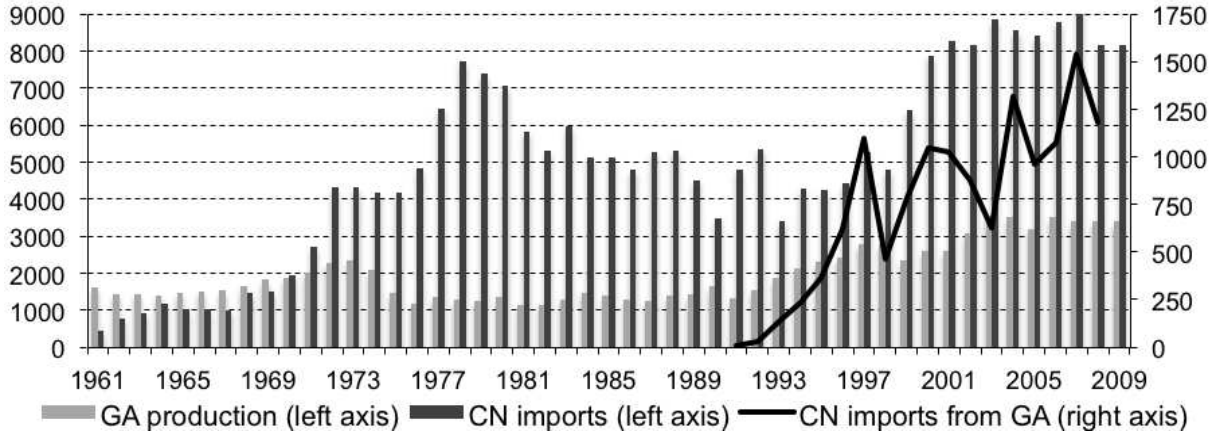
7 The employment distribution per sector in numbers of workers is as follows: state (60,000), forestry (32,000), oil (15,000), and other extractive industries (10,000) (Kramkimel et al., 2005).

8 Okoumé grows in 70-80% of Gabon's forest and in much smaller volumes in neighbouring countries. There are no perfect substitutes although Meranti (an Asian species) is a second-best option.

9 Calculated from Eurostat (http://epp.eurostat.ec.europa.eu) and UN Comtrade (http://comtrade.un.org/db) both accessed November 2009.

cubic meters in 1991 to almost 2,000,000 cubic meters at its peak in the year 2000 (Figure 6). The increase in the trade volume from 1991 to its average volume in the following years (1997-2006) amounts to a staggering 10,568%. Total exports to China (up to 65% of Gabon's total exports) chiefly present an additional demand, whose absolute level had never been matched before by its traditional key partner France.

Figure 6: Log production and trade - Gabon and China (CUM thousand)



Source: Calculated from ForesSTAT and Forestry Trade Flows (http://www.fao.org) accessed January 2011 and trade flow data extracted from Collomb et al. (2000)

An immediate consequence of the new situation of demand, i.e. subsiding log demand from France matched by (over proportional) increasing requirements from China, was an intensification of extractive activities in Gabon. Log production increased above 2.5 million cubic meters in 1997 for the first time in history (Figures 6). Moreover, the range of extracted tree species increased markedly due to less distinct wood fibre preferences of Chinese buyers. When France was the dominant driver of logging activities the number of species exported in volumes of 20,000 cubic metres and above was five (and tilted towards Okoumé). The number has now increased to fourteen as measured in 2008 by Gabonese customs (Collomb et al., 2000; SEPBG, 2009). Overall, dominant importers of tropical timber have played a crucial role in determining the volume and the species mixture of tropical logs in the export-orientated tropical timber industry of Gabon.

2.2.1 The Forestry Code

As demonstrated above, the tropical timber industry is heavily influenced by foreign importers' demands. In addition, the government of Gabon introduced major reforms in 2001 with the introduction of the Forestry Code (*Loi N° 016/01 Portant Code Forestier*). It includes four major features: the termination of the state monopoly SNBG (*Société Nationale des Bois du Gabon*) on the commercialisation of the dominant species Okoumé and Ozigo, the application of a sustainable forest management system, a higher degree of transparency, and the enforcement of domestic processing (Makak and Mertens, 2009). The overall focus thus shifted from raw material extraction towards the industrialisation of the timber industry through the creation of forward linkages to primary processing industries.

Inter alia, the Forestry Code involved a re-design of the concessionary allocation system (to increase transparency) and an introduction of new types of concessions (conditional on processing capacities and forest management systems; specifies maximum concession area size and duration of exploitation), and a reform of the tax system (incentives for processing and sustainable production methods). Most importantly, it also set direct local processing requirements by which 75 percent of timber production needs to be processed domestically before exportation by January 2012. The state continued to assign (log) export quotas to private enterprises with concessions, which they perceive to be quasi production quotas.

Two key factors caused the introduction of the Forestry Code, or essentially a turnaround in the economic function of the timber industry. First, Gabon's oil reserves are finite and oil production peaked some years ago, in 1996/7. The state is thus forced to allow and enforce economic diversification. Second, it is believed that the reform is equally a result of external pressures exerted by a) the International Monetary Fund and the World Bank, the most important creditors to Gabon, b) European governments and organisations, and c) European buyers of tropical timber and wood products. The actors re-defined their perspective on the function of forests both as a source of timber and non-timber forest products in light of environmental (e.g. climate change and deforestation) and economic concerns (e.g. rent-seeking, illegal logging, and income distribution)[10].

The government further announced a log export ban starting January 2010 in order to further stimulate domestic processing and the creation of jobs. An initial interim period until the end of April 2010 (later revised to May 15) was given during which remaining stocks of logs could still be exported. By August 2010, news appeared that as an immediate consequence of the log export ban Cameroon had increased its production and exportation of logs (to China), as well as that large numbers of logs are piling up in Gabon (Hance, 2010; ITTO, 2009b, 2010). It is also rumoured that traders of logs began to relocate to other Central African countries.

3. Research questions and methodology

The MMCP hypothesis states that countries can increase the economic gains of their resource reserves by creating and/or expanding linkages to complementary industries and service sectors. In order to have an organised approach to answering the overarching research hypothesis the following research questions will be of guidance:

- Which forward linkages currently exist in the tropical timber industry in Gabon?
- What is the nature of these forward linkages?
- Are the linkages a function of any of the six 'MMCP drivers'?
- Do other variables influence the nature of existing forward linkages?
- How do the change in dominant consumer markets and the influx of Chinese investors into the industry affect the nature of linkages and/or the drivers of linkages?

[10] Because of these concerns various actors within and external to the tropical timber industry introduced standards governing the procurement of wood (see Kaplinsky, 2010; Terheggen, 2010).

- What are the developmental consequences of following a linkages-intensive approach to resource-based industrialisation?

3.1. Data collection

The report is based on quantitative and qualitative data retrieved through primary data collection in Libreville, the capital of Gabon, as well as through a literature review. With regard to the latter, the report makes use of research results, data (macroeconomic and trade) and other information published in journal articles, conference papers, and reports. This material was produced by academic institutes, international organisations like the World Bank and the United Nations Economic Commission for Africa (UNECA), plus 'specialised' agencies. Specialised agencies include, among others, the Forestry department of the Food and Agricultural Organization of the United Nations (FAO), the International Tropical Timber Organization (ITTO), the Congo Basin Forest Partnership (a voluntary multi-stakeholder initiative, www.cbfp.org) and the illegal-logging.info website managed by the Royal Institute of International Affairs (Chatham House, UK). Furthermore, the FAO databases (ForesSTAT and Forestry Trade Flows) were used intensively to extract production and trade data.

The fieldwork took place between November 2008 and February 2009 in Libreville as the majority of logging and processing companies, as well as international, regional and national organisations are based there. Semi-structured, open-end interviews were conducted with a diverse group of interview partners. In total, 20 logging/processing companies were interviewed and asked to complete a questionnaire. Of the total, 16 interviews resulted in both quantitative and qualitative data that could be used for empirical data analysis sections of this report. The remaining four interviews, though conducted with logging/processing companies, delivered purely qualitative data. For this reason, the information extracted from these interviews complemented the qualitative parts of the discussion but could not be utilised for quantitative data analyses. The population size can only be estimated, as there is no complete, accessible database about the population of 'forestry' firms in Gabon.

However, it is possible to make an informed judgement about the representativeness of interviews with logging/processing companies. For example, the most up-to-date list of concession holders published by the World Resources Institute (WRI) in cooperation with the Ministry of Forestry (Gabon Forestry Atlas edited by Makak and Mertens, 2009, p. 29) lists companies whose combined concession area in Gabon equals 10.2 million hectares. In comparison, the aggregate concession area size of the 16 interviewed companies is equal to 5.5 million hectares, and that of those including the companies with exclusively qualitative data is 6.3 million hectares. The concession area sizes translate to a sample size of roughly 54% and 61% respectively.

Using a different dataset, namely export statistics for the year 2008 disaggregated to companies (obtained from SEPBG during fieldwork; SEPBG, 2009), also allows calculating the sample size. The total log export volume in 2008 for all companies was 1.7 million cubic metres. Companies covered during fieldwork exported 1.1 million (16 interviewed companies) or 1.2 million cubic metres (18 companies, 2 not

listed), which are sample size shares of approximately 65% and 74% accordingly. Lastly, the Ministry of Finance published a list of all concession holders in 2007. The approximate concession area size is equal to 10.2 million hectares[11]. According to these data, the sample sizes are around 48% (16 companies, 4.9 million hectares) or 56% (20 companies, 5.7 million hectares). Taken all results into account, the estimated sample size of logging/processing companies interviewed during fieldwork lies roughly between 50% and 70%.

It should be noted that individual concession holders (including politicians and ministers, around one million hectares of combined concession area) were not interviewed, as they are not directly involved in the management and extraction of timber from their concession areas. The exploitation rights are often passed on to private companies, which were contacted for interviews instead. Information about the position and function of this group of individuals was also collected during interviews in Gabon with other actors. For instance, two traders were interviewed that buy tropical logs from such individual concession holders. In addition, the author interviewed staff of a EU-financed project directly targeted at small-to-medium sized companies, including individual smallholders.

Next to logging/processing companies and traders, three transport companies and three capital good providers were interviewed. Furthermore, the author spoke to six international organisations like the World Bank, the World Wide Fund for Nature, and the Tropical Forest Trust. A representative of the only existing logging company association was interviewed, too, as well as the only provider of specialised education, i.e. an employee of the National School for Waters and Forestry. The French and Chinese embassies, plus the Chinese Centre of Commerce were visited also. Lastly, the author interviewed two consulting companies in Gabon. For many groups of 'other' industry actors, information about the population size does not exist. This holds true for the capital goods and transport sectors, traders and service providers (accountants, insurance companies, etc.). Based on interview information, in some sectors only of a handful of companies exist, e.g. there are only two producers of saw blades. The author interpreted the small population of complementary sectors as a sign for the absence of domestic backward linkages.

4. Forward linkages: tropical timber processing activities

Gabon's tropical timber industry for long concentrated on the extraction and exportation of logs, especially to France and since the mid 1990s to China. Over a period of 40 years (1961-2001) around a tenth of total forest product exports were in the form of processed wood relative to an average share of 89% of logs (see Figure 3 and Appendix-Figure 1). On a global scale, Gabon is the 14th largest exporter of roundwood (2%) and the 3rd largest exporter of tropical logs (16%) in 2008[12]. While these market shares might be impressive, other countries have exploited the change

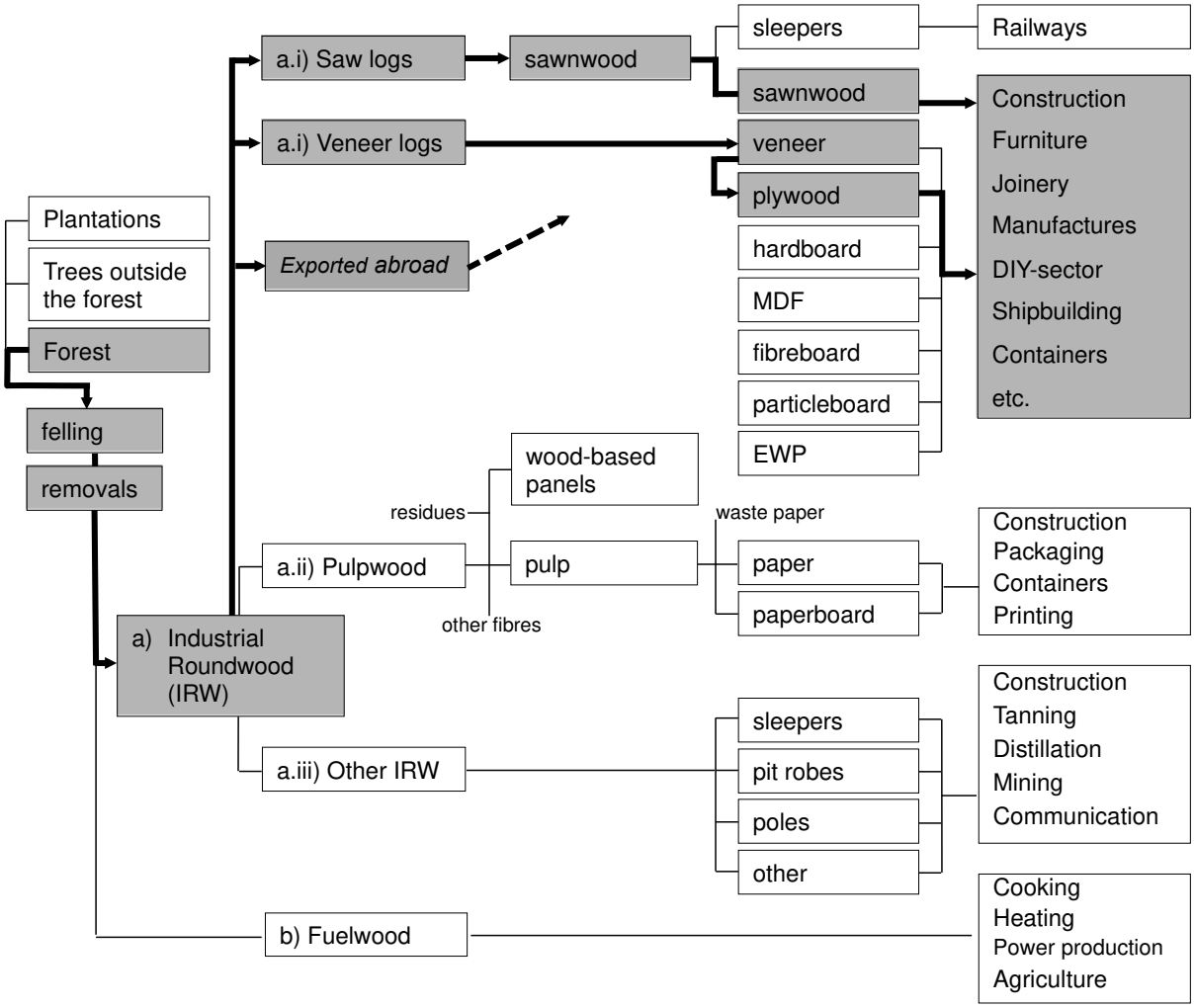
[11] This is the approximate area size of all companies (not individuals, see text below) in the concession holder list corrected for double entries.

[12] All data extracted from ForesSTAT (http://faostat.fao.org) accessed August 2010 and January 2011; export distribution of logs and wood products based on RWE volumes.

in OECD importers' consumption patterns, marked by higher wood product demand, more successfully (see Section 2). Despite Gabon's relatively weak international position regarding domestic conversion rates, processing activities in Gabon rose in the 1980s and noticeably increased since the late 1990s.

There are two main forward linkages from the extractive industries to the processing sector: the processing of logs into sawnwood or into veneer sheets. Veneer sheets can be further processed into plywood thus symbolizing an indirect third forward linkage. The flow of logs and wood products is graphically displayed in Figure 7. The processing steps are shown in Appendix-Figure 2, e.g. applying adhesives to individual veneer sheets that are then compressed together and trimmed produces plywood. Next to the main input tropical timber, to which access is regulated through a concessionary system as the state is the sole owner of all forests, the main inputs into all levels of production are labour, capital goods (e.g. chain saws, skidders, loading machines, three types of processing mills, optional dry kiln, adhesives/oils/varnishes, and trucks for transportation), capital, and know-how.

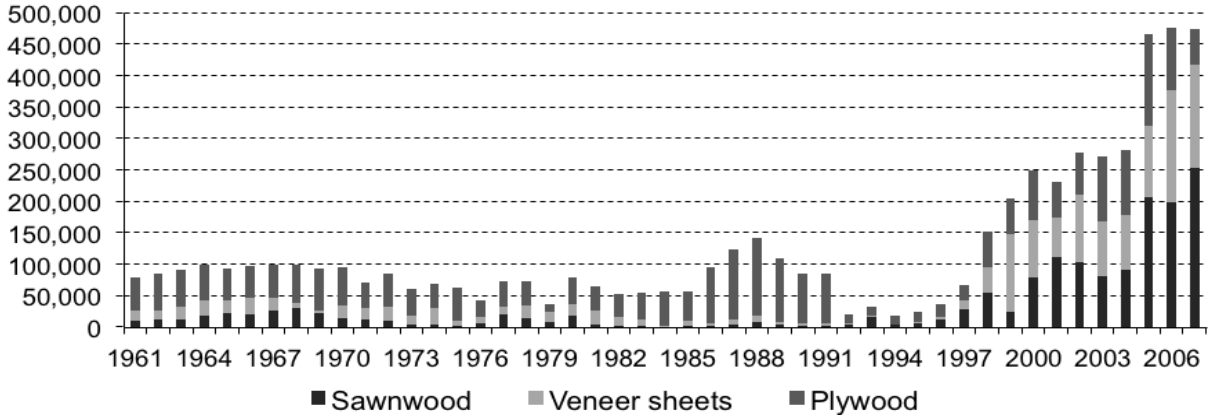
Figure 7: Forest products flow chart



Source: Based on Westoby (1987, p. 22)
Notes: Grey text boxes highlight the three dominant products produced in Gabon; EWP = engineered wood products, MDF = medium-density fibreboard, DIY = do-it-yourself;

Both the total volume of all primary processed wood products and the distribution between the three types of products changed over time (Figure 8). For almost four decades (1961-91) the average export volume was around 80,000 cubic metres, rarely exceeding the 100,000 cubic metre mark as in the 1980s. After a sudden drop in the mid 1990's, total export volumes steadily increased again, yet rapidly shot up after 2004 to an average of 470,000 cubic metres. Moreover, initially exports were dominated by plywood with an average share of 70%. In 2007, the situation almost reversed with the export distribution now being dominated by sawnwood (54%) and veneer sheets (34%). The changes in the export distribution become even clearer when displayed as an export index (Appendix-Figure 3). The export index of sawnwood is not only the highest but increased particularly steep since 2003. Over a ten-year period (1997-2007) the export volume of sawnwood rose by 770%, of veneer sheets by 300%, and that of plywood by around 130%.

Figure 8: Export volumes of selected wood products - Gabon (CUM)



Source: Data extracted from ForesSTAT (http://faostat.fao.org) accessed January 2011

From a 'linkages' perspective these are counterintuitive developments. In other words, the plywood industry, which is in fact directly linked to the veneer-processing sector, has stagnated qua real export volume and diminished in importance relative to exports of particularly sawnwood. Interestingly, veneer sheet exports have increased quite substantially although it is normally regarded a 'semi-processed' product for the plywood industry, of which only relative small volumes are exported (see Figure 1-2). Furthermore, the sawnwood sector is often seen as the least profitable and 'demanding' forward linkage in the tropical timber industry. This is because of low domestic entry barrier barriers and thus a high degree of competition, as well as lower degrees of economies of scale and capital requirements (e.g. Bazett, 2000).

4.1. Barriers to entry

The barriers to entry to the tropical timber industry in Gabon can be grouped into two categories. First, access to the forest stock, as well as the size and location of companies' concessions, are of critical (and increasing) importance. An area smaller than 50,000 hectares is considered insufficient, whereas a size of minimum 300,000 hectares is judged economically optimal. Access to the forest stock opens up the possibility to appropriate resource rents by exporting logs and to control the input

supply of logs for processing (now required by the Forestry Code). The geographic location determines the quality, availability of species, and transportation costs.

The second set of entry barriers is comprised of access to financial capital, technical expertise, skilled labour and knowledge of the industry (contacts to actors in Gabon and abroad). Financial capital is assigned the highest weight by interviewed industry actors. Representatives of logging/processing companies said that this is because of the necessity to invest in existing and new equipment (exploitation, transportation, processing) and to pay other factors of production as mentioned above. It is important to point out that almost all capital goods have to be imported from abroad (mainly Europe and Japan), as they are not domestically produced, i.e. there are no complementary industries in Gabon (Terheggen, 2010). As will be discussed in detail in the next section, other factors of production such as skilled labour and technical expertise are often imported from abroad, too.

4.2. Industry governance system

It was already mentioned that Gabon's timber industry is largely defined by foreign buyer requirements. Indeed, given the small domestic market of Gabon, the industry is export-orientated. For example, production and export volumes of logs moved in tandem with French processing industry demands. Since Chinese processing industries started to source tropical logs from Gabon, domestic production reached unprecedented levels. Next, the range of tree species extracted from the forests is a function of foreign buyer preferences. This initially restricted the number of traded species though has increased due to less pronounced fibre characteristics' preferences from buyers in China. Moreover, foreign buyers can shape the volume and mix of domestically produced wood products. Processors in Gabon pointed out during interviews that they produce according to order, i.e. wood products are custom made to buyer specifications (e.g. species, size, finishing). All industry actors are price takers, i.e. the price of a specific order of logs or wood products is usually set in reference to the prevailing global price. Price movements of tropical timber reflect the situation of global demand and supply at given points of time. The price of Okoumé logs shows an overall upward trend over time (Appendix-Figure 4)[13].

In general, buyer-determined industry governance prevails for areas that are critical to the buyer, where a widely accepted global standard (both public and civil society defined) does not exist and/or where producers' performances need to be monitored (Terheggen, 2010). For example, buyers do not monitor the applied silviculture method in Gabon, as logging companies can use a third-party certification scheme (e.g. Forest Stewardship Council, FSC) to communicate this information to the buyer. Similarly, buyers will not control whether import restrictions set by foreign governments in light of consumer health and safety are met as compliance with phytosanitary measures is routinely documented at customs in Gabon according to an international system. Contrastingly, wood products that do not meet the specifications and/or degree of quality set by buyers will be rejected or may result in a reduction of the sales price.

[13] Data extracted from Commodity Price Statistics (www.unctad.org) accessed January 2011

4.3. Factor utilisation

The tropical timber industry in Gabon has firmly concentrated its activities to the extractive level of production. Since the late 1990s also significant volumes of primary processed wood products are produced and exported. The total production volume of wood products is, however, small compared to total log export volumes, e.g. 16% of total exports in 2001 (see Appendix-Figure 1). Still, built on the trajectories of private companies the Forestry Code, introduced in 2001, set explicit targets to deepen processing activities in Gabon. The overall aim is an industrialisation of the industry through the creation of forward linkages. The rationale of establishing domestic processing requirements as stipulated in the Forestry Code is an increase in local value-added and employment. Log export bans are usually introduced for the same reasons.

The impact of a forward-linkages approach to industrialisation can be estimated. Table 1 and 2 simulate factor utilisation of labour and capital if the same quantity of wood is exported exclusively in the form of logs, sawnwood, veneer sheets or plywood. The simulations also calculate the resultant earnings of foreign exchange, employment figures and investment requirements, taking into account processing losses in the conversion of logs, as well as the average unit-prices of tropical logs in global markets. Each of the processing sectors take the necessary production and processing steps that precede it into account. By its nature the simulations are crude and simplified. Still, to test the robustness of the simulation it was run twice applying different variables, e.g. to simulate higher degrees of efficiency. Although the outcomes for all variables across all sectors were significantly different across the two simulations the general conclusions that can be drawn are similar.

Table 1: Outcome of simulation I – fixed quantity of log inputs

Item	Abbr.	Unit	Log	Sawnwood	Veneer	Plywood
RWE Input [a]	O_{RWE}	CUM	3,430,000	3,430,000	3,430,000	3,430,000
Real Output [b]	O_R	CUM	3,430,000	1,370,000	1,750,000	1,490,000
Foreign exchange [c]	FX	USD m	1,050	750	1,170	1,190
Employment [d]	L	number	7,400	21,000	22,500	47,100
Capital [e]	K	USD k	39,900	74,800	428,700	730,400
Capital productivity	O_R/K		146.4	31.2	6.9	3.5
Labour productivity	O_R/L		465.1	65.4	77.8	31.7
Capital intensity	K/L		5.4	3.6	19.1	15.5

Source: Author's calculations

Notes:
- a RWE = roundwood equivalent
- b Converted using average rates of conversion for Gabon based on interview data, when necessary adjusted for species mix and final destination, at fixed RWE input levels
- c Prices weighted for species mix and averaged over the period 2003 until 2007; extracted from Commodity Price Statistics (www.unctad.org) accessed November 2009 and July 2010
- d Based on 2004-2006 sectoral employment averages extracted from Nguema (2007) and production data retrieved from ForesSTAT (http://faostat.fao.org) accessed November and December 2009; corrected for domestic skill deficiencies (20% reduction of simulated employment figures)
- e Based on 2003 capital depreciation costs across sectors as stated in Odysée Développement (2005), converted into USD using the average 2003 exchange rate (http://data.un.org)

Channelling resources into the veneer sheet and plywood forward linkages can enhance foreign exchange earnings. Given that prices of higher value-added products are greater than those of logs, the simulation results are a reflection of differences in real output, i.e. the lower quantities of veneer sheets and plywood compared to logs are compensated through price. This is not the case for sawnwood, thus signalling processing inefficiencies. It is further evident that there is a substantial gain in employment to be achieved by the processing of logs into sawnwood, veneer sheets and plywood (even in Simulation I where employment numbers were reduced by 20% to signal domestic skill deficiencies). Net employment is highest in the plywood sector, followed by veneer and sawnwood. The total numbers stated in the Tables show that plywood production is relatively employment-intensive per unit of input.

However, the augmentation of foreign exchange earnings and employment through processing come at a very considerable cost of capital, particularly in the production of plywood and veneer sheets. This statement is still true when capital costs were simulated to fall by 20% in the second simulation, for example, to reflect more competitive input markets, and after technological improvements were considered as expressed in changes in average rates of conversion.

Table 2: Outcome of simulation II – fixed quantity of log inputs, adjusted variables

Item	Abbr.	Unit	Log	Sawnwood	Veneer	Plywood
RWE Input [a]	O_{RWE}	CUM	3,430,000	3,430,000	3,430,000	3,430,000
Real Output [b]	O_R	CUM	3,430,000	1,910,000	1,810,000	1,630,000
Foreign exchange [c]	FX	USD m	1,050	1,030	1,210	1,300
Employment [d]	L	number	9,200	33,000	28,700	62,200
Capital [e]	K	USD k	31,900	70,700	352,900	615,800
Capital productivity	O_R/K		162.6	40.8	7.7	4.0
Labour productivity	O_R/L		372.1	58.0	62.9	26.1
Capital intensity	K/L		3.9	2.4	13.8	11.1

Source: Author's calculations

Notes:
- a RWE = round wood equivalent
- b Converted using **global** average rates of conversion, when necessary adjusted for species mix and final destination, at fixed RWE input levels
- c Prices weighted for species mix and averaged over the period 2003 until 2007; extracted from Commodity Price Statistics (www.unctad.org) accessed November 2009 and July 2010
- d Based on 2004-2006 sectoral employment averages extracted from Nguema (2007) and production data retrieved from ForesSTAT (http://faostat.fao.org) accessed November and December 2009; numbers **not** corrected for skill deficiencies
- e Based on **80%** of the 2003 capital depreciation costs across chains as stated in Odysée Développement (2005), converted into USD using the average 2003 exchange rate (http://data.un.org)

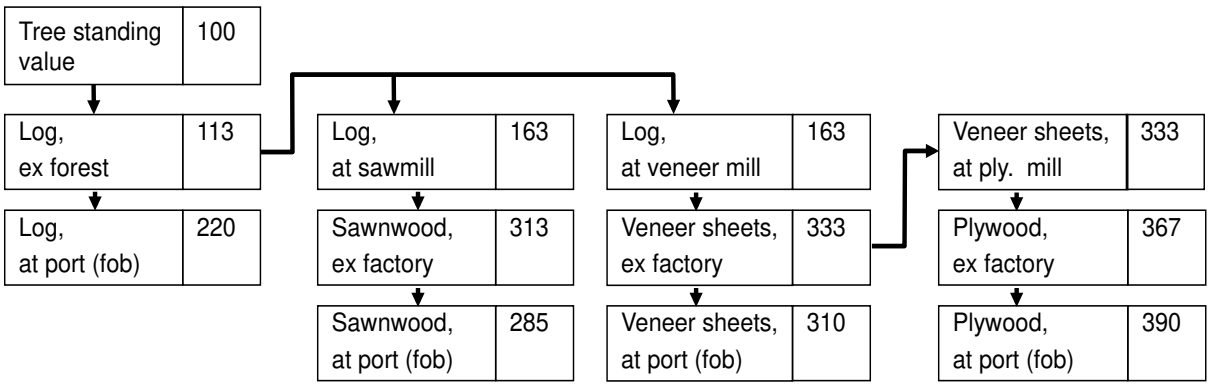
The productivity of capital and labour is substantially higher for logging activities than any of the forward linkages options. In economic terminology, log production is a 'superior technology' since it has higher factor productivities for both capital and labour than each of the three alternative uses of timber. This economic 'superiority' of the logging sector persists in Simulation II for which the average rate of conversion, skill of domestic labour and costs of capital were 'improved'. The processing sectors are thus 'economically inefficient', for instance as reflected in its low rates of conversion captured by changes in real output in the simulation results. Furthermore,

in the context of high unemployment rates in Gabon (around 20%), it is notable that the capital cost per job is lowest in sawmilling, marginally higher in logging, and highest in veneer and plywood processing.

4.4. Value-added and income distribution

Using an index of the value of logs and processed wood products after their respective points of production (ex forest or ex factory) as well as the point of exportation (at port, fob), results in a general overview of the value-added distribution throughout Gabon's tropical timber industry (Table 3). The value chain starts at the forest level where the standing value of a tree is assigned an index value of 100 points. Once the tree is felled, cleared off its branches and transported to the landing site (log collection point in the concession area) there is an increase in its value to 113 index points. The transportation from the landing site (ex-forest) to the port results in an index point value of the same log of 220 points.

Table 3: Intra-chain value-added distributions



Source: Author's data collected during fieldwork November 2008 – February 2009

Extracting and transporting logs from the forest to the port adds value to the log as it can now be sold for consumption abroad (in contrast to an inaccessible tree in the forest), but even more value can be added to the raw material by processing it. Deeper processing activities result in higher value-added indices. The value of logs at the point of exportation (at port, fob) is 220 index points whilst those of sawnwood, veneer, and plywood are 285, 310 and 390 respectively. The net increase in value between each wood product (at port, fob) in relation to a log (ex forest) is 172 index points for sawnwood, 197 index points for veneer sheets and 277 index points for plywood.

Nonetheless, as can be seen in the diagram (Table 3) making logs available for consumption to foreign industries is assigned a higher index value increase (107) than making it available for either of the two forward linkages (log at mill minus log ex forest, 50). In essence, this means that exporting logs adds more value than selling logs domestically. Moreover, the producer margin, defined as the price of a log or wood product (at port, fob) minus the respective production costs (ex forest/factory), are in fact negative for both sawnwood (-28 index points) and veneer sheets (-23 index points), marginally positive for plywood (23 index points), yet highest for logs (107 index points).

In short, although one can observe increases in value-added (final price at port, fob) in fact not value but costs have been added to each product. The actual unit profits are highest for producers who export logs and thus undertake no processing activities. Resource rents that can be appropriated in the extractive sub-sector are eroded in processing sub-sectors, signalling inefficiencies in processing and low barriers to entry except for the plywood sub-sector.

5. Influence of MMCP drivers on forward linkages

There are three forward linkages in the Gabonese tropical timber industry. The creation of these forward linkages is a direct result of private company initiatives reacting to foreign (European) market demands. The introduction of the Forestry Code aims to deepen processing activities in Gabon and to create new employment. Yet, it was shown that logging is a 'superior technology'. It is also the most profitable sector, now dominated by rising Sino-resource demands. Throughout previous sections of this report, some factors were already introduced that explain processing inefficiencies, e.g. technology and access to factors of production like capital. This section discusses the influence of the MMCP drivers on the breadth and depth of forward linkages. Given research results presented in the previous section of this report, it also asks whether the erosion of resource rents observed in processing sub-sectors is a cost penalty of specific variables that may or may not be captured by the MMCP drivers.

5.1. Ownership of production

Gabon's tropical timber industry is foreign-dominated by large-scale operators such as Rougier Gabon (French), Rimbunan Hijau (Malaysian) and Sunly Gabon (Chinese). According to data in the Forestry Atlas Gabon (Makak and Mertens, 2009) 52% of all industrial concession areas are assigned to European-owned companies, 21% to Malaysian ones, 16% to Chinese-owned firms and 7% to Gabonese nationals. Yet, the ownership of some companies has changed over the past two years or so[14]. The adjusted dataset reveals that European-owned companies' share in aggregate is much smaller (around 40%) and that of Chinese companies is higher (28%), whilst there were only minor changes amongst Malaysian (19%) and Gabonese-owned firms (8%).

Asian companies, in particular Chinese- and Malaysian-owned ones, thus challenge the previous French predominance. It is estimated that the total concession area size that was transferred to Chinese companies is around one million hectares, which is equivalent to 10% of the total industrial concession area. The structure of ownership of production has changed considerably.

There are major differences between foreign-owned companies and Gabonese ones qua concession areas, workforce, and production (Table 4). In aggregate, Gabonese companies' concessions are 175,000 hectares large compared to around 500,000

[14] The Forestry Atlas Gabon probably uses data from 2006 (latest 2007), whereas primary data were collected during November 2008 and February 2009 and adjusted when necessary until August 2010 based on newspaper reports and other up-to-date information.

hectares or beyond for foreign-owned companies. The latter hence appear to achieve economies of scale[15], whereas Gabonese-owned companies operate at a scale below the economically optimal 300,000 hectares mark. The relatively larger concession areas associated with foreign-owned companies allow these operators to extract roughly three times more tropical logs, for which higher number of workers are employed. Interviewees also reported that larger companies in general and large foreign-owned ones in particular have easier access to capital than smaller companies. The latter rely more heavily on buyers' advance payments for cash flows (in the absence of adequate banking systems and products in Gabon). Financial capital is critical for the acquisition of other factors of production.

Table 4: Ownership and company size (n = 12)

Size / Ownership	Concession *(hectare)*	Workforce *(number)*	Log Production *(cubic metre)*
China	532,000	357	160,000
Malaysia	621,000	380	*
EU	493,000	657	175,000
Gabon	174,000	230	52,000
Others	150,000	150	50,000

Source: Author's data collected during fieldwork November 2008 – February 2009
Note: * Workforce and production data of Malaysian companies are incomplete and thus excluded

Figure 9 provides an overview of companies' nationalities and the sub-sectors they participate in, i.e. companies' participation in extractive activities and one or more forward linkages. The majority of companies have access to Gabon's forest stock through concessions from which they extract logs. Logs that are not exported are mostly processed into sawnwood. It can also be seen that the production of veneer sheets and plywood is confined to a handful of companies, of which the majority are European-owned[16]. One exception to this observation is a Chinese-owned company, which produces both sawnwood and veneer sheets (yet sawnwood is the dominant of the two products). Most companies that process logs into veneer sheets always continue to process the sheets into plywood (still, primary and secondary trade data do show that veneer sheets are exported abroad, too). In fact, half of the veneer/plywood producers concentrated primarily on these processing activities, as they do not participate in the sawnwood sub-sector. In general, Chinese, Asian and Gabonese companies are active in the extraction of logs and sawnwood sub-sector.

The sample contains two processors with no direct access to the forest stock. During interviews the representatives of these companies said that this causes them to face a situation of log supply uncertainty, which was ascribed by one respondent to "the increasing control of Chinese enterprises over raw materials". The other respondent

[15] It was not possible to calculate the output per labour given the available data, i.e. labour may include non-'production' staff in transportation and those working in social-environmental areas.

[16] The owners of the only 'Gabonese' veneer/plywood mill have in fact a dual Gabonese-French citizenship. Although they prefer to be regarded as Gabonese, their activities resemble those of European-owned companies (indicated by the serrated line in Figure 9), to which they are grouped henceforth.

further explained that since the introduction of the Forestry Code, specifically the new concessionary system, only companies with a concession are assigned log export quotas. As a result, timber processors can no longer trade with logs (purchased domestically) and have thus lost a vital, resource rent earning part of their business. Overall, these statements indicate that access to the forest stock is an increasingly important entry barrier for the participation in forward linkage activities[17].

Figure 9: Ownership and sub-sector activities (n = 15)

Ownership / Activity	China			MY		EU				Gabon				Others	
Logging															
Sawnwood															
Veneer									*						
Plywood															

Source: Author's data collected during fieldwork November 2008 – February 2009
Notes: Each column represents a company (and its subsidiaries); * represents activities that are undertaken in cooperation with another processor at these processors' processing unit facilities; MY=Malaysia

Primary data also allow drawing conclusions with respect to industry actors' date of entry. In general, logging and processing companies entered the industry in Gabon in consecutive waves (Figure 10). European-owned companies were the first ones to enter, starting as early as the 1950s though mostly clustering around the 1980s. The average year of entry of Gabonese-owned companies is 1991. Only from the late 1990s (1997) did the first Malaysian companies enter the industry. The average access year of companies under Chinese ownership is 2003.

Figure 10: Companies' backgrounds and function changes (n = 15)

Ownership / Activity	China			MY		EU				Gabon				Others	
Logging	'04	'06	'05	'97	'97	'83	'70s		'84	'88	'95	'04	'01	'00	
Sawnwood	**'07**	'99	**>'05**	**'06**	n.a	**n.a**	n.a.		'00s		**'07**	**'07**		**'08**	**'05**
Veneer	07						90s	99	07	99					
Plywood							90s	99	00s	04					
Trade		'99	>'05	'97	'97		'52						'76	'97	

Source: Author's data collected during fieldwork November 2008 – February 2009
Notes: Numbers in bold indicate processing activities, which were started in the post-Forestry Code period of production; n.a. = data not available

Sub-sector participation of companies has changed over time. The general tendency in the industry was to first establish logging companies (and thus to secure access to

[17] Processing companies currently without concessions confirmed during interviews that they already started the formal process to gain access to the forest stock, i.e. in cases where processing was the primary activity the vertical integration of logging is vital to control resource flows to existing linked processing units.

resources), whilst forward linkages were created as a secondary step, on average around the year 2004. Still, veneer sheet and plywood processors, of which all are European-owned, started their operation in the (late) 1990s. Contrastingly, sawmills under Chinese, Malaysian and Gabonese ownership were most frequently established in 2007, or the post-Forestry Code period.

Across all groups and within each group of nationalities are variations regarding companies' affiliations or links of companies in Gabon to foreign-based headquarters, as well as the presence of multiple subsidiaries of a company. As graphically highlighted in Appendix-Figure 5, there are three types of company affiliations: a) diversified transnational corporations (TNCs) with their headquarters located abroad, and with one main office plus several local subsidiaries in Gabon, b) multi-entities with one main office and several local subsidiaries all in Gabon, and c) single-entities that are neither associated with a TNC nor have local subsidiaries. There are two main reasons for establishing subsidiaries. First, they are established to bypass maximum concession area sizes set at 600,000 hectares (§97 of the Forestry Code; estimated to apply to at least six companies, three Chinese-, one Malaysian- and two French-owned). Secondly, subsidiaries undertake specific activities, e.g. one extracts timber and another one processes it (vertical integration).

The exact distribution of the three types of company affiliations across groups of nationality is presented in Table 5. The numbers translate into relatively larger networks of subsidiaries around Chinese and Malaysian 'Gabon offices' compared to European-owned companies with smaller networks of local subsidiaries, and compared to Gabonese single-entities with no networks. This information can be linked to companies' sub-sector participation. Chinese and Asian companies have a wider network of local subsidiaries (plus satellites, see below); they largely focus their activities on the extraction of timber and production of sawnwood. Thus, these subsidiaries' activities are largely confined to the broadening of existing functions, rather than a deepening through increased value-added processing (veneer sheets and plywood). Contrastingly, it appears that European-owned companies deepened their activities as they participate in the logging sub-sector and all three forward linkages. Gabonese companies did not create networks of companies and processing activities are limited to the sawnwood sub-sector.

Table 5: Types of company affiliations and ownership (frequency count, n = 15)

	China	Malaysia	EU	Gabon	Others	Aggregate
a) Diversified TNCs	2 (3)	2 (7)	2 (1)		1 (0)	7 (11)
b) Multi-entities	1 (3)		1 (1)	1 (2)*		3 (6)
c) Single-entities			1	3	1	5

Source: Author's data collected during fieldwork November 2008 – February 2009
Notes: * company with dual-citizenship treated as European-like; numbers in brackets refer to the number of subsidiaries of Gabon offices

On average, European companies only export 38% of their total log production in its raw state, whilst using the remaining 62% as input into linked processing mills (Table 6). In contrast, the aggregated shares for each Chinese and Malaysian companies are 70% (log export) and 30% (input). Gabonese-owned companies export around 90% of total log production. China is the dominant market for logs, whereas the EU

dominates with respect to wood products. It is only among Chinese and Malaysian-owned companies that China or South Africa is a prime export location (mostly for sawnwood). It is important to point out that for most European-owned companies in Gabon the Chinese log market is in fact a 'secondary' market, because the focus of their activities is on processing. Their sub-sector participation is thus driven by EU-buyers.

Table 6: Ownership, sub-sector activities and final markets (n = 15)

Ownership / Activity	China			MY		EU				Gabon			
Logging													
Sawnwood													
Veneer									*				
Plywood													
Log export share [a]	70%			70%		38%				90%			
Log export destination [c]	CN	CN	CN	CN	CN	EU	CN		CN	CN	CN	CN	CN
Product export share [b]	30%			30%		62%				10%			
Product ex. destination	EU	CN	SA		SA	EU	EU	EU		EU	EU	EU	-

Source: Author's data collected during fieldwork November 2008 – February 2009
Notes: see previous Table
a share of total log production exported unprocessed
b share of total log production channelled into linked processing sub-sectors
c CN=China, EU=Europe, SA=South Africa is the respective main export destination for logs and processed wood products

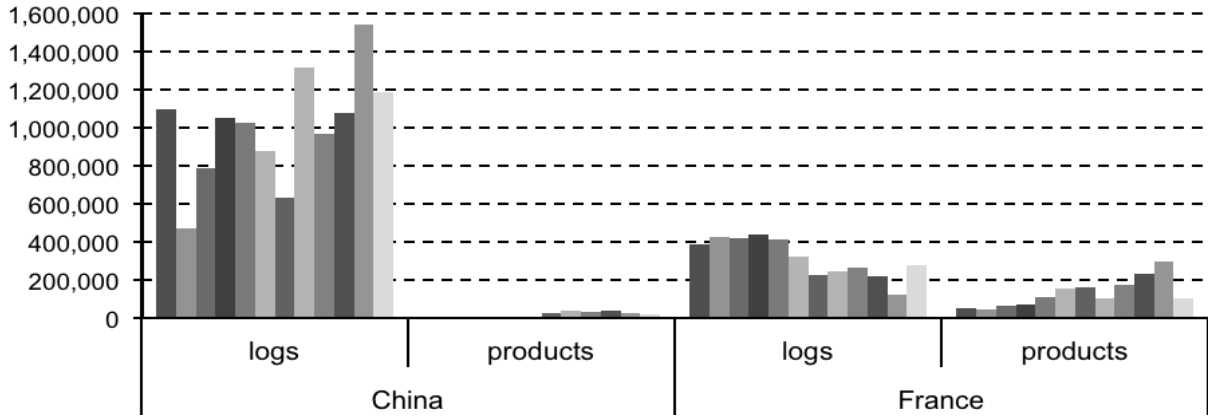
There is evidence to conclude that Chinese and Malaysian companies that entered the timber industry in Gabon (in light of domestic resource constraints) did so during a period, where China has already been the dominant buyer of tropical logs. They thus focus their activities on the extraction of logs for the Chinese market. Their participation in the sawnwood sub-sector appears to be a strategy to comply with the Forestry Code's domestic processing requirements. It is highly likely that processing activities are also financed through resource rents from logging. Most European-owned companies focus their activities on the processing sub-sectors and export wood products to the EU market. They entered the industry at a time when France (the EU) was the dominant driving force of the industry.

5.1.1 Nature of final markets

In Section 2 of this report it was said that the North began to outsource processing activities to the South, and that Southern tropical processing sectors with the ability to develop dynamic capabilities consequently increased their domestic log utilisation rates. The same holds true for Gabon (though internationally to a much smaller degree). More specifically, the composition of France's (or European) demand for Gabonese forest products changed quite drastically away from logs towards processed wood products (Figure 11). In recent years, the total volume of primary processed wood products (in roundwood equivalents) has been higher than the volume of logs in the same year. For instance, in 2007 France imported around 120,000 cubic metres of logs, yet the equivalent of nearly 300,000 cubic metres of

logs in processed form. In contrast, China imports large amounts of logs and in direct comparison almost insignificant amounts of wood products (chiefly sawnwood, no plywood).

Figure 11: Chinese and French import distributions of Gabonese logs and selected wood products (1997-2008, RWE, cubic metre)



Source: Data extracted from ForesSTAT (http://faostat.fao.org) accessed January 2011
Note: Converted using average rates of conversion for Gabon adjusted for final destination based on interview data

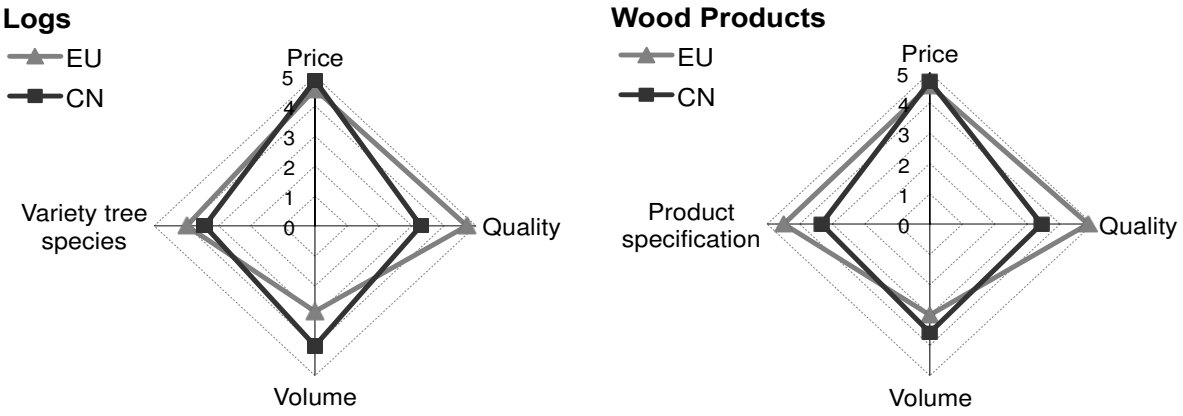
There are further differences between China and Europe with respect to firm-specific, public and private standards demanded by each group of buyers (and which are simultaneously entry barriers to each respective market). Overall, European buyers are more demanding than their Chinese counterparts are (Figure 12). The most critical firm-specific standards set by Chinese buyers for both logs and wood products are price and volume. Quality, species selection (logs) and being able to meet product specifications (wood products) are of moderate importance. European buyers are thought to rate price, quality (logs and wood products) and product specifications of wood products as critically important. European buyers buy a smaller range of species, or have a more specific demand for certain fibre characteristics. The volume they buy per transaction is much smaller than that of Chinese buyers. As interviewees summarised, "Chinese industries demand quantity not quality as the EU" and "… Chinese take logs of all species, also hardwoods not requested by EU markets in the past".

Moreover, European buyer requirements are more stringent than those of Chinese buyers regarding public regulations (in aggregate for logs and wood products; Figure 13 left). To be precise, with the exception of phytosanitary requirements all other technical standards are considered to be of no or minor importance to Chinese buyers. These standards are on average important for EU buyers. Private standards concerning production methods (legality and sustainability certification requirements, as well as GPPs[18]) and other environmental regulations (ISO 14001) show large

[18] Private standards might also be accepted as proof of meeting governments' green public procurement (GPP) criteria: "Several national governments in European markets … have communicated public procurement policies that include criteria favouring the purchase of certified forest products …" (UNCTAD, 2010).

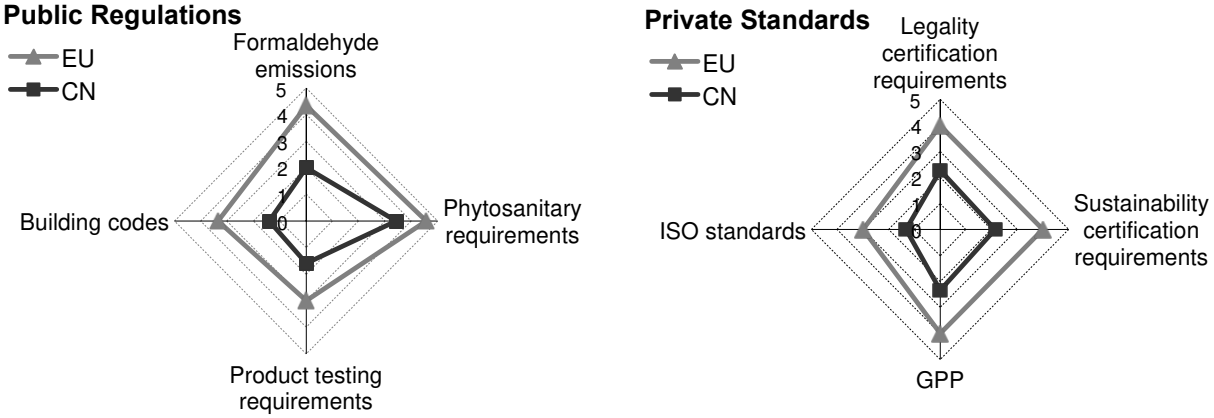
differences between groups of buyers (Figure 13 right). In fact, "The EU market is the driving force for sustainable forest management and legality and FSC certification". Based on interview notes with producers in Gabon (though not captured in Figure 13), qualitative data suggest an almost indifference of Chinese buyers towards certification: "There are no requests for certified wood from Chinese customers", or "The Chinese have no interest in certification and mainly concentrate on logs", and "The Chinese market does not ask or care about certification".

Figure 12: European and Chinese buyers' firm-specific standards (1 = not important, 5 = critically important, n = 15)



Source: Author's data collected during fieldwork November 2008 – February 2009

Figure 13: European and Chinese buyers' public and private standards (1 = not important, 5 = critically important, n = 15)



Source: Author's data collected during fieldwork November 2008 – February 2009
Note: GPP=Green public procurement; ISO standards=ISO 14001

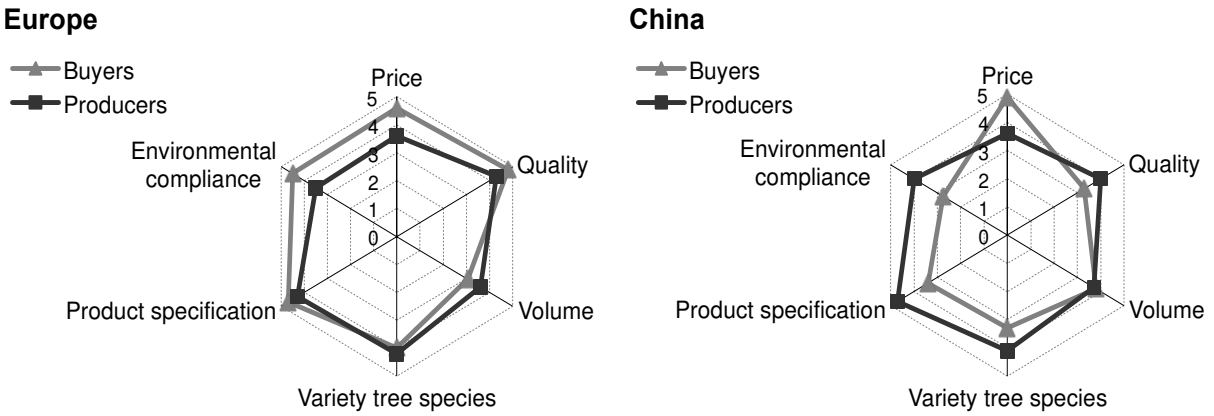
Word limitations do not allow a more detail discussion of the subject of standards at this point (for further information see Kaplinsky et al., 2011 and Terheggen, 2010). It is nevertheless important for a discussion about drivers of forward linkages to acknowledge the fact that the nature of final markets is a critical factor that might determine the breadth and depth of linkages and the participation of groups of owners of 'production' in specific sub-sectors. This is because the tropical timber industry is buyer-driven and in case of Gabon strongly orientated towards export markets. Each market is characterised by a different set of market entry barriers,

such as quality and environmental standards for access to Europe and quantity for access to China. There are thus certain variables governing, or limiting, export market access to those producers who are able to meet the respective standards.

5.2. Skills - market entry barriers

Access to foreign markets is subject to standards. It could be argued that producers' ability to vertically integrate processing activities is a function of skill to meet foreign-set standards. These standards were shown to be more stringent in the EU, which increasingly consumes processed wood products, than in China largely consuming logs. The capability to meet foreign buyer demands is represented in quantitative terms in Figure 14, which shows the degree of conformity by producers in Gabon with each European and Chinese buyer standards for firm-specific performance criteria (plus environmental compliance replacing and summarising private standards). Note that although producers had the option of judging their performance separately for each European and Chinese buyer requirements, the answers appear to be similar. The variation of the numerical values is small, not exceeding 0.4 at the maximum and averaging 0.08 points on a five-point scale. It thus seems producers gave testimony of their abilities in general and irrespective of the definition of buyers.

Figure 14: Producers' ability to conform to buyer standards (1 = extremely poor, 5 = very good, n = 15)



Source: Author's data collected during fieldwork November 2008 - February 2009

Producers in Gabon judge their performance on average to fall short of European buyer expectations but to often excel those of Chinese buyers. More specifically, producers in Gabon specified that their performance regarding EU buyers' quality specifications, price perception and environmental standards are difficult to comply with. The two variables that are relatively less important to EU buyers, variety of tree species and volume can be met. In contrast, producers are not able to meet Chinese buyers' volume demands, i.e. there is an undersupply of logs. Producers' capacities with respect to quality, range of tree species and environmental compliance surpass those of Chinese buyers. Price perceptions differ strongly. Overall, European standards are relegated by those of China. Producers can comply with 'lower' Chinese standards but struggle to meet critical European standards.

Although available data do not allow a differentiation of producers according to nationality (ownership of production) the results can be further specified with qualitative data extracted from interviews. For instance, being able to meet Chinese quality requirements was not an issue of concern for all producers in Gabon; yet European quality requirements are considered essential for accessing this market. The quality of logs is a given variable that can generally not be improved (though quality defects can be attempted to be disguised).

Technical issues were never singled out as a significant area of concern to producers. For example, producers in Gabon specified that meeting the request for phytosanitary certificates is relatively easy. Representatives of a Chinese company and a Chinese trader explained that the phytosanitary certificate is part of the standard paper work and that "There is no problem executing these [regulations] on the ground". Other technical standards, such as formaldehyde emissions, were often not mentioned at all during interviews. Note that Gabonese, Chinese, and Malaysian producers are not participating in the plywood sub-sector, where the usage of chemicals is of importance. While it cannot be said with certainty whether this 'skill set' is a real blockage to the participation in plywood processing, European-owned plywood processing companies' representatives never mentioned this technical standard as a difficulty either.

Producers clearly differentiated between the types of wood products they have the capability to produce. As a Chinese processors explained, "Plywood is too complicated for us so we focus on sawnwood". A Malaysian producer who made a similar statement said: "We consider peeling logs [i.e. a method to produce veneer sheets] but right now sawnwood is easier". At a Chinese company it was further explained, "We export the logs of good quality and make sawnwood of the logs that were rejected", which are dominantly exported to China and South Africa, markets that demand low-medium quality products. An owner of a small-to-medium sized Gabonese company recapitulated, "the new government policy discriminates small companies, as financial means and technical expertise are required, which are only available to larger companies".

Many producers appear to struggle to bear the costs of meeting environmental standards, in particular certification requirements. For example, one interviewee said, "We are not certain whether there is a price premium on FSC wood and we are not sure if the costly FSC investments are the right step to take". Overall, the need for certification for access to the European market was not questioned but the ability to finance such a process. The yearly costs to maintain the required standards were judged a considerable problem. Sustainability and legality certificates issued by third parties are assigned to a forest area not a company. In order to sell a certified wood product, the log input needs to come from a 'certified' forest. Thus, in order to be able to enter the European market at least parts of the total concession area needs to be certified, or wood needs to be bought domestically at a price premium. Chinese buyers, according to one interviewee (of a FSC certified company in Gabon), do not pay a price premium.

However, in contrast to some interview statements there are clear differences between companies in Gabon. Quantitative data show that all certified companies (i.e. FSC, OLB, ISO 14001:2004) in Gabon are subsidiaries of European-owned

diversified TNCs and large-scale private enterprises but none are Chinese-, Malaysian-, or Gabonese-owned (Terheggen, 2010). Furthermore, the processing of logs into primary products is a comparatively low-technology activity. To be more precise, although Chinese and Malaysian companies seem to face technological difficulties, at least those companies that are part of TNCs (and/or foreign state-owned enterprises, often in the case of China) have access to this technology as primary products are 'routinely' produced in China and Malaysia. Note that these companies also have access to capital, a decisive factor of production.

Consequently, it appears that not necessarily the ability to hurdle foreign market standards (e.g. due to technology) but 'motivation' might be a decisive factor. Interview statements support such a proposition. For instance, a representative of a Malaysian company, whom the author asked whether processing activities are likely to be further expanded, replied that the Malaysian owner would be unreasonable to shift his existing processing facilities from Malaysia to Gabon where "everything is much more expensive and more complicated". Moreover, Asian investors are frequently driven to venture abroad due to domestic supply shortages of logs (see also Sizer & Plouvier, 2000). Indeed, Malaysian and Chinese companies, especially invisible 'satellites'[19] are publicly accused of having accessed Gabon only to exploit domestic resources and often in an unsustainable manner[20]. A supporting statement was given by a the manager of a Malaysian logging company as part of a discussion on profitable forest land usages, "…the forests [in Gabon] should be converted into oil palm plantations … at least with palm trees you always make money, because you can harvest every single year; it's like a sustainable gold mine – not like the forest which you just *harvest once*" (emphasis added).

There is a diverse range of capabilities amongst Gabon's tropical timber industry. Comparatively 'higher' market entry barriers governing access to the EU limit the number of EU market participants (increasingly) to processors with the ability to produce high quality, certified wood products to exact buyer specifications; the latter are in majority European-owned companies. In contrast, market access to China is more facile, or actually defined over a different set of variables namely quantity and price. Producers with limited 'processing skill set' hence participate in the sawnwood and logging sub-sectors. This might be particularly the case for Gabonese-owned companies with limited access to technology and other factors of production. The Chinese 'log' market is a primary market for Gabonese, as well as Chinese and Malaysian companies. Yet, in the case of the latter two, there is reasonable doubt about the 'blockage'-nature of final market standards.

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[19] Invisible satellites are Chinese companies (only extraction) operating under the radar of the public. They are unofficially and invisibly affiliated to large Chinese operators in the industry. They are believed to engage in environmentally harmful logging practices and to employ large numbers of Chinese workers in all levels of employment. Their prime objective is to extract logs for export to China. Space limitations do not allow a detailed discussion of these 'satellites' in this report (see Terheggen, 2010).

[20] See e.g. Bosshard (2008), Gill and Reilly (2007), Terheggen (2010), Yang (2008), and Section 5.4.1

5.2.1 Skills - production cost penalty

Skills can also be discussed from the perspective of a production cost penalty, especially one that contributes to the erosion of resource rents in processing. Earlier sections briefly mentioned that skilled labour and know-how are important factors of production. This can be reflected in the distribution of production costs. Anecdotal evidence suggests that wage costs can make up a quarter of total production costs in a vertically integrated logging-processing company. Other major cost items are capital goods (20%), transportation (14%), customs (22%), and taxes (10%). In comparison, it was suggested that logging companies' costs fall into four categories each comprising roughly 25% of the total: i) forest management (taxes, logging, storage, infrastructure), ii) inputs (machinery, gas/petrol, labour), iii) transportation (domestic), and iv) customs (all duties and fees, phytosanitary certificate).

In general, Gabon is described to have a rigid labour market with constrained access to skilled labour due to underinvestment in education and training (Grau, 2008; Wunder, 2003). All companies interviewed in Gabon also report a lack of both skilled and semi-skilled Gabonese labour. For instance, one interviewee explained, "We would like to fill our senior positions with Gabonese, but … we cannot find skilled labour in Gabon …". The existing labour pool was judged to being not motivated, e.g. "Gabonese labourers need a change of attitude", or in fact as being "lazy". Due to this shortage of domestic skills, the required personnel are recruited from abroad (Table 7). Foreign labour is chiefly present in senior positions (management, technicians), which are most often sourced from Europe and/or Asia (depending on the ownership of production). Foreign labour in administrative positions, in transportation, and in production/processing (labourers) is most frequently sourced from other Central African countries.

Table 7: Distribution, origin and cost of labour (percent, EUR, XAF, n = 14)

	Distribution	Origin		Cost	
	(percent)	*(percent)*		*(EUR)*	*(XAF)*
		Gabon	Foreign		
Management	7	24	75	5,700	3,750,000
Technicians	4	59	41	1,600	1,030,000
Administration	6	87	13	700	460,000
Labourers	74	84	16	300	220,000
Transport	6	70	31	800	500,000
Environment & Social	2	74	26	600	410,000

Source: Author's data collected during fieldwork November 2008 – February 2009
Notes: 1 XAF = 0.001524 EUR (fixed exchange rate)

Table 7 also shows that managers and technicians are paid substantially more than labour in other positions. In contrast to labourers, the position most frequently filled with Gabonese staff, management staff and technicians earn 19 and five times as much respectively. The strategic importance of transportation (see below) is reflected in drivers' wages, as these are twice as much as those of labourers in production/processing. Relatively high wages (vis-à-vis labourers) in administration

and positions regarding environmental and social issues could reflect higher skill levels but also scarcity.

The OECD (2008) described the state of Gabon's education and training sector to be alarming. According to the report, the sectors are characterised by high inefficiencies and under-organisation, resulting in overcrowded classrooms. Teaching programs are not adequately adapted to produce skilled labour required by the private sector. It is believed that more than 80% of technical graduates are not employed in the sector for which they were trained. As a result, the "lack of qualified and trade workers weighs on factor costs (substantial wage bill and training costs) and results in a lack of competitiveness …" (p. 326). It should be noted that wage rates for labourers in Gabon, a major oil exporting country, are approximately two to three times higher than those in neighbouring countries. 'Inflated' wages hence add to the production costs and reduce competitiveness.

In sum, wage costs are a major cost item, which can be assumed to increase as companies participate in processing sub-sectors (compared to logging) both because of an expanding workforce and because relatively more skilled labour, which is scarce and expensive in Gabon, is needed. An absence of domestic skilled labour is thus a cost penalty to companies in Gabon in general and processors in particular. Moreover, given the importance of financial capital, among others to source skilled labour, large-scale companies should find it easier to bear the 'skill' cost penalty. This could also be an explanation of the limitation of relatively smaller Gabonese-owned companies to the sawnwood sub-sector.

5.2.2 Skills - education and research

The following statement, extracted from a publication more than 30 years ago, still adequately describes the scientific landscape of Gabon: "The institutional framework for forest research in developing countries is determined to a great extent by economic and political situations as well as past colonial history" (Iyamabo, 1976, p.-). More specifically, "Agriculture in Gabon has traditionally been overshadowed by more economically attractive sectors such as mining and oil, with the result that the country's agricultural expenditures [including forestry] and researcher numbers have remained exceptionally low compared with many other African countries" (Stads et. al., 2004, p. 7). Consequently, there is a shortage of trained scientists at domestic scientific institutions. For example, the Agricultural and Forestry Research Institute (IRAF), which is part of the National Scientific and Technological Research Center (CENAREST), has 22 full-time researchers for four departments, including one of forestry science (Stads et. al.; Solem, 1997).

The same holds true for educational institutions like the Schools of Forestry at the University of Omar Bongo and the National Water and Forestry School (ENEF) at the University of Masuku, where the output of skilled labour for industry is constrained, because "graduates [of ENEF] aim for jobs with the Ministry [of Forestry] since they are unwilling to work and live on-site [at logging and processing units]". Another logging company representative remarked that the state-initiated apprenticeship system failed because "the majority of money was lost to various sources *but*

training" (emphasis added). Whereas a representative of ENEF complained about companies unfamiliarity to train students (e.g. through internships)[21], management staff at timber companies said that they do not have the time and financial resources for an apprentice, next to fear of poaching by other companies. Most commonly, labourers are trained on the job by existing staff and 'imported' from abroad as discussed above.

During our research, we identified two companies (TEREA and SYLVAFRICA), whose expertise lays in technical knowledge of forest management systems. During fieldwork, the dominant type of work undertaken was the mapping, inventory taking and production of forest management plans required for the concession application process. Yet, services might also include the training of staff at logging companies, for example, in techniques of chainsaw log cutting. Both knowledge-intensive service providers are foreign-owned and dominantly staffed with expatriates. It is not know to which degree 'foreign' expertise is transferred to the domestic workforce. Nonetheless, anecdotal evidence suggests self-employment of trained domestic workers is usually made impossible due to the industry's high entry barriers, especially the availability of financial capital.

5.3. Infrastructure - production cost penalty

Costs for domestic transportation of logs and wood products make up a substantial part of total production costs varying between 14% and 25%. There are three ways to transport logs and wood products, each with different unit costs: a) via road ≈ FCFA 75-85 m^3/km (€0.11-0.13 m^3/km) with unit price depending on road conditions and increasing with distance, b) via river ≈ FCFA 10-20 m^3/km (€0.02-0.03 m^3/km), or c) via train ≈ logs FCFA 60 t/km (€0.09 t/km) and wood products ≈ FCFA 88 t/km (€0.14 t/km) with unit costs decreasing with distance (Author's data). Transportation via railways with the Transgabonese railway is limited as it consists of a single track running the length of Franceville (in the Southeast of Gabon) to the industrial centre Owendo in Libreville (the capital located in the Northwest of the country). Waterways are only an option for logs and largely constraint to species that float on water.

Gabon has the poorest road network density of the Central African region (around 30 metre per square kilometre), with its network being limited to four major roads linking the interior with Libreville; the second largest urban centre Port Gentil is not accessible via road (Appendix-Figure 6). The total road network consists of 9,170 kilometres, of which roughly 10% are surfaced and mostly located in urban centres. There is only one main access road to Libreville, where most logging and urban processing companies are located, and which has the biggest commercial port of Gabon. It can take up to four hours to pass the 12 kilometres long stretch of road leading into Libreville. Road infrastructure is not only limited in length but also described to be qualitatively inadequate and poorly maintained (Grau, 2008; OECD,

[21] The interviewee said that the provided education is insufficient, both due to a lack of practical experiences for their students and the school curriculum. The school once cooperated with GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit), now with the FLEGT programme and one university in France. However, the interviewee felt that further foreign input is required on an even larger scale to improve the school's standards. The interviewee thought that "the Chinese' consider co-operation with the School as too expensive and unnecessary".

2008, 2009). Wunder (2003, p. 32) writes about transportation in rural areas, "Unpaved roads are often impassable during rains, thus making transport and commercialisation of products highly unpredictable". Similarly, the World Bank (2008) concludes that the lack of adequate road networks inhibits domestic trade and agricultural development (including forestry).

The high costs of road transportation are a direct result of inadequate transportation networks, poor maintenance of existing roads and road congestion. For example, one company representative complained that due to the high number of road accidents (as a result of poor road conditions) and on-site repairs during transportation, the actual number of 'working days' of a truck is reduced from theoretically 25 to 15 days a month. A transport company estimated that only 5 out of 12 trucks are on average in use due to repairs or damage. Given the high costs associated with transportation, companies often try to overload trucks to around 40 cubic metres, from the usual 30 cubic metres, which further increases the risks of accidents and breakdowns.

Road transportation of logs and wood products is either carried out by companies' own trucks/drivers or outsourced to transport companies. Profit rates in the transport sector are close to or nil. Lastly, transportation costs are pushed up because of the need to pay bribes to the police. The bribes were estimated to be around FCFA 80,000 (€122) per truck and month. Total amounts spent can surpass tax expenses of transport companies.

The Forestry Codes (§232) recommends that processing units should be in proximity to companies' respective forest concession. It can already be noticed that recently established processing units are indeed inland and close to the extraction site. There are also a great number of previously established processing units in Libreville and to a lesser extent in Port Gentil. However, the existing physical infrastructure was designed to transport logs not wood products. Transportation by road (trucks) and train will have to be adapted to transporting wood products if forward linkages are expanding. It is also questionable whether the existing harbour infrastructure, designed for Okoumé logs that float, is able to handle increasing volumes of wood products. The least costly mode of transportation via waterways is also no longer an option for transporting wood products, or has to be adequately changed (e.g. boats with large, open platforms) to also cater to processors. In general, both the 'rural' and urban traffic is increasing since the introduction of the Forestry Code and due to an expansion of production as a reaction to Chinese log demands.

5.3.1 Soft infrastructure

The overall ranking of Gabon in the 'Doing Business' report published annually by the World Bank (www.doingbusiness.org) is 156 of 183 economies (in 2011) and shows a downward trend. Next to an absence of skilled workers and adequate physical infrastructure, private industry is constrained through Gabon's current state of soft infrastructure such as electricity, corruption, customs regulations and access to finance. Although the direct impact of deficiencies in soft infrastructure cannot be qualitatively measured both as a cost penalty or as a blockage of the creation/expansion of forward linkages, there exists a uniform agreement among

industry experts and actors of the timber industry that the business environment is poor, that it does impact on production costs, and that it leads to inefficiencies.

The finanicial sector of Gabon is described as poorly developed (OECD, 2008). Logging and processing companies in Gabon report that financial capital is largely imported or needs to be supported by international organisations. Access to capital is generally relatively easier for larger than for smaller industries in the timber sector. Interviewees also pointed out that vital services in the industry are provided by state monopolies, such as SEPBG (Société des Parcs à Bois du Gabon) handling log and wood product transportation at the port and Comilog (mining company), which acquired the rights to manage the Transgabonese railway. Despite the termination of other state-owned monopolies, like the energy and water company SEEG, these were often replaced with private monopolies without noticeable improvements in quality (OECD, 2009).

The judicial system of Gabon seems to be erratic and in need of further structural reform (following the harmonisation of corporate law in 2006 and the implementation of competition-monitoring mechanisms; see OECD, 2008). The OECD recommends, "efforts must be continued in the fight against corruption and in strengthening the legal and judiciary system in order to create an environment favourable towards the development of the private sector" (2008, p. 328). It further states that "Gabon's regulatory and judicial framework hamper business activity at a time when falling oil prduction requires the country to diversify …" (2007, p. 278).

5.4. Sector-specific policy - Forestry Code

The Forestry Code is a direct driver of forward linkages in Gabon's tropical timber industry. In fact, the Forestry Code aims to stimulate a forward linkages approach to development. In more detail, the new concessionary system requires companies operating at an industrial scale (so-called CFAD - *Concession Forestière sous Aménagement Durable* concession holders) to process logs domestically. The allocation of a concession is further depending on companies' proposed forest management system. The new tax system also provides incentives for producers and processors to apply sustainable management practices and penalises the exportation of logs (rather than wood products). Export quotas for logs are only assigned to companies with processing capacities. The domestic processing requirement was set at 75% of total log production.

An immediate consequence of the introduction of domestic processing requirements in 2001 has been the increase in sawnwood production. The upshot of sawnwood production between 2004 and 2005 is clearly visible in Figure 8 (taking into consideration a gestation period of acquiring and installing new sawmills). Between 2004 and 2007, the export volume of sawnwood rose by around 130%, of veneer sheets by nearly 90%, but the export volume of plywood decreased by over 40%. This information correlates with data presented in Figure 9, which demonstrated that most (Chinese, Malaysian and Gabonese) sawnwood processors established their sawmills after the introduction of the Forestry Code. Contrastingly, European companies in the veneer-plywood linkage started to process before 2001, which was a period driven solely by foreign market demands, particularly those of European markets.

Statements made during interviews with industry actors confirm qualitative data presented in this report. Several interviewees said that the reason for their 'upgrading' efforts, i.e. the establishment of sawnwood processing facilities, next to the extraction of logs is the processing requirement stipulated in the Forestry Code. One company representative mentioned, "one of the most important national regulations is the processing requirement … we put up new facilities and bought existing ones to meet government criteria". Others said, "we are expanding the production of processed wood to reach the 75 percent quota", "we started to process logs in 2006 due to the Forestry Code, and "our processing unit started in 2008, and we are installing a second one that will start production in 2009, to increase the processed products' share of total exports".

Whilst value, or indeed 'costs', is added to logs in the various processing linkages, the profitability of processing is always lower compared to extracting and exporting logs. The only sub-sector with positive profit margins is plywood, which is protected by higher entry barriers (capital, skills, know-how). The numerical values presented in Section 4 are supported by statements of logging/processing company representatives, who said, "we earn zero profits with sawnwood" or "sawnwood production does not even cover my costs". An owner of one veneer-plywood processing company explained, "we can achieve 50% [i.e. processed log share] but anything beyond is not profitable; … For every one percent increase in processing our production costs double". An industry expert further commented, "the industry likes logs because they are easy to cut and transport … products have to be handled more often and are more expensive to produce".

The processing requirements were also criticised from a technical point of view as "the 25 and 75 shares are based on an ideal rate for Okoumé logs and its 20 to 30 year rotation cycle … other species require longer rotation cycles of an optimum of 50 to 100 years and are much more difficult to process". Indeed, comparing average rates of conversion extracted from interview notes with global averages reveal that only the plywood processors perform at an optimum, those for sawnwood and veneer sheets are lower and vary according to both species and specification (i.e. European wood products are more 'intricate' compared to 'bulkier' sawn woods demanded by China). Nevertheless, the 'economic superiority' of the logging sub-sector persists even after average rates of conversion were adjusted to the global average in our second simulation exercise. In essence, inefficiencies exist in various areas of production (costs).

Lastly, it should be mentioned that the merit of introducing a log export ban (LEB) as done by the government of Gabon in the first half of 2010 is questionable, as "… plenty of studies on this issue have demonstrated the perversity of LEBs, even when they have agreed that LEBs have induced the development of local forest-based industries" (Resosudarmo and Yusuf, 2006, p. 77). The authors, summarising existing research, conclude that countries' total export revenues from forest product exports decreased after LEB's were put in place. Studies also demonstrate that compared to losses in revenue the increase in the number of jobs in processing sub-sectors is marginal. It was also found that LEBs could discourage the adoption of (costly) sustainable forest management practices. Moreover, case studies from

Indonesia, the Philippines and Malaysia have shown processing capacities to increase but inefficiencies in these sectors to rise.

5.5. Political economy

The phase of transition from the previous, unregulated system to the 'new' Forestry Code system is described as "anarchic" (Makak & Mertens, 2009, p. 6) and to discriminate smaller concession holders compared to large (foreign-owned) ones (Author' notes; ITTO, 2005). The ITTO further asserts that the government shows "… signs of fatigue, [and] constraints start emerging, which act as many hindrances for the process and its momentum (p. 7). One Gabonese interviewee described the situation as follows, "Government regulations are a joke as nothing is monitored and the system is totally corrupt". Some producers felt that there is a "lack of political willpower and commitment to support the introduction of sustainable forest management in Gabon" as "there is a lack of monitoring of logging activities", or "there is no cooperation between private industries and the government … We do not get support for sustainable forest management and receive no credits or subsidies from the government".

In general, Gabon's government has a poor track record in the management of resource rents, as described in Section 2, turning the country into a rentier state with an inflated government sector, which has significantly increased reservation wages (IMF, 2005; Wunder, 2003). Resource rents were also channelled into the hands of the political elite, among others, by distributing forest concessions for rent-seeking purposes[22]. Ombar Bongo Ondimba is said to have risen to power in 1967 through strong support from France, and he subsequently installed a political system, where "the Franco-Gabonese elite … exploited the natural resources of Gabon for their personal enrichment" (Yates, 2008, p. 213).

Before the introduction of the Forestry Code (indirectly through external pressure), the government was also accused of weak field monitoring of the timber industry, to having become over-bureaucratised (Wunder, 2003) and to have poor tax collection rates (Collomb et al., 2000). Additionally, the state-owned logging company SNBG[23] was also identified during interviews as actively supporting illegal logging. SNBG supposedly buys logs for exportation from the domestic market that fail to reach girth specifications laid down in the Forestry Code and/or that come from concession holders, who have not paid their taxes (in full). Yet, such logs are routinely 'rubber stamped' by SNBG and enter the market without further questioning.

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[22] It was only after the World Bank exerted pressure on the government of Gabon, in an effort to achieve a higher degree of transparency, that a list of all concession holders plus a detailed geographic map of concessions were published in 2007. These datasets are only available through the website of the Ministry of Finance (as the state agency involved in the World Bank's Structural Adjustment programme). The material is out-dated and shows that a large number of concessions are held by members of the government. One interviewee also pointed out that some concessions belong to administrative and technical staffs of the Ministry of Forestry, who do not necessarily have the technical expertise and capital to manage the concessions effectively.

[23] The management of SNBG, the state-owned company that previously held the export monopoly of Okoumé and Ozigo, is not discussed in this report (see Forests Monitor, 2001; IMF, 2005; World Bank, 2005).

While still maintaining its strong political and economic ties with France, the 'election'[24] of the new president (the former president's son) in 2009 is considered by some to be like "grease to the wheels for Chinese investors" (Sharife, 2009). The recent inflow of Chinese FDI is linked to development assistance, often in the form of interest-free loans and turnkey projects, and is increasingly important to Gabon. It is targeted at the forestry, mining and oil industry, through more focused on the latter two (Alves, 2008; Jansson, 2009). Nonetheless, the government of Gabon is also accused of cooperating with the Chinese government in providing active support to Chinese logging companies' quest for resources.

Put differently, the Chinese government is thought to support the entrance and activities of Chinese timber extractors specifically in tropical-rich countries with weak national governance systems. This is exemplified by the following statement: "China's sources for hardwood log imports reads like a who's who of countries with problems in illegal logging (EIA, 2005, p. 3; Eastin, 2005). The WWF states, "… it is likely that at least some of the major logging companies that supply China [from Gabon] are supported by China's diplomatic effort" (2006, p. 43). Hewitt states, "China … has shown no interest in supporting efforts towards sustainable forest management by enterprises …" and continues, "business might serve to supplement the interests of Gabon's elite as a *quid pro quo* for the latter's complicity in neglecting the social and environmental impact of China's exploitation of Gabon's mineral and marine resources" (emphasis in original, Global Timber, 2010)

5.6. Regional factors

Regional factors in the MMCP context refer to the influence of South African processing industries and knowledge intensive services on other African resource industries. South Africa, based on its own natural resources, has so far gone through a successful linkages-approach to industrialisation. The capacities it developed enable South African firms to also be active in the extractive and processing levels of resource-based activities in other African countries (indeed globally), to be an influential location for further processing of raw materials sourced in Africa, as well as to provide services to other industries. The issue is particularly relevant for mining industries (e.g. gold, copper, diamonds) but not for the tropical timber sector in Gabon. South Africa is only a relatively small buyer of medium quality sawnwood. There are no South African owned logging and processing firms in Gabon. Workers in Gabon's linked service sectors have occasionally been trained in South Africa.

6. Conclusion and policy recommendation

This report analysed the MMCP research hypothesis of potential economic gains derived from the creation and/or expansion of linkages next to existing resource exploiting activities. Seven linkage drivers were selected for consideration: ownership, infrastructure, skills, national system of innovation, regional factors, sector-specific policy, and the nature of final markets. Additionally, the programme

[24] Following 'elections' in September 2009, riots took place in disapproval of the president-elect Ali Ben Bongo, who was accused of electoral fraud, and in protest of France's alleged involvement in the election outcome (BBC News, 2009a-c).

acknowledges the general impact of policy, including political economy, on commodity sectors, as well as the broader industry and macroeconomic environment. The degree of the influence of each driver, measured on a Likert scale, is displayed graphically in Figure 15 and discussed in more detail in this section.

The creation of forward linkages is a direct consequence of the nature of final markets (in an export-oriented, buyer-driven industry). There are clear differences between the two final markets Europe and China qua consumption patterns and market entry barriers (standards). Whereas Chinese industries require large quantities of logs for their booming domestic processing industries European countries increasingly demand wood products. This is because 'Northern' processing sub-sectors are increasingly outsourced to the South due to competitive pressures and substitution possibilities, as well as due to consumer pressures. In simple terms, European market demands drive the creation of forward linkages in Gabon, whilst Chinese requirements block the creation of forward linkages as their focus is on logs instead (given a resource-intensive stage of growth and lack of domestic consumer pressures). Interestingly, Chinese market needs match the current comparative advantage of Gabon in exploiting and exporting tropical logs. Simulation exercises have shown the extractive sub-sector to be of 'economic' superiority.

Figure 15: Key drivers and blockages
(1 = not important, 5 = dominating importance)

MMCP drivers Scale	1	2	3	4	5
Ownership - EU				**D**	
- CN/MY				**B**	
- GA				**'B' (?)**	
Infrastructure			**B**		
Skills			**B**		
NSI = Education and research			**B**		
Regional factors	**-**				
Policy - sector-specific					**D**
Policy - political economy				**B**	
Final markets - EU					**D**
- CN					**B**

Note: D = driver, B = blockage, EU = Europe, CN = China, MY = Malaysia, GA = Gabon

Still, there are differences in producers' and processors' nationalities operating in Gabon and reacting to the demands and nature of final markets. The breadth and depth of forward linkages is thus, albeit indirectly, a function of ownership of production, too. To recapitulate, European-owned companies participate in all three processing sub-sectors, yet Chinese, Malaysian and Gabonese companies activities are restricted to logging and the production of sawnwood. Specifically Asian companies broadened their activities over time rather than to deepen them through the creation of all three forward linkages like their European counterparts do. With respect to Gabonese companies their sub-sector participation seems to be a result of size (below the 'economic' optimum), access to technology and capital. In contrast, Asian companies at times argued that a lack of know-how impedes their participation in forward linkages, yet 'motivation' seems to be an even stronger influencing factor.

However, it is not plausible to argue with an inherent Chinese (or Asian) characteristic that would explain differences vis-à-vis European and Gabonese companies. It is rather a result of cross-influences from the nature of final markets and companies' date of entry (as it is for all producers).

For instance, French-owned companies, or first-wave investors of the 1980s, initially concentrated their activities on the extraction of timber when demand from France for tropical logs was still strong. European companies in Gabon extended their range of activities to the processing level due to the changes in European consumption patterns in the 1990s. More specifically, rising wage costs in Europe, possibilities of substitution and rising public concern about the sustainability of log consumption led to a fall in European processing activities, which were outsourced to tropical-rich countries instead. Given the dominance of Okoumé, a species with wood fibre characteristics ideally suited for peeling (a method to produce veneer sheets), and the fact that processing industries in France had already specialised in the production of plywood (made of veneer sheets), French-owned logging companies in Gabon vertically integrated these two linkages to their activities. Plywood was the dominant wood product of total exports during this time. Access to capital, knowledge, technology and other factors of production enabled these companies to react to changes in final market requirements.

Chinese and Malaysian companies, on the other hand, entered the tropical timber industry specifically to fill log resource gaps 'at home' and at a time when the Chinese market was dominating the global industry qua levels of consumption and processing capacities. China has replaced the OECD countries, such as France, as the dominant importer of tropical logs. Chinese absolute consumption levels are sufficiently large to have a non-marginal influence on global production, trade, and to some degree price. Domestic tropical log shortages are filled with imports. The entrance of Chinese and Malaysian traders and logging companies in the Gabonese timber sector coincides with a 'new' Sino-driven period of the industry. Chinese companies in Gabon, in some cases linked to Chinese processors and/or large Chinese TNCs in China, define their sub-sector participation according to Chinese industry needs for logs. For these companies and Malaysian-owned ones entrance to the Chinese markets is also more facile and the most economically rewarding activity.

There is at least one Chinese company, which produces veneer sheets specifically for the European market (and which confirmed during interviews that they are considering FSC accreditation). This could be a supporting indicator of the dominating importance of final markets as 'new' producers eventually react to changes and/or differences in markets. In other words, it could be the case that once Chinese companies re-orientate their Gabonese-based activities directly towards non-Asian markets, the nature of their (sub-) sector participation changes accordingly. At this point, such a statement is speculative based on anecdotal evidence requiring further research.

Gabonese companies entered the domestic timber industry during a period when European buyers were the most influential force and began to increasingly demand wood products instead of logs. The bulk of their activities concentrated on the extraction and exportation of logs first to Europe and now largely to China. Their sub-

sector participation is limited to the logging and the sawnwood forward linkages. This is a function of their size (of concession areas), which makes it more difficult to operate at an economic optimum, and of access to financial capital. Gabonese companies have no networks to foreign TNCs, from which they could import skilled labour, know-how, and other factors of production allowing their participation in other parts of the sector. In a sense, the dominant demand for logs might play into Gabonese companies' hands, who appear to have struggled to access European markets and to develop the necessary capabilities but who can access the Chinese market with lower entry barriers instead.

The Government of Gabon initiated major reforms of the timber industry in the late 1990s to early 2000s, most strongly symbolised by the introduction of the Forestry Code in 2001. These reforms were driven by the need to diversify in light of falling oil production and by strong external influences from important creditors and export markets underlining the importance of transparency, sustainability, and environmental impacts of logging activities, as well as of industrialisation of non-oil resource sectors to foster economic growth. It was hence driven by a belief in a forward linkages approach to industrialisation, especially domestic value-addition and employment creation. The Forestry Code sets explicit domestic processing targets and provides tax-incentives to encourage domestic processing activities. As a reaction to processing requirements, the industry substantially increased its production of sawnwood, to a lesser degree of veneer sheets, but almost not at all of plywood. It is for this reason that the Forestry Codes is a sector-specific policy driver of the expansion of forward linkages in general, and the sawnwood sub-sector in particular.

In early 2010, the state also imposed a log export ban to further stimulate domestic processing. The reaction to the log export ban cannot be covered with primary data. Yet, research carried out in other tropical countries shows that log export bans generally fail to deliver, or only at substantial economic costs. These research results were confirmed by simulation results presented in this report. It is unclear what motivated the introduction of the ban and on what 'economic' grounds the decision was made.

Even though the Forestry Code stimulated industry actors' participation in the sawnwood processing sector, the legislative reform is criticised for technical reasons. For example, domestic processing requirements are based on average conversion rates of Okoumé logs and forest management cycles on the average growth rate of the same species. Moreover, the capacity and capability of the government to enforce the Forestry Code is questioned. It was also shown that the government has a poor track record of resource rent management, and that it is actively supporting illegal logging. It has failed to create a stimulating business environment for private industries, which is additionally 'penalised' by monopolistic infrastructure providers and inadequate soft infrastructures.

In sum, many of the blockages to the expansion of forward linkages are a direct consequence of the absence of stimulating policy, the provision of soft and physical infrastructure, as well as shortcomings in the educational sector and labour markets. Simulations results indicate that only high resource rents in extractive industries are able to absorb existing inefficiencies, whereas these are diluted in most processing

activities. The variables leading to inefficiencies are thus processing cost penalties and blockages to a deepening of forward linkages.

6.1. Developmental impacts and policy recommendations

The full absorption of resource rents by the state is not desirable, because of the current political climate and the frequent failure to allocated resource rents into productive activities (or indeed the general public). Based on this, a more direct deployment of rents by private industries seems to be a better option. It could thus be argued that with regard to employment creation it might be beneficial to continue to enforce the expansion of processing industries, i.e. to come to a trade-off of inefficient processing but higher employment rates. This would also mean that current resource rents which are often absorbed by large foreign companies (and thus exported abroad) and/or by individuals in light of rent-seeking behaviour, would be transferred into the domestic economy through inefficient processing, because resource rents are converted into domestic production costs including employment. Following this line of reasoning, the creation of forward linkages by French companies (independent of government intervention) can be regarded as having been a positive socio-economic development. The previously dominant silviculture system *Méthode Okoumé* did not result in deforestation (Wunder, 2003), as logging had been restricted to a few species.

The comparative advantage of Gabon's timber industry lies in the availability of natural resources rather than in other factors of production. In other words, exploiting and exporting logs allows the appropriation of natural resource rents that are often diluted in the processing sub-sectors (except plywood). Chinese industries' demands for natural resources thus complement Gabon's current endowments. From an economic point of view, the trade relationship with China is a win-win situation for Chinese industries, the Gabonese state, and many private companies of the tropical timber industry in Gabon. Nonetheless, parts of the total resource rents are probably being exported abroad. Chinese and Malaysian firms, especially invisible Chinese 'satellites', are also accused of employing over-proportional large numbers of Chinese workers and of unsustainable logging methods (see also Terheggen, 2010). The socio-environmental impact on forest ecosystems and forest communities is unclear. Still, the intensive margin of production has increased already.

It is also not known what the reaction of industry actors will be if domestic processing requirements are enforced (as done by the introduction of the log export ban). In the past, some European- and Gabonese owned companies were taken out of production as production costs made a continuation unprofitable (subsequently bought by Chinese companies that do not face environmental compliance costs, that are less strictly monitored by the public, and that may receive state support, e.g. in the form of cheap capital, and/or a protection from domestic monitoring by the Gabonese state). Given the unprofitability of processing activities (at least to a degree required by the Forestry Code) it might induce even more industry actors to exit the industry, in particular those that are currently focused on serving the Chinese market. In crude terms, the forced participation in forward linkages and forced beneficiation could actually decrease the number of total industry actors with possible consequences on total employment, tax revenues, and foreign exchange.

It is for the above reasons that a sequencing of a forward linkages approach to industrialisation should be considered, which is complemented by changes in education, the labour market, the financial and business environments, as well as soft and physical infrastructure, next to an enhanced exploitation of Gabon's vast forest ecosystems. In more detail, current windfall gains could be invested into the extractive level of Gabon's forestry industry. Physical infrastructure, education and enforcement of regulations regarding resource sustainability are goods and services that the government can provide in support of the forestry industry. At the same time, it may create the foundation for an expansion of industry activities into profitable processing activities at a future point in time and after existing cost penalties were abolished or at least substantially reduced.

An expansion of forward linkages should be pursued given an increase in efficiency, because of the benefits associated with a linkages based approach to development in general, and because China will eventually exit its current resource-intensive stage of growth, thus also impacting on the comparative advantage of Gabon. Investments into sustainable extractive industries will profit future expansions of processing industries, which make use of the same inputs as the logging sector, but which is currently at a stage where it could not absorb such provisions.

Lastly, the monetary potentials of holding forest ecosystems are not well exploited at the moment. These potentials are the United Nations REDD programme (Reducing Emissions from Deforestation and Degradation, see http://www.un-redd.org) and (eco-) tourism. Both lay outside of the analysis of this report but should be explored in the future. The same holds for backward linkages to producers of capital goods and providers of services, which do exist to a certain, albeit often basic, degree in Gabon.

Based on discussions in preceding sections of this report and existing research outcomes with respect to linkages and resource-based industrialisation, a number of policy recommendations follow:

- The log export ban should be lifted, as it is highly unlikely to support the goals of domestic 'value-addition' and employment creation set by the government. In fact, it probably adds 'costs' that outweigh gains in employment and foreign exchange earnings.
- The Forestry Code should be reviewed and possible revised, particularly regarding quantitative targets and prescriptions that have previously been based on Okoumé rather than an appropriate mixture of Okoumé and other hardwood species exported in large numbers. A step-wise increase in domestic processing targets could be beneficial as it allows a sequencing of activities along the realities of Gabon (education, infrastructure, etc.) and private industry (e.g. the development of dynamic capabilities).
- Enforcement of any regulation is only possible with trained personnel and in a non-corruptive environment. Both variables, plus lack of vehicles for government staff, are insufficient to enable the monitoring of regulations set by the government. The transition towards the new Forestry Code period of production was labelled 'chaotic'.
- The sustainability of log production should be guaranteed despite (or especially because of) the increase in the intensive margin of production. Log

production takes part in a forest ecosystem that needs to be preserved for future generations.

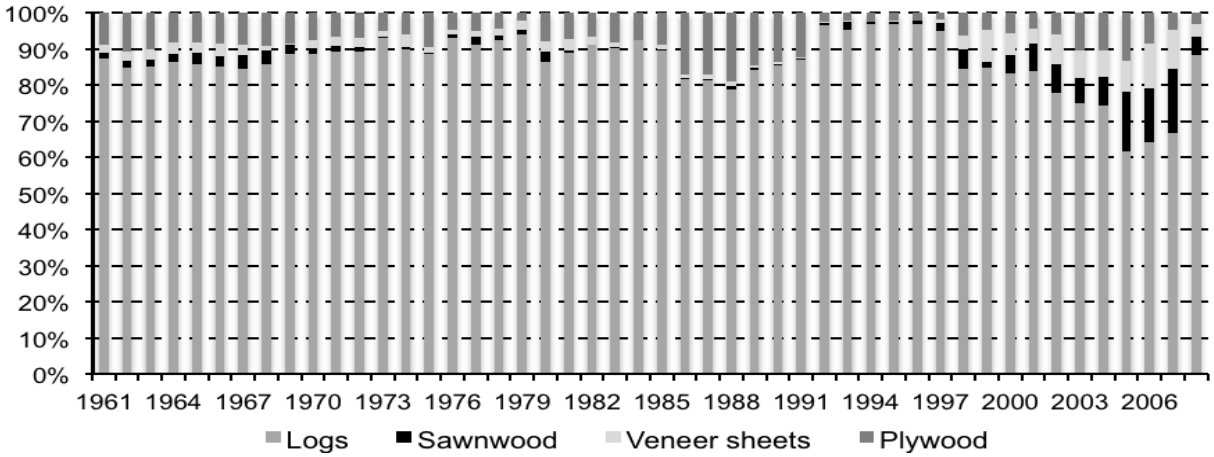
- Physical infrastructure is a vital part of the functioning of the forest industry and should be drastically improved to reduce the cost burden and congestion of log transportation, as well as to prepare for the possibility of increasing volumes of wood product transportations.
- The provision and quality of soft infrastructure, especially access to electricity and water, needs to be improved as well. The continuous reform of the judicial and financial sectors should remain a priority.
- Services such as support of private companies to become FSC/OLB/etc. certified are currently almost absent. Such services could be provided by government agencies (possibly in co-operation with regional/international bodies or organisations) in direct support of private companies. It is fact that private standards are non-tariff barriers to trade dynamic in nature (e.g. in particular regarding the continuation of pressure exerted by Northern consumers, industries, and states on Chinese industries, which will thus be of importance to suppliers in Gabon, too) and of increasing importance.

- There are serious deficits in the availability of skilled workers and training even at the extractive level of production. Therefore, large investments in education, training (and possibly research) are a must. The current mismatch of technical graduates and private industry requirements is alarming. It is a clear sign that the education sector, government bodies, associations, and private industries need to co-operate with each other.
- Skills spillovers through on-the-job training measures currently favoured by the industry need to be further analysed, for instance, the migration of workers from one (resource) sector to another or the knowledge transfer from expatriate to domestic staff.
- Given that Gabon's forests are part of the Congo Basin, it is only reasonable to aim for co-operation in education/training matters with neighbouring states (e.g. via the existing Congo Basin Forest Partnership or other regional bodies)
- One factor contributing to the relatively high wage level prevalent in Gabon is the large 'inflated' government sector that significantly increased reservation levels[25]. A streamlining of the government sector should thus be considered and analysed.
- Overall, the capacity and willingness of the Government of Gabon to decisively stimulate the diversification of its oil-dominated economy, among others through a forward linkages approach of the industrialisation of the tropical timber industry, is questionable (at least to a certain degree), but remains the crucial factor to implement recommendations stated in this report.

[25] See e.g. IMF (2005) and Wunder (2003)

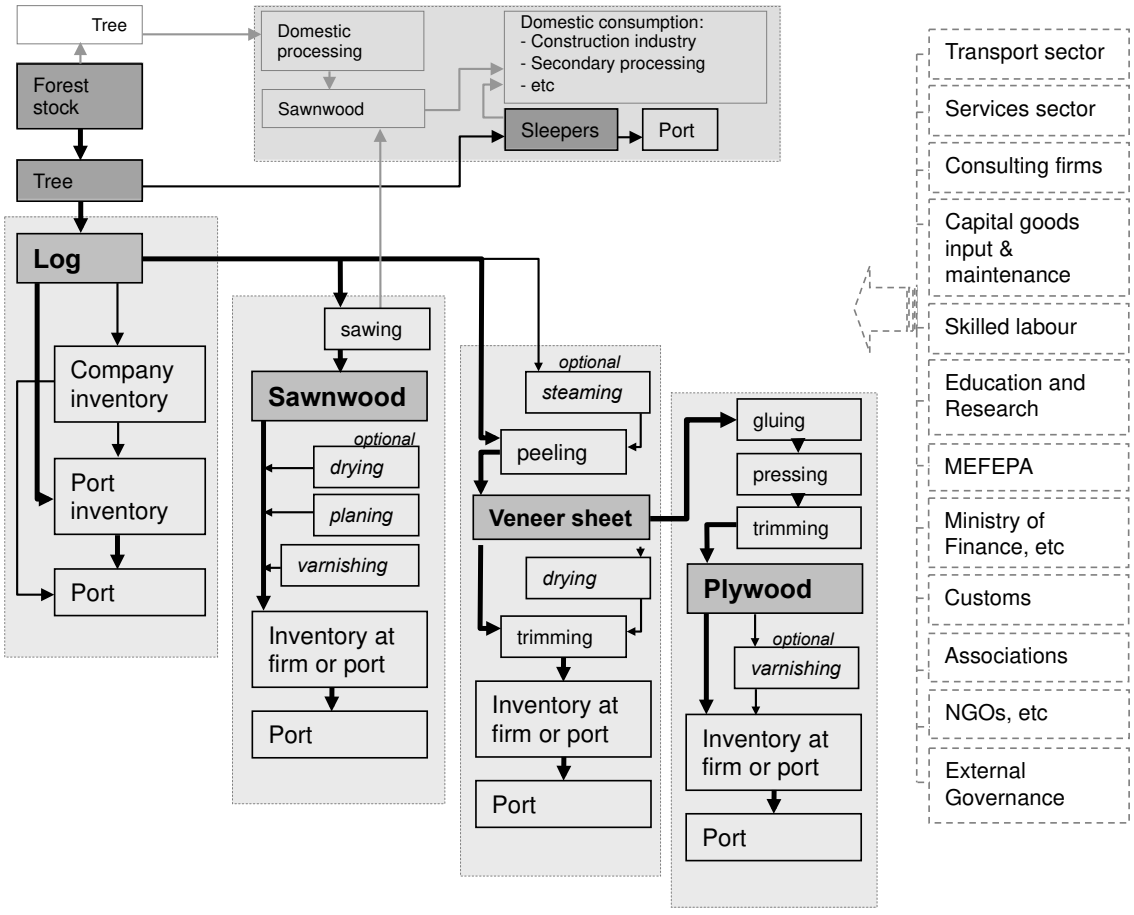
Appendix

Appendix - Figure 1: Export distribution of logs and wood products (percent of total RWE)



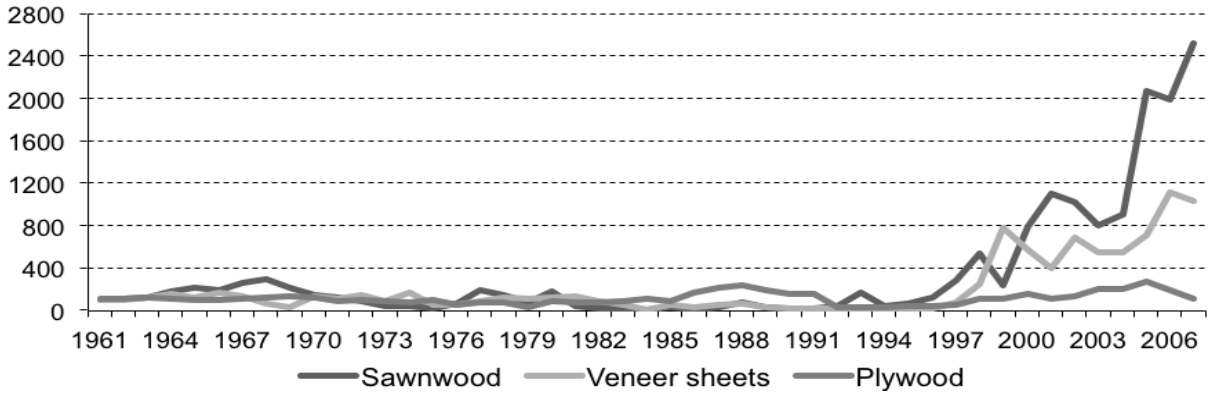
Source: Data extracted from ForesSTAT (http://faostat.fao.org) accessed January 2011
Note: RWE = roundwood equivalent calculated using average conversion rates for Gabon (sawnwood = 0.49, veneer = 0.51, plywood = 0.43)

Appendix - Figure 2: Gabon's tropical timber value chain



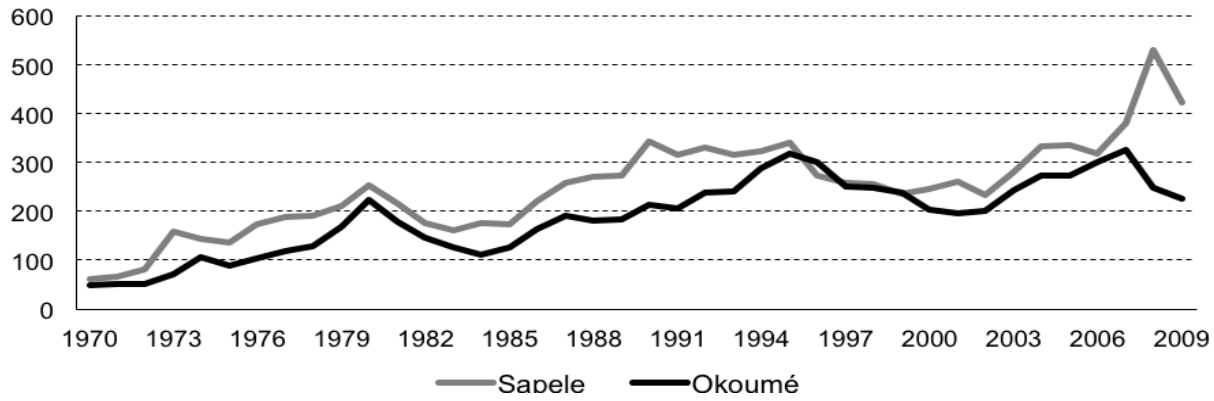
Source: Constructed from author's data collected during fieldwork November 2008 - February 2009
Note: Text boxes with dashed lines give examples of actors external to the value chain

Appendix - Figure 3: **Gabon export index of selected wood products (1961=100)**



Source: Data extracted from ForesSTAT (http://faostat.fao.org) accessed January 2011

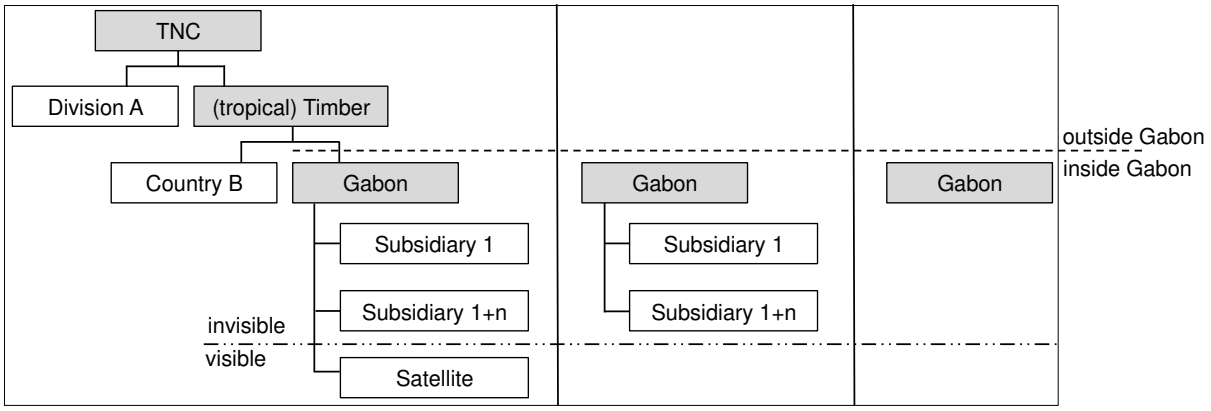
Appendix - Figure 4: Sapele and Okoumé log free market prices (USD per cubic metre)



Source: Data extracted from Commodity Price Statistics (http://unctadstat.unctad.org) accessed January 2011

Notes: Annual averages of free-market prices; Sapele: LM, U.K. import price, FOB; Okoumé: Gabon, superior quality, FOB; Both species are representing global tropical log price movements

Appendix - Figure 5: Types of company affiliations



Source: Constructed from author's data collected during fieldwork November 2008 - February 2009

Appendix - Map 1: Map of Gabon

Source: OECD (2008)

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