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Abstract

The effectiveness of a log export ban policy in achieving the twin goals of conservation and economic development has been vigorously debated by many researchers and policy-makers for the last two decades or so. Despite the abundance of work focusing on this issue that demonstrates the perversity of this policy, many countries around the world still implement it. This paper will, first, review the economic and political arguments on the pros and cons of this policy. Second, it will review the Indonesian experience in implementing the policy in the 1980s and 2000s. Third, using a CGE model, this paper will predict the anticipated impact of implementing the log export ban policy on the national economy and on household incomes for various socio-economic groups.

1. Introduction

Log export ban (LEB) policy aiming to conserve forest covers and to induce local economic development has been conducted by forest rich countries/regions for a long time. Restrictions on log exports from British Columbia-Canada and from Alaska-United States (US) during the early 1900s were probably the first two cases of an LEB policy implementation (Lane, 1998). Since then, more countries have followed suit, despite the existence of opinions questioning the effectiveness this policy. In the last two decades, a significant number of forest rich countries, particularly developing countries, have implemented an LEB policy (Table 1). At the same time, the debate as to the effectiveness of such a policy in achieving the twin goals of conservation and economic development has intensified (Goodland and Daly, 1996; Kishor et al., 2004).

In general the debate is as follows: On one hand, forest managers believe that imposing an LEB policy will encourage the development of local forest-based industrialisation with a strong export orientation. The development of local forest-based industry is expected to create greater value-added as well as more job opportunities in the country (Ehinger, 1992; Vincent, 1992; Azis, 1992). Furthermore, forest managers expect that a country currently exporting large amounts of primary products will increase its exports of forest-based industrial products and thus also its export revenues (Azis, 1992). In the same camp, conservationists believe that an LEB policy is a second best policy to reduce the amount of timber exploitation, since log exports decline, thus reducing the rate of deforestation. And more recently, both forest managers and conservationists see the LEB as a measure that is relatively easy to enact in combating illegal logging, since most such logs are exported.

Table 1. Indicative list of Countries Implementing Log Export Restrictions

Country	Period	%age of world forest ¹	Restriction
US ²	1926 to present	6.62%	Ban of export of logs taken from federal lands in Alaska
	1990 to present		Forest Resources Conservation and Shortage Relief Act (1990): 100% export ban on logs from Federal lands west of the 100 th meridian, except timber surplus to needs, and 1995 ban on log exports from State and other public lands (excluding Indian land) west of the 100th meridian.
Canada ³	1906 to present	6.32%	Restriction on log exports from British Columbia, Variety of Federal and Provincial regulations regarding the export of logs.
Bolivia ⁴	1974 – 1996	1.42%	Log export bans
Brazil ⁵	1969 to present	14.06%	Log export bans
Cameroon ⁶	June 1999 to present	0.62%	Log export restrictions in the form of a progressive increase in the share of annual cutting going to local processing
Costa Rica ⁷	May 1986 to present	0.05%	Log export bans
Ghana ⁸	1972, extended in 1979 and 1994 to present	0.16%	Log export bans. A ban on all exports of raw logs has been decreed, beginning in 1994.
Indonesia ⁹	1980 – 1992	2.71%	Log export bans
	1992 to 1998		Prohibitive tariff (replaced the log export bans)
	November 2001 to mid 2002.		Log export bans re-implemented.
Papua New Guinea ¹⁰	1994 to present	0.79%	Log export bans quota, now replaced by export duties.
Malaysia ¹¹	1992 to present	0.50%	Quota on export of log for Serawak.
	1993-1996		Log export bans, from Sabah.
New Zealand ¹²	1993 to present	0.21%	1993 Forest Amendment Act bans export of most logs, chips, and sawn timber from natural forest and restricts harvest to areas with an approved sustainable management plan.
Phillippines ¹³	1989 to present	0.15%	Export bans on all native wood products with the exception of value added products
	January 1999 to present		Logging is banned on slopes of 50% gradient and over 1,000 meters above sea level.
Russian Federation ¹⁴	1999 to present	22%	Licensing and export tax for beech, oak and ash.
Vietnam ¹⁵	1992 to present	0.25%	Ban on export of logs and sawn timber for wood harvested from natural forests.
	April, 1992 to present		Prohibition of commercial logging in the remaining natural forests in Northern Vietnam, south-east of the South Mekong Delta, and in the Red River Delta.
Cambodia ¹⁶	September, 1992 to present	0.24%	Cambodia's provisional national council agreed to a moratorium on log exports
Thailand ¹⁷	1989 to present	0.38%	A complete logging ban imposed by the cabinet
China ¹⁸	1998 to present	4.22%	Logging bans

Note:

- ¹ In the year 2000
- ² Lane (1998), APEC (2000), Kishor et al (2004).
- ³ Lane (1998), APEC (2000), Kishor et al (2004).
- ⁴ International Institute for Environment and Development, May 1999, Privatising Sustainable Forestry, A Global Review of Trends and Challenges (<http://www.iied.org>), Kishor et al (2004).
- ⁵ Kishor et al (2004), TED database (<http://www.american.edu/projects/mandala/TED/brazil.htm>)
- ⁶ Kishor et al (2004), August 2003 Edition of hardwoodmarkets.com (<http://www.hardwoodmarkets.com>) “Africe-Cameron-75% reduction in log exports”.
- ⁷ Kishor et al (2004).
- ⁸ TED database of case study, (<http://www.american.edu/projects/mandala/TED/ghana.htm>), Kishor et al (2004)
- ⁹ APEC (2000), Kishor (2004),
- ¹⁰ FAO (2000), “Asia and the Pacific National Forestry Programmes: Update 34” (<http://www.fao.org>)
- ¹¹ APEC (2000), TED database of case study (<http://www.american.edu/projects/mandala/TED/malay.htm>)
- ¹² APEC (2000)
- ¹³ APEC (2000), “Philippines: Row Rages Over Lifting of Log Export Ban” article in <http://www.forest.org>, FAO (1997), Asia-Pacific Forestry Sector Outlook Study: Commentary on Forest Policy in the Asia-Pacific Region. <http://www.fao.org>
- ¹⁴ APEC (2000)
- ¹⁵ FAO (2000), “Asia and the Pacific National Forestry Programmes: Update 34” (<http://www.fao.org>), “Cambodia’s Future on the Move: A Briefing Document by Global Witness”, March 1998 (<http://www.globalwitness.org>).
- ¹⁶ TED database (<http://gurukul.ucc.american.edu/TED/camwood.htm>)
- ¹⁷ TED database (<http://www.american.edu/TED/thailog.htm>)
- ¹⁸ CIFOR news online No. 35, May 2004 (<http://www.cifor.cgiar.org>)

On the other hand, plenty of work focuses on this issue, demonstrating the perversity of LEBs, although agreeing that this policy induces the development of local forest-based industry. A significant number of these works show that removing it will increase a country’s revenue from forest related industries (Wisemann and Sedjo, 1981; Gillis, 1988; Perez-Garcia et al., 1994; APEC, 2000; Kishor et al., 2004). Some specifically argue that an LEB reduces a country’s export revenue from forest and wood products (Lindsay, 1989; Manurung and Buongiorno, 1997). Some doubt that an LEB can reduce the rate of deforestation and even believe that it could discourage the adoption of sustainable practice in timber harvesting (Deacon, 1995; Dean, 1995; Barbier et al., 1995 check). Although LEBs might increase job opportunities, the number of new jobs is not that significant compared to the loss of revenue from forest related industries (Perez-Garcia, 1997) and these new job opportunities diminish as the severity of environmental problems increases (Dean and Gangopadhyay, 1997).

Recently in Indonesia, the debate on the LEB again became heated among policy makers and individuals interested in the forestry sector. In October 2001, the Ministry of Forestry and Ministry of Trade and Industry enacted a new regulation to ban exporting any logs from Indonesia, making this the second time Indonesia had adopted an LEB policy. The main objectives for its adoption this time are, first, to combat the illegal export of logs and, second, to boost the development of forest-based manufacturing industries. This policy was supported by various NGOs who are concerned that the current rate of deforestation is too high and maintain that one of the main causes for this is the illegal export of logs (EIA and Telapak, 2002). The policy was also supported by business people in the wood processing manufacturing industries, particularly people in

the plywood industry, who face strong competition from China in the world market. They believe significant inputs for the wood processing manufacturing industries in China come from Indonesia (Gellert, 2005; Obidzinski, 2005). An LEB will then force Chinese industries to obtain logs elsewhere, most likely at a higher price, thereby increasing their production cost. Meanwhile an LEB is expected to reduce the domestic price of logs, so making the wood processing industries in Indonesia more competitive.

Last year a new cabinet was formed. The new Minister of Trade, supported by the head of the Indonesian National Planning Agency (Bappenas) and various academicians, plans to eliminate the LEB. The main argument is that it will create a distortion in the economy, so reducing the country's welfare. Debates over the pros and cons of the LEB policy then took place in several forestry forums. The objective of this paper is therefore as follows: First, to review the economic and political arguments as to the pros and cons of this policy; Second, to review the Indonesian experience in implementing the policy in the 1980s and 2000s; Third, using a CGE model, to predict the anticipated impact of implementing the LEB policy on the national economy and on household incomes for various socio-economic groups. It is hoped that this paper will be useful as a comparative case for countries in addition to Indonesia currently implementing an LEB policy.

The organisation of this paper is as follows. Following this introduction is a section revisiting the pros and cons of the LEB policy; including some discussions on the empirical works related to the debates. The next section reviews Indonesia's forestry sector. Then the paper moves on to a section explaining the computable general equilibrium (CGE) model utilised in this paper, followed by a section describing the simulation scenarios that try to capture the possible impact on the Indonesian economy of implementing the LEB policy. Finally there is the conclusion.

2. Revisiting the Debate over the Log Export Ban Policy

The rationale and arguments in favour of and against the log export ban (LEB) policy have been widely discussed in the literature. The debate has encompassed many diverse issues which can be divided into resource-based industrialisation, employment generation, environmental consideration, balance of payment and fiscal implication. This section revisits these debates, which also aims to demonstrate the need to implement a Computable General Equilibrium (CGE) model to analyse them.

2.1. Resource-based industrialisation

The proponent of the resource-based, downstream industrial development argument anticipates that forcing loggers to sell logs only to domestic processing mills would induce a strong development of downstream industry. Furthermore, they believe that by advancing export-oriented, natural resource-processing downstream industries, countries that are currently exporting primary products could increase their value-added (Kishor, 2004).

This rationale is one of the most widely used to justify the log export restriction. It can be traced back to the old strategy of industrialisations to foster higher economic growth. This strategy is usually associated with the old style of import substituting industrial development, protecting domestic industry through trade policies. Some of the LEB regulations even explicitly stated this rationale (Zhang, 1996).

Since the LEB regulation aims to prevent roundwood (log) from directly leaving the country, the domestic processing Industry would not have to compete with foreign processors for access to the local timber supply, which is typically cheap in the case of developing countries (Bran, 2002). The low cost of logs as a raw material for processing industries will expand their scale. Further expansion is also believed to come from new investment in the processing industry.

Figure 1 represents the equilibrium of supply and demand in a country's logging (left) and wood processing (right) sectors. P_0 is the world price of logs; so Q_0 is the total amount of logs produced by this country and Q^D_0 is the part that is sold to domestic processing mills. Meanwhile, the equilibrium of supply and demand in the wood processing industry, associated with the P^{Q_0} price of logs is Q^Q_0 . When an LEB is imposed, the price of logs drops to P_1 ; processing mills hence are willing to buy as much as Q^D_1 which is greater than Q^D_0 but smaller than Q_0 . It can be seen that the LEB policy creates a welfare loss for the country by as much as the A triangle. Meanwhile in the processing industry, this cheaper price of logs and new investment will shift the supply curve to the right, inducing a welfare gain by as much as the areas of B, C and D. The proponent of LEB argues that the welfare gain in the wood processing industry will be larger than the welfare loss in the logging industry.

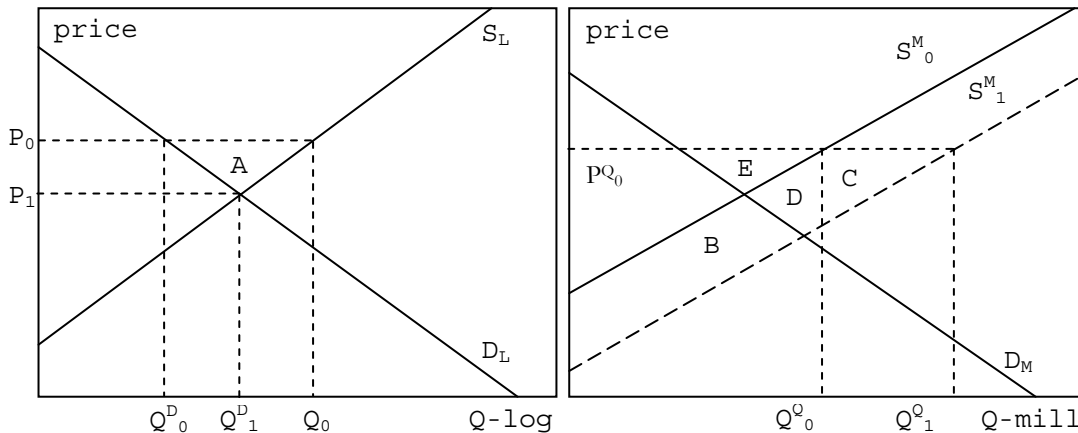


Figure 1. Supply and Demand of Logging and Wood processing Sectors

Another related and relevant rationale in favour of the LEB is the efficiency argument. The lower price of logs as a raw material will expand the size of the industry; and production will move to its minimum efficient scale (Kishor, 2004). Meanwhile, the incoming new capital will increase the capital labour ratio. Following the rise in

marginal productivity of employment, efficiency will improve in the wood processing industry (Lindsay, 1989).

It remains questionable, however, whether or not the shifting of the supply curve in the wood processing industry will significantly occur, offsetting the dead weight loss in the logging sector. Most empirical studies, however, do not support such argument. In the case of the Indonesian LEB during the 1980s, Gillis (1988) predicted that the domestic value added at world prices in the sawnwood industry was in fact minus \$15 per every \$100 of log inputs, since the sawnwood industry became inefficient in utilising the logs. Boscolo and Vincent (2000) also found a similar result when analysing the implementation of the LEB policy in Malaysia, the Philippines, and Indonesia. They found that, although processing capacity did occur, it was in fact established at high economic cost in the form of subsidisation and inefficiency. For every cubic meter of plywood produced, for instance, 15 to 20 per cent more trees had to be cut than would have been the case had the logs been processed by other efficient milling plants in Asian countries. Other cases of less efficient and wasteful processing caused by LEBs are cited in the works by Barbier et al. (1995) and by Dauvergne (1994).

2.2. Employment generation

The employment generation argument is another very widely-used rationale for log export bans. It claims that more people can be employed in processing industries than in logging activities. Export of unprocessed logs may represent the export of employment which otherwise could have occurred in the domestic processing sector. A fall in log prices, accompanied by an increase in value added will increase the demand for labour and the creation of more employment in the manufacturing forestry sectors (Zhang, 1996, Barbier et al, 1995). This rationale is, again, explicitly mentioned in most government regulations implementing log-export restriction. Preserving employment in the domestic wood processing industry had been commonly stated as the rationale for this type of regulation (Johnson et al, 1995, Lindsay, 1989).

As many believe that small-scale industry is relatively labour-intensive, the idea of promoting small-scale industry has also been mentioned by LEB proponents. This argument was explicitly stated in the US Set Aside Act 1958, that the objective of the log export ban was to enable small timber companies in local communities to be competitive with large timber firms (Lane, 1998). In line with this argument, Zhang (1996) also mentioned that some argued that income distribution could be improved as employment in the processing industry would increase and absorb the unemployed and those workers from lower paying jobs.

Again, it seems that empirical evidence does not really support the idea that employment in the economy will expand as a result of export-log ban policy. This is simply because the downsizing of the logging sector will also bring about the contraction of employment. As employment in the processing sector increases, so does unemployment in logging activities (Zhang, 1996). In fact, the experience of log-export ban policy in various countries suggests that the expansion of the processing industry employs fewer people, which in the end undermines this argument (Zhang, 1996).

2.3. Environmental considerations

Concerns, particularly for the high rate of deforestation in developing countries, increasingly became one of the most recent and important rationales for the LEB policy. Environmentalists argue that the market price and quantity of logs does not take into account the fact that the market supply only represents the private marginal cost of logging, excluding its externalities. Externalities associated with deforestation include the ignorance of the use of non-timber forest benefits such as water-shed protection, as well as carbon and biodiversity storage. The inclusion of true marginal social cost should shift the log supply curve to S^L_1 as illustrated in Figure 2, and the socially optimum extraction of logs should be C instead of B, given P_1 as the world price of log. Ignoring what would be the market price of logs, this can be achieved, in the case of Figure 2, by eliminating the entire log export.

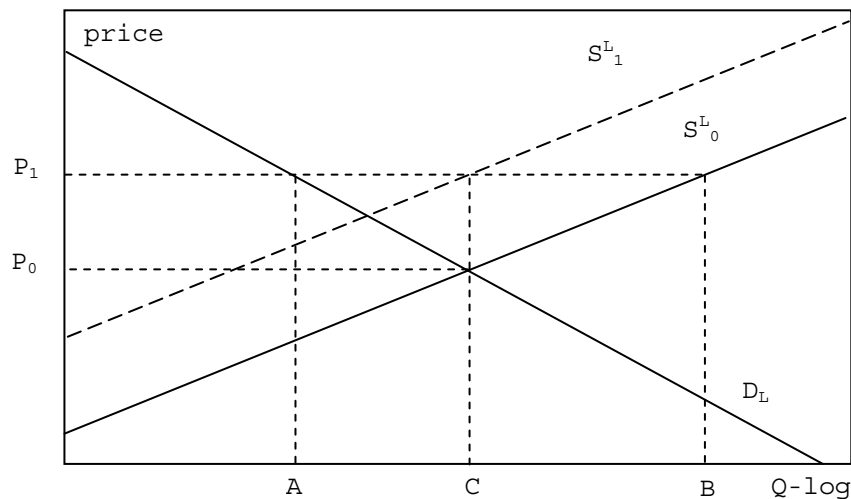


Figure 2. Illustration of the Environmental Concern Argument

Following the reduction in timber exports, deforestation in general is expected to decrease. This idea has recently been formally stated in many LEB regulations i.e. to preserve the existing resource from over-harvesting and improving national forests for future generations (Lane, 1998). It has been viewed as a second best policy tool for addressing environmental externalities. Despite not being the first best solution, the LEB is considered easy to implement (Kishor, 2004). Nowadays, in various countries, LEBs have become traditionally associated with protecting forests from overuse (Bran, 2002).

The environmental argument for the log-export ban seems to be strengthened when linked to the prevalence of illegal logging in various developing countries. In those countries, there is a strong belief that most of the illegal log-harvesting is merely in response to increasing log demand by processing mills abroad which are willing to pay higher than domestic prices. The magnitude of illegal logging is expected to decrease, following the implementation of the LEB, because lower domestic prices eliminate the incentive to conduct such a risky operation.

Despite increasing support from environmentalists, the counter-argument against LEB policy from an environmental perspective is also strong. The theoretical literature on trade and the environment (summarized by Kishor, 2004) does not support the view that LEBs can be used as a second-best policy tool for externality. Less efficient domestic wood processing industries will use many more logs compared to a similar more efficient industry abroad, hence inducing a much higher rate of deforestation. Pearson (2000) further argued that the first best method for dealing with deforestation is with domestic rather than trade measures. Export restriction can create a distortion involving additional costs. Instead of using trade restriction, production or consumption intervention and creation of markets and proper assignment of property rights would be a better approach for dealing with deforestation and environmental problems in general.

Several empirical works also found that the implementation of LEB policy in various countries in fact was not associated with slower deforestation. Kishor (2004) and Dauvergne (1994), for example, argued that the lower log price following the export ban policy may have encouraged substitution of wood for primary inputs (capital and labour), hence increasing demand for timbers and creating more pressure on forests. Moreover, a lower price for timber may create disincentives for forest conservation. Loggers may become more ignorant as to the negative environmental impacts of their activity since they do not see financial gain from conserving forests. As Barbier et al (1995) argued, by depressing timber prices, log-export bans have discouraged the adoption of sustainable practices in timber harvesting and have reduced incentives to adopt more modern technology geared toward increasing wood recovery ratios in timber processing. Lower log prices have reduced relative returns to forestry sectors and have intensified the pressure to clear forested land for competing agricultural crops and plantations. In the case of Indonesia, for example, as Bran (2002) emphasised, the development of the timber processing industry intensified the pressure on Indonesia's forest resources, and aggravated the already significant rate of deforestation.

2.4. Balance of payment implication

The balance of payment implication of LEB policy mainly involves its impact on trade issues i.e. export, fair trade, and foreign exchange earnings. Governments in some developing countries believe that outward orientation of high value-added industries is the best strategy for economic development. This, in addition to other factors, was inspired by the success of the newly industrialised countries such as Korea and Taiwan, where economic openness and their export-oriented machinery and electronic — having a higher value added than primary industries — industrialisation had been proven to be effective in fostering higher economic growth. Thus the LEB is believed to be a good policy to increase the value of exports, since processed-wood products may have a higher value added than primary products. It is expected that the country will accumulate more foreign exchange earnings, a very important resource to finance the import of investment goods for domestic capital accumulation, a necessary element of economic growth¹.

¹ See Fujita and James (1997) for a discussion of export orientation and its relationship to the export of primary products in the case of Indonesia.

Related to trade issues in general, Kishor (2004) mentioned the idea that LEB policy could have been simply a counter-measure on the part of developing countries who believed that their domestic processing industry was discriminated against in the developed country market for various reasons, of which a recent one is the requirement of eco-labelling. LEB policy, then, had been considered as an attempt to protect the domestic processing industry from this “unfair trade”, decreasing their cost of production and making them look much more competitive in the world market.

On the other hand, developed countries, following the export ban of developing countries, will again make a long-run counter measure, since after a while, trading partners will adapt to the policy, making it ineffective. Log importers, such as Japan, for example, may substitute tropical woods for other raw materials, or find an alternative supply such as logs from temperate and other regions. This has made the LEB policy difficult to sustain in the long-run.

2.5. Fiscal implication

Besides higher foreign-exchange earnings, the other rationale for the log export ban policy is related to government budget. It is expected that export of higher value added products in the form of processed woods would generate more revenue for the government budget from higher export tax earnings (Lane, 1998, Kishor, 2004).

The idea that the LEB may prevent the evasion of tax on logging activities which is prevalent in many developing countries also has a fiscal implication. The Indonesian government, for example, put forward this rationale when implementing the policy in 1980s. Timber extraction enterprises were suspected of evading tax from their high export earnings, and the diversion of tax objects from the extraction to the processing industry had been argued to be able to lower the degree of the tax evasion (Lindsay, 1989).

3. Forestry Sector in Indonesia

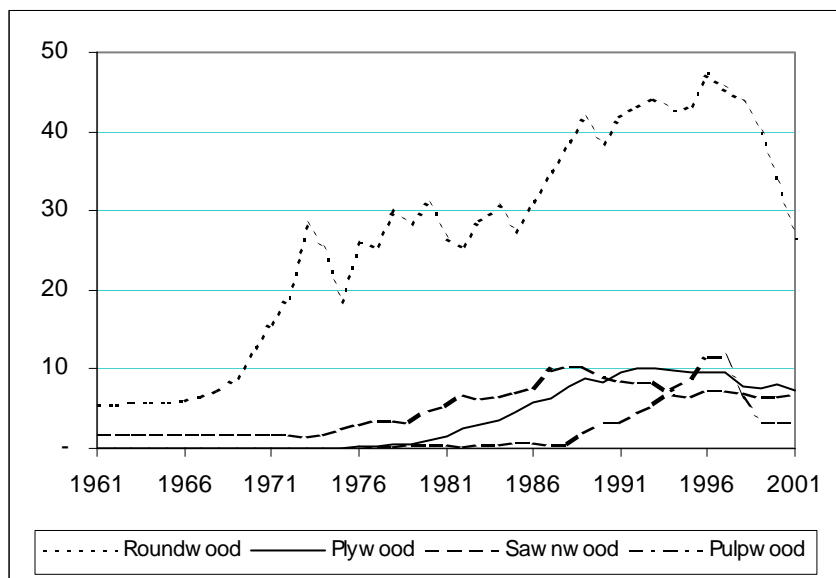
Approximately 10 per cent of the world’s tropical forests or around 144 million ha are located in Indonesia, scattered from the westernmost tip of Sumatra to the eastern border of Papua, occupying approximately 70 per cent of the country’s land area (Barbier, 1998). Therefore Indonesia ranks third — after Brazil and Zaire — in its endowment of tropical forests (Forest Watch Indonesia, 2002). Indonesia’s forests have been one of its most important natural assets. Forestry related activities have provided an important source of formal as well as informal employment for many people and have generated large amounts of both government revenue and foreign exchange (Indonesia-UK Tropical Forest Management Program, 2001).

3.1. Forest Exploitation and Deforestation

Forest exploitation has long been conducted in Indonesia. However, the rate of exploitation significantly increased when Soeharto resumed leadership of the country in 1966–67. The president was quick to realise the potential of the country’s abundant forests. In the first year of his presidency, he enacted the Law No. 5/1967 on forestry,

which put all forests under state control. This law provided a legitimisation for Soeharto to start giving forest concessions (HPH) to various individuals or agencies — many of whom were military officers and institutions supporting his regime,² who then invited foreign partners to join them in exploiting the forests. By 1971, around 80 forest concession permits, mostly in Kalimantan and Sumatra, had been given to various individuals and institutions (Barr, 1998). The number of forest concessions, and therefore their area, kept increasing. As a result, by the mid 1990s more than 500 forest concessions had been allocated, covering around 54 million ha of the country's forest area (Forest Watch Indonesia, 2001).

Figure 3 shows the production of industrial roundwood (log), plywood, sawnwood, and pulpwood (in m³) since 1961. It can be seen that log production significantly increased from the end of the 1960s until the mid 1990s. The sawnwood industry started to take off around the mid 1970s, while the plywood industry was flourishing by the mid 1980s. The pulpwood industry started to grow later on — around the early 1990s — and was able to exceed the production of sawnwood and plywood for several years around mid 1990s.



Source: FAOSTAT (<http://faostat.fao.org/>)

Figure 3. The Production of Several Industrial Wood Products (in m³)

Along with the increase in their production, the contribution of forest-related industries to the national economy also became more significant. By the mid 1990s, it has been conservatively estimated that at least 20 million people depended on Indonesia's forests for the bulk of their livelihood (Sunderlin et al., 2000). The forestry and wood processing sectors accounted for around 4 per cent of the Gross Domestic Product (GDP). The total forestry and wood processing production ranks second — after mining — in

² Later on, in the 1970s, the government also established state-owned logging enterprises

export value, and typically accounts for approximately 10 per cent or around 5.5 billion USD (FWI/GWF, 2002).

It is important to note that log production in Figure 1 does not include illegal logging. Note that illegal logging can take various forms, starting with harvesting logs without any permit to under-reporting practices by legal logging companies. This illegal activity obviously goes hand in hand with bribery and corruption practices (Telapak Indonesia and EIA, 2001). The practice of illegal logging was predicted to increase from the 1970s onwards — a case of *banjir kap* (Obidzinski, 2005). It was estimated that, by the end of the 1990s, three times the amount of logs were harvested illegally than legally (Scotland et al., 1999). The amount of wood harvested from Indonesian forests is most likely much higher than the number in Figure 1.

The direct implication of this significant increase in log harvesting was the acceleration of deforestation. It was suspected that annual deforestation increased from below 0.3 million ha annually before 1970 to 0.6 million annually in the 1970s (Table 2). The number kept increasing up to around 2 and 3.8 million ha annually between 1990 and 1997 and between 1997 and 2000, respectively; i.e. the rates of deforestation during 1990–1997 and 1997–2000 were around 1.4 per cent and 2.7 per cent annually. These figures are higher than the global rate of tropical deforestation in the mid 1990s, which was approximately 0.7 per cent per year (FAO, 1997). Hence, there is an argument that Indonesia needs to make a significant effort to reduce its rate of deforestation as well as to eliminate illegal logging.

Table 2. Estimated Annual Deforestation (in million ha/year)

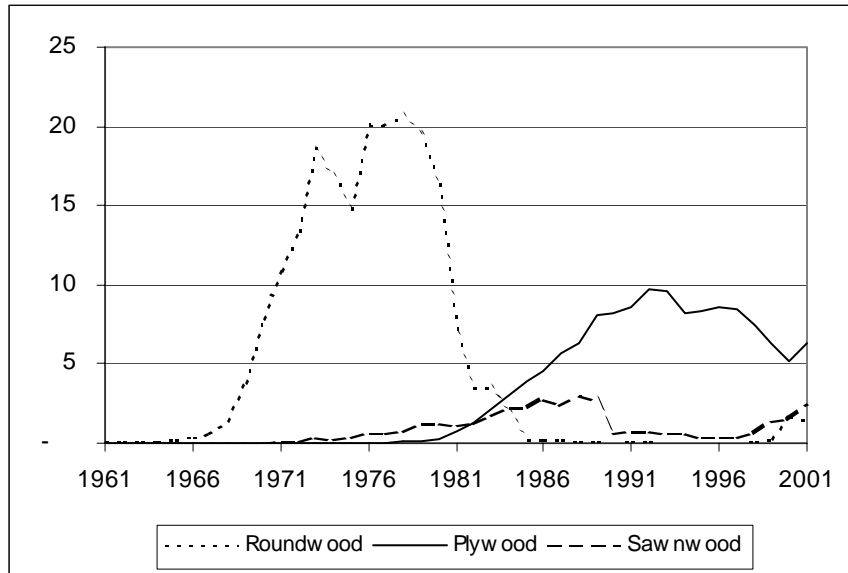
Sources	Period	Deforestation	
Forestry Department	<1970	<0.3	-
FAO (1990)	1970-1980	0.6	0.4%
WRI (1999)	1980-1990	0.8	0.6%
WRI (1999)	1990-1995	1.2	0.9%
Holmes (2000)	1995-1997	2.0	1.4%
Purnama (2003)	1997-2000	3.8	2.7%

3.2. Domestic Wood Processing Industry, Export and The First Log Export Ban

Log exports increased significantly once Soeharto took power (Figure 4). Most of the increases in log production at the end of 1960s were for export purposes. This is understandable. There were not many wood processing industries; i.e. sawnwood and plywood, in the country.

It was only in the early 1970s that domestic sawnwood manufacturing began to increase slightly; while the establishment of plywood manufacturing took place in the mid 1970s. In the late 1970s, the Indonesian government was interested in a more rapid development of domestic wood processing industries, particularly plywood, believing this was the way to receive a higher value-added from the forestry sector. To push more

forest concession holders to invest in the wood processing sectors, the government initially imposed high export taxes on logs. Since this turned out to be only moderately effective, in April 1981 the government issued a log export ban (LEB) regulation. The ban was also accompanied by various subsidies and regulations aimed at the construction of a domestic plywood industry. They included a ban on manual logging and a vertical integration requirement for processing mills to have forest concessions to supply them.³ The plywood industry, indeed, grew from 21 mills in 1979 to 101 in 1985 (Gellert, 2005).



Source: FAOSTAT (<http://faostat.fao.org/>)

Note: No export of pulpwood.

Figure 4. Exports of Several Industrial Wood Products (in m³)

LEB and the vertical integration requirement also made a large number of foreign forest concession owners that were reluctant to invest in wood processing industries in Indonesia sell their ownership to, as well as pushing many military forest concessions into a joint venture with, local business groups — mostly owned by Soeharto's business cronies, such as Bob Hasan of Kalimantan, Prajogo Pangestu of Barito Pacific and Burhan Uray of Djajanti — who had access to low interest credits from state-owned banks. As a result, ownership of forest concessions was concentrated into several business groups; i.e. the 15 largest business groups in this sector owned almost 40 per cent of the total concession area (Barr, 1998), and 64 business groups owned almost 100 per cent (Brown, 1999).

³ The other aim of the LEB is to reduce tax evasion concerning logging activities. At that time, logging enterprises were suspected of evading tax on their high export earning, and it was argued that the diversion of tax objects from the extraction to the processing industry made it possible to lower the degree of the tax evasion (Lindsay, 1989).

To gain a share in the world plywood market, the government forced all plywood companies to join the Indonesian Plywood Producers' Association (Apkindo) headed by Bob Hasan, and provided him with a broad mandate to govern Apkindo as a collective marketing agency with an ability to control the amount and price of Indonesian plywood exports. Bob Hasan then adopted predatory pricing strategies. By the early 1990s Indonesia's share of the world tropical plywood market reached approximately 80 per cent (Barr, 1998). By this time, Apkindo had become the world price-setter in tropical plywood and was claimed to set the price higher than it should have been. At the same time, Apkindo introduced various fees to its members, and channelled the collected funds to other military officers, Soeharto and his foundations, as well as government officials in forestry-related sectors (Dauvergne, 1994; Brown, 1999).

Several works have been devoted to analysing the impact of this LEB on the Indonesian economy. Lindsay (1989), who conducted his observation during the 1981–1986 period, concluded that revenue increases from exporting more plywood and sawnwood were less than the losses in log exports. Manurung and Buongiorno (1997) who conducted an analysis for the 1981–1989 period supported this conclusion. Furthermore they also found that more jobs were lost in the logging operation than jobs were created in the plywood and sawnwood industries. However, they also found that Indonesia received a higher value added from the forestry sector and fewer logs were cut under the LEB regime than without it.

Azis (1992), who also worked on this issue, agreed that during the 1980–1985 period more jobs were lost in logging operations compared to new jobs created in the plywood and sawnwood industries. However, if one considered a longer period of analysis in which the ban also stimulated the establishment of pulp, paper and other wood product industries, Iwan argued that the number of new jobs created would be overwhelmingly higher than the number of job lost in the logging operations.

In 1992, due to external pressure, Indonesia removed the LEB regulation, but replaced it with very high rates of export tax, eliminating the vertical integration requirement. Some tax rates were up to 200 per cent; therefore, log exports remained low. Whether or not the LEB was beneficial for the country remained inconclusive among policy-makers in Indonesia.

3.3. Crisis, Illegal Logging and The Second Log Export Ban

In the early 1990s, the pulpwood industry was established for several reasons. First, the business group involved in the plywood industry, feeling that Indonesia had achieved a dominant role in the world tropical plywood market, were looking to diversify their activities. The thought behind choosing to invest in pulpwood was that this would be a stepping stone to establishing paper industries that would fulfil the increasing demand, both domestic and worldwide, for these products.⁴ Second, the government made vast wood supplies available to pulpwood producers at relatively low prices (Barr, 2001). Some of the large domestic business groups, including the ones in the plywood industry, had their own financial institutions, which were able to access international sources of

⁴ Note timber business groups also diversified their activities into palm oil production.

funding, which were willingly allocated, seeing Indonesia was growing at a rate of over 7 per cent.

Pulp(wood) and paper production hence increased significantly from the early 1990s up to 1997. Since large investment was required to build pulp or paper mills, the ownership of pulp and paper production was very concentrated. Three business groups — Sinar Mas, owned by Eka Tjipta Widjaja, Raja Garuda Mas, owned by Sukanto Tanoto, and Bob Hasan groups — controlled 90 per cent of the total national pulp production; while as for the paper industry, the ten largest paper mills, of which five of them were owned by Sinar Mas, were responsible for almost 70 per cent of the total paper production (Barr, 2001).

It is important to note that the growing number of both plywood and pulpwood companies was creating a crisis in the domestic wood supply; i.e. legal wood production from domestic forest concessions was not enough to fulfil the demand of the wood processing industries (Brown, 1999). These wood processing industries had also relied significantly on the low price of domestic wood. To solve this wood supply deficit, the government produced a permit (IPK) to allow private logging operators to harvest logs from areas that had been slated for conversion for a minimal fee (and no reforestation fee). Meanwhile, plywood and pulpwood companies were also accepting more illegally logged wood, including wood harvested in conservation areas and with less than the allowable diameter (Obidzinski, 2005). Both IPK and illegal logging are certainly not sustainable sources of wood.

It is also important to note that there was considerable debt in the forest-related industry by the mid 1990s, though the exact amount is hard to establish. But one can gauge the size of the debt in this sector from the following partial information. The total investment in pulp and paper industries at that time had been accumulated to around USD 12 billion (Barr, 2001). Most of this was certainly in the form of debt. Also, Barito Pacific who controlled the largest production of plywood had accumulated debts as high as Rp 3.8 trillion (Brown, 1999). Given the fact that the supply of wood would not be sustained at the current rate of demand, investing in the wood processing industry made it a risky investment.

As is widely known, in 1997 the economic crisis hit Indonesia so badly that it required help from the International Monetary Fund (IMF). Before providing the necessary support, one of the Fund's requirements was that Indonesia dismantled Apkindo's export marketing power. By February 1998, Indonesian plywood producers were able to export their panels free from Apkindo's control. On the other hand, they did not have the power to control the world plywood market anymore and at the same time they individually had to face new competitors from China.

The financial crisis placed Indonesia's forestry industries in great turmoil. They were thrown into a severe liquidity crisis. Approximately USD 3 billion of outstanding loans in the forestry sector had to be under the control of the Indonesian government,

through its Indonesian Bank Restructuring Agency (IBRA).⁵ More than half of these outstanding loans were associated with plywood and sawnwood industries, and around 20 per cent with logging companies (Barr, 2001). The financial pressures generated by debts, and also the inability of plywood companies to renew their machinery so as to compete with more efficient mills abroad, particularly in China, significantly contributed to the engagement of logging and wood processing companies in illegal logging activities.

During the period of 1997–2002, China's plywood export doubled annually, and reached approximately 520 thousand m³, almost equalling that of Brazil, the third largest exporter of plywood after Indonesia and Malaysia. In general, China's wood processing production surged. For secondary processed wood products, since 2002 China has become the world's largest exporter, surpassing Italy (Gellert, 2005). As a consequence, with a domestic ban placed on logging in the Southwest of the country since 1998, China also became the world's leading importer of industrial logs. Meanwhile in Indonesia, in addition to the abolition of Apkindo's control on log exports, the IMF also required Indonesia to reduce export log tax rates. Thus Indonesia's log exports have increased since 1998, particularly to hungry mills in China. By 2001, the amount of logs legally exported made up 5 per cent of the total of industrial log products. What is more noteworthy is that mills in China also received logs from illegal logging in Indonesia. It is suspected that this amount is much larger than that of legally exported logs (EIA and Telapak, 2002).

Illegal logging is not at all a new phenomenon in Indonesia, for these activities in various forms have occurred for many years. However, since the mid 1990s, illegal logging has appeared to be more widespread across the country, more open, and its magnitude to have increased. Illegal loggers have also been more eager to sell their logs to foreign buyers, such as China and Malaysia, who are willing to pay more than domestic buyers (Telapak Indonesia and EIA, 2002). However, the amount is still most likely smaller than the amount domestically marketed (Obidzinski, 2005). By the early 2000s, illegal logging was clearly one of the main issues in the Indonesian forestry sector, as the estimated amount reached approximately three times the amount legally harvested, pushing the rate of deforestation to almost double that of the early 1990s.

The Indonesian government reacted to this problem by adopting the LEB policy in October 2001 through a joint ministerial decree between the Ministry of Forestry No: 1132/Kpts-II/2001 and the Ministry of Industry and Trade No: 292/MPP/Kep/10/2001, and later on through government regulation (*Peraturan Pemerintah*) No.34 of 8 June 2002. Besides reducing the amount of illegally harvested wood, the government also wants to protect domestic wood processing industries, particularly plywood, from the tough competitors in China.

Environmentalists who are concerned about the on-going rate of deforestation supported this policy. For different reasons, domestic wood processing business people

⁵ IBRA is a government agency temporarily established to restructure the Indonesian banking system, which, otherwise, would have collapsed due to the country's economic crisis.

also support the LEB policy. They hoped the export ban would make illegal loggers sell their logs only to them, and now at a lower price. With these cheap inputs, they expected to be able to compete with the more efficient mills abroad and still make a profit.

Last year a new cabinet was formed. The new Minister of Trade and the head of Bappenas argue that the LEB should be eliminated, since it creates a distortion in the economy, so reducing the value of timber. The pros and cons of the LEB policy have since been debated in several forestry forums.

4. The Model

To be able to analyse the impact of an LEB policy in the context of the Indonesian economy, taking into account particularly the development of downstream industry, employment and environmental concern arguments, a CGE model for Indonesia is utilised. The CGE consists of six equation blocks (Resosudarmo, 1996), as follows:

- **Production Block:** This block represents the structure of production activities and producers' behaviour.
- **Consumption Block:** This block represents the behaviour of households, government, and companies.
- **Export-Import Block:** This block models the country's exports and imports of goods and services.
- **Investment Block:** This block simulates decisions to invest as well as the demand for goods and services used in the construction of the new capital.
- **Market Clearing Block:** This block contains market clearing conditions for labour, goods and services, and foreign exchange.
- **Intertemporal Block:** This block consists of dynamic equations that link future economic conditions to economic activities in the current year.

In the production block, a nested Constant Elasticity of Substitution (CES) function represents the production technology. On the upper level of this nested production function, output is defined as a CES function of composite intermediate input and value added. On the lower level, intermediate input is a Leontief function of several material inputs (see Resosudarmo 2003). Value added is a function of factor inputs expressed in a CES function. The functions in the production system are as follows:

$$X_i = \alpha_i^x \cdot \left(\beta_i^x \cdot IN_i^{-\rho_i^x} + (1 - \beta_i^x) \cdot VA_i^{-\rho_i^x} \right)^{\frac{1}{\rho_i^x}} \quad (1)$$

$$INT_{i,j} = iomi_{i,j} \cdot IN_j \quad (2)$$

$$VA_i = \alpha_i^v \cdot \left(\sum_f \beta_{i,f}^v \cdot FD_{i,f}^{-\rho_i^v} \right)^{\frac{1}{\rho_i^v}} \quad (3)$$

where:

- | | |
|--------|--|
| i, j | is the index for production sectors |
| f | is the index for factors of production; i.e. agricultural labourers, manual-clerical workers, professional personnel, land and capital |
| X | is the sectoral output |

IN is the composite intermediate input
VA is the composite value-added
INT is the intermediate input
FD is the factor inputs.

There are 62 sectors in the production block (Table 3). The forestry sector consists of Wood, Other Forest Products and Hunting. The forest-based manufacturing sector is disaggregated into 11 production sectors; i.e. sectors number 32 – 42 in Table 3).

Table 3. List of Production Sectors in the CGE Model

No.	Sectors	No.	Sectors
1	Rice	32	Sawnwood Industry
2	Bean	33	Plywood Industry
3	Corn	34	Wood Product Industry
4	Tuber	35	Wood Furniture Industry
5	Fruit and Vegetable	36	Other Wood Industry
6	Rubber	37	Non-plastic Anyaman Industry
7	Sugar Cane	38	Textile Leather Industry
8	Coconut	39	Pulp Industry
9	Palm Oil	40	Paper Industry
10	Tobacco	41	Paper Product Industry
11	Coffee	42	Printed Matter Industry
12	Tea	43	Fertilizer Industry
13	Clove	44	Pesticide Industry
14	Fibrous	45	Chemical Industry
15	Other Estate Crop	46	Cement Industry
16	Other Crop	47	Rubber Plastic Product Industry
17	Livestock	48	Basic Metal Industry
18	Roundwood	49	Oil Refinery
19	Other Forest Product	50	Transport Vehicle Industry
20	Hunting	51	Electricity Gas Water
21	Fishery	52	Construction
22	Metal-Ore-Petrol Mining	53	Retail and Inventory
23	Other Mining	54	Restaurant
24	Food Processing Industry	55	Hotel
25	Oil-Fat Industry	56	Land Transportation
26	Rice Mill Industry	57	Air and Water Transportation
27	Flour Industry	58	Bank and Insurance
28	Sugar Industry	59	Real Estate
29	Other Food Industry	60	Public Service
30	Drink Industry	61	Pesticide-Health Services
31	Cigarette Industry	62	Private Service

In the consumption block, ten different types of household groups are distinguished as follows: (1) Agricultural Employee (agricultural workers who do not own land); (2) Small Farmer (agricultural land owners with land between 0.0 and 0.5 ha); (3) Medium Farmer (agricultural land owners with land between 0.5 and 1.0 ha); (4) Large Farmer (agricultural land owners with land larger than 1.0 ha); (5) Rural Non-labour (non-agricultural households, consisting of non-labour force and unclassified households in rural areas); (6) Rural Low Income (non-agricultural households, consisting of small retail store owners, small entrepreneurs, small personal service providers, and clerical and manual workers in rural areas); (7) Rural High Income (non-agricultural households, consisting of managers, technicians, professionals, military officers, teachers, big entrepreneurs, big retail store owners, big personal service providers, and skilled clerical workers in rural areas); (8) Urban Non-labour (non-

agricultural households, consisting of non-labour force and unclassified households in urban areas); (9) Urban Low Income (non-agricultural households, consisting of small retail store owners, small entrepreneurs, small personal service providers, and clerical and manual workers in urban areas); (10) Urban High (non-agricultural households, consisting of managers, technicians, professionals, military officers, teachers, big entrepreneurs, big retail store owners, big personal service providers, and skilled clerical workers in urban areas) households.

The expenditures of each household group on goods and services are a function of prices and income. Each household group determines its expenditures by maximizing utility according to a simplified version of the Linear Expenditure System, subject to the group's budget constraint. The budget constraint of each household group equals household income minus taxes, savings, and net transfers among households. The following equation represents the budget constraint of each household group:

$$\sum_i P_i \cdot C_{i,h} \leq Y_h - T_h - S_h - TR_h \quad (4)$$

where:

- h is the index for household groups
- P is the price of commodities
- C is household consumption of commodities
- Y is the income of households
- T is income taxes
- S is household savings
- TR is net household transfers.

In the investment-saving part, this CGE is a saving-driven model; meaning the aggregate investment is determined by the sum of private, government, and foreign savings. Household saving rates for all households are fixed shares of household incomes. Foreign saving is exogenously determined. Government savings is residually defined from the government revenue and consumption equation, in which government consumption is an exogenous variable.

In the export-import block, a constant elasticity of technology (CET) function is used to model the producers' decision to supply domestic or international markets, while a standard Armington model is applied to model a substitution between domestic and imported products.

In the market of factor inputs, land and capital are fixed. The markets for agricultural, manual-clerical, and professional labour are assumed to be always in a full-employment equilibrium. Nevertheless, for each type of labour, wage differences between sectors were fixed exogenously. Macro closure specifications for this CGE can be summarised as follows. In the foreign exchange market, the central bank is assumed to control the amount of foreign reserve, so allowing the exchange rate as the equilibrating mechanism. Note that the balance of payments flows, such as foreign borrowing, interest and amortization payments of international loans, and so on, are set exogenously.

The CGE is then run for multiple years, in which capital and labour supply increase each year with the following formulas:

$$K_{i,t+1} = K_{i,t} \cdot (1 - depr_i) + DK_{i,t} \quad (5)$$

where: t is the index for years
 K is the capital in each year for each sector
 $depr$ is the depreciation rate
 DK is the new capital invested in each year for each sector,
and

$$LB_{t+1} = LB_t \cdot (1 + rl) \quad (6)$$

where: LB is the total labour supply in each year
 rl is the growth rate of labour supply, taking into account the rates of mortality and retiring process.

5. Simulation Scenarios and Results

The simulation scenarios developed to represent various possible situations to enable us to understand the likely impact of the LEB policy on the Indonesia economy are as follows:

- *Base Case Scenario*: This scenario aims to simulate the Indonesia economy from 1993 to 2004 and the expected condition of the economy from 2005 until 2020. In this scenario, the growth rate of the country's Gross Domestic Product (GDP) will be as shown in Figure 5. In this scenario, the Indonesian government implements the LEB in 2001. In this year, the total volume of logs exported is still around 5 per cent of the total log production. In 2002, due to the implementation of the LEB, log exports started to drop and gradually decreased until there were no wood exports by 2005⁶. Another important assumption here is that the LEB policy does not induce an inefficient behaviour in the wood processing industries, due to high competition in these industries. This scenario is called the Base Case, since results from all other scenarios will be compared to the result from this scenario. It is important to note that the period to be examined is from 2002 to 2020.
- *Scenario 1*: This scenario simulates a situation in which the Indonesian government never implement the LEB policy up to 2020. Comparing the result from this scenario with the Base Scenario, one can understand how the Indonesian economy would gain or lose from implementing the LEB policy.
- *Scenario 2*: This simulation represents the on-going belief that implementation of the LEB will only mean more red tape, since the government is currently weak and so no regulation can be fully implemented. In this scenario, then, the LEB policy implemented in 2001 is assumed to be translated only into an increase in red tape by as much as 30 per cent more than the world price of logs.⁷ Furthermore, this assumes that the rent will go directly to high income urban households as their incomes.

⁶ The assumption of gradual decline, acknowledging the fact that certain exporters have to meet some export commitments.

⁷ The 30 per cent is based on several observations in Papua and Kalimantan. Asking higher than this rate would make exporters choose to cease their activities, at least temporarily.

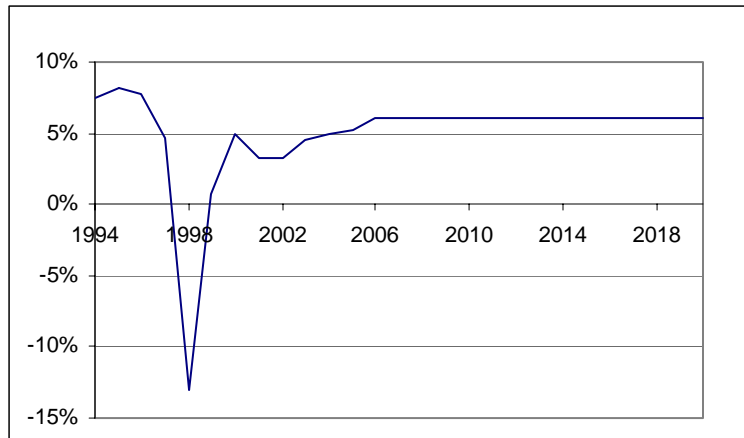


Figure 5. Growth of GDP in the Base Scenario

- *Scenario 3*: In this scenario, it is assumed that the Indonesian government does not implement the LEB policy. However, to protect downstream industry, an export tax of as much as 50% of the world price of logs is imposed at the end of 2001.⁸ Note that the main difference between this scenario and Scenario 2 is that, in this scenario, the revenue from this export tax goes to the government, while, in Scenario 2, the revenue from red tape goes to high income urban households.
- *Scenario 4*: This scenario tries to simulate a better policy to address environmental concerns, particularly the excessively fast rate of deforestation. In this scenario, the government is assumed to impose a higher output tax — as much as 50 per cent — on logging companies. It is expected that the amount of logs harvested would be less than under other scenarios.
- *Scenario 5*: In this scenario, the Indonesian government implemented the LEB policy in 2001 and this policy has been able to attract higher new capital investment from 2006 until 2010 of as much as 5 per cent, 5 per cent, 20 per cent and 20 per cent in the plywood, sawnwood, pulp and paper industries, respectively, compared to the rates of new investment in these industries under the Base Scenario.

5.1. Short-run Observation

In the short-run observation, we observe the condition of the economy at the end of 2002 under various scenarios. This situation can be seen in Table 4. Please note that the result from Scenario 5 is not reported, since it will be the same as the result from the Base Scenario.

⁸ The choice of 50 per cent in Scenarios 3 and 4 is arbitrary. Several environmental groups suggest a much higher rate to be able to internalise the environmental consequences of harvesting timber. This paper tries to pick a tax rate that is high enough but not totally eliminates exports.

Table 4. Results from the Base and Other Scenarios for the year 2002

	Scenario								
	Base	1		2		3		4	
	Case	No LEB		Red Tape		Export Tax		Output Tax	
GDP (billion Rp)	424,088	431,083	1.6%	432,028	1.9%	432,508	2.0%	426,527	0.6%
<u>Value-added</u> (billion Rp)									
Roundwood	15,909	36,872	131.8	30,710	93.0	23,466	47.5	20,937	31.6
Sawnwood	973	1,013	4.2	1,026	5.4	1,035	6.3	1,273	30.8
Plywood	3,169	3,070	-3.1	3,139	-1.0	3,219	1.6	3,701	16.8
Pulp	283	187	-34.0	197	-30.2	215	-24.1	179	-36.6
Paper	965	896	-7.1	918	-4.9	945	-2.1	910	-5.7
<u>Employment</u> (thousand people)									
Roundwood	1,779	2,891	62.5%	2,594	45.9%	2,211	24.3%	2,164	21.6%
Sawnwood	220	238	7.8%	237	7.6%	235	6.7%	283	28.3%
Plywood	823	839	2.0%	843	2.5%	848	3.0%	970	17.9%
Pulp	281	217	-23.0%	223	-20.6%	234	-16.7%	211	-25.1%
Paper	805	794	-1.4%	799	-0.7%	806	0.0%	804	-0.2%
<u>Household Income</u> (billion Rp)									
Agric. Employee	13,332	14,114	5.9%	13,932	4.5%	13,706	2.8%	12,801	-4.0%
Small-scale Farmer	61,991	69,056	11.4%	67,196	8.4%	64,968	4.8%	60,504	-2.4%
Med. scale Farmer	16,804	18,531	10.3%	18,104	7.7%	17,582	4.6%	16,333	-2.8%
Large-scale Farmer	25,607	27,308	6.6%	26,944	5.2%	26,479	3.4%	24,781	-3.2%
Rural Low Income	18,723	18,989	1.4%	18,952	1.2%	18,906	1.0%	17,891	-4.4%
Rural Non-labour	4,963	4,971	0.2%	4,952	-0.2%	4,938	-0.5%	4,721	-4.9%
Rural High Income	60,994	62,209	2.0%	61,887	1.5%	61,532	0.9%	58,541	-4.0%
Urban Low Income	31,728	31,400	-1.0%	31,410	-1.0%	31,468	-0.8%	30,071	-5.2%
Urban Non-labour	8,577	8,903	3.8%	8,792	2.5%	8,672	1.1%	8,216	-4.2%
Urban High-Income	84,796	81,526	-3.9%	85,805	1.2%	89,937	6.1%	80,142	-5.5%

Comparing the results from Scenario 1 and from the Base Case Scenario in Table 4, it can be seen that not implementing the LEB would make the value-added of the logging (roundwood) sector higher by more than 100 per cent than the situation under the Base Scenario; i.e. the LEB caused the logging sector value-added to be lower by more than 100 per cent in the first year of its implementation compared to the situation without the LEB. The main reason is that the LEB made the price of logs only half what it would be if the LEB was not implemented. In terms of volume, the difference was only 10 per cent. Meanwhile, the LEB induced higher value-added in the plywood, pulp and paper industries. In total, however, the LEB ended up making the GDP of the country 1.6 per cent lower than it could be in 2002.

On the employment issue, a year's implementation of the LEB significantly reduced the amount of labour in the roundwood sectors and to a lesser degree in the sawnwood and plywood sectors. Although the number of people employed by the pulp and paper sectors increased, the number is much lower than the jobs lost in the

roundwood, sawnwood and plywood sectors.⁹ Proponents of the LEB seem to get it all wrong, at least for the short-run observation.

Observing the impact of LEB on household incomes, it can be seen that all rural and agricultural households receive a higher income under the no LEB scenario compared to their incomes under the LEB scenario; i.e. the Base Case Scenario. Hence, it can be said that the agricultural and rural households have to share the burden of an LEB policy in the short-run.

Observing other alternative scenarios, all will in the short run induce a higher GDP than the GDP under the LEB scenario (Base Case Scenario). The three most interesting observations are as follows. First, in the short-run, having a high export tax is probably the better policy. It is able to produce the highest GDP for 2002 and induces higher income for almost all household groups. For those facing lower income, the reduction is relatively very small.

Second, allowing the improper implementation of the LEB policy — meaning people can still export their logs as long as they are willing to pay a much higher bribe (Scenario 2), although creating an unfair situation that may lead to political chaos, in the short-run, does not give such a bad result. It is still able to induce a GDP approximately 1.9 per cent higher than that in the Base Case Scenario. The fact that this is lower than the export tax scenario (Scenario 3) indicates that the pattern of government spending is able to generate a higher GDP than the spending pattern of the average rich household in urban areas.

Third, the implementation of a 50 per cent output tax on the roundwood industry (previously the tax rate was relatively small due to the IMF requirement) has not been able to reduce timber harvesting as much as the LEB policy (Base Case Scenario); i.e. the amount of logs harvested under this scenario is still 4 per cent higher than that under the Base Case Scenario. This policy generated lower incomes for all household groups in 2002 compared to their incomes under the Base Scenario. Urban households have to shoulder most of the burden of this policy.

5.2. Long-run Observation

Tables 5 and 6 present the estimated long run impact of various scenarios. Table 5 shows total present values of GDP and household income gains during the 2001–2020 period. The present values are calculated using a 5 per cent discount rate. Table 6 illustrates the total present value of value-added gains using a 5 per cent discount rate and the annual average job gains and losses during the 2001–2020 period. Figure 6 portrays the percentage differences of logs harvested between the Base Case and other Scenarios.

⁹ Discussion on jobs lost and gained is rather irrelevant in this context, since the CGE assumes a full employment condition.

Table 5. Long Term Observation of GDP and Household Incomes

(billion Rp)	Scenario						
	Base Case		1	2	3	4	5
	2001	2020	No LEB	Red Tape	Export Tax	Output Tax	New Investment
GDP	410,938	1,173,182 185%	-37,520 -0.46%	7,917 0.10%	52,703 0.65%	-103,429 -1.27%	4,718 0.06%
<u>Household Income</u>							
Agricultural Employee	13,573	37,356 175%	6,678 2.61%	5,688 2.23%	4,429 1.73%	-15,103 -5.91%	458 0.18%
Small-scale Farmer	65,929	200,985 205%	80,800 6.35%	63,861 5.02%	43,825 3.45%	-61,506 -4.84%	4,487 0.35%
Medium-scale Farmer	17,732	52,164 194%	18,474 5.47%	15,017 4.45%	10,801 3.20%	-17,243 -5.11%	1,128 0.33%
Large-scale Farmer	26,319	69,314 163%	14,531 3.02%	12,799 2.66%	10,390 2.16%	-25,232 -5.25%	1,207 0.25%
Rural Low Income	18,288	50,641 177%	-2,591 -0.73%	-1,348 -0.38%	116 0.03%	-22,369 -6.33%	363 0.10%
Rural Non-labour	4,791	13,411 180%	-966 -1.03%	-909 -0.97%	-737 -0.78%	-6,034 -6.42%	-20 -0.02%
Rural High Income	59,829	169,759 184%	-5,803 -0.50%	-3,428 -0.29%	-150 -0.01%	-69,483 -5.96%	1,837 0.16%
Urban Low Income	30,285	82,988 174%	-13,827 -2.34%	-11,298 -1.91%	-7,696 -1.30%	-41,294 -6.99%	-64 -0.01%
Urban Non-labour	8,541	24,844 191%	2,188 1.31%	1,509 0.90%	875 0.52%	-10,622 -6.37%	240 0.14%
Urban High-Income	78,803	211,993 169%	-77,320 -4.99%	-19,397 -1.25%	35,467 2.29%	-111,566 -7.20%	-476 -0.03%

Table 6. Long Term Observation of Industrial Value-Added and Employment

	Base Case		Scenario				
	2001	2020	1	2	3	4	5
			No LEB	Red Tape	Export Tax	Output Tax	New Investment
Value added (billion Rp)							
Roundwood	34,739	78,874 227%	301,079 74.88%	223,953 55.70%	135,143 33.61%	56,860 14.14%	10,270 2.55%
Sawnwood	978	3,094 316%	-478 -2.35%	-79 -0.39%	307 1.51%	4,490 22.09%	-1,042 -5.13%
Plywood	2,974	8,582 289%	-4,016 -1.15%	-2,547 -0.73%	-897 -0.26%	7,622 2.18%	-2,833 -0.81%
Pulp	159	964 604%	-838 -16.18%	-741 -14.30%	-594 -11.46%	-1,226 -23.67%	243 4.68%
Paper	860	2,255 262%	130 0.74%	146 0.83%	148 0.84%	942 5.38%	-82 -0.47%
Employment (thousand people)							
Roundwood	2,783	4,152 149%	1,096 38.6%	831 29.3%	509 18.0%	338 11.9%	42 1.5%
Sawnwood	229	541 236%	10 2.59%	11 3.05%	12 3.20%	85 23.00%	-8 -2.27%
Plywood	810	1,791 221%	-6 -0.50%	4 0.34%	14 1.11%	210 16.21%	-27 -2.05%
Pulp	205	698 340%	-75 -15.61%	-66 -13.73%	-53 -10.94%	-117 -24.29%	26 5.32%
Paper	750	1,533 204%	-16 -1.39%	-11 -0.95%	-5 -0.44%	-16 -1.36%	-37 -3.21%

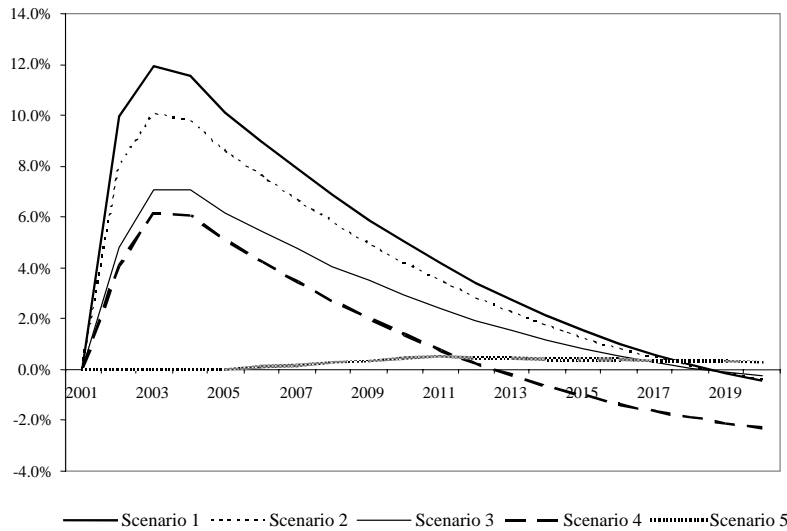


Figure 6. Percentage Differences of Logs Harvested Between Base Case and Other Scenarios

A long-run comparison between Scenario 1 and the Base Case Scenario shows a positive total gain of value-added in the roundwood industry under Scenario 1; i.e. not implementing the LEB policy would generate higher total value-added from the roundwood industry. Negative total gains, however, occur in the sawnwood, plywood, pulp and paper industries. By 2020, the total of these negative gains will be much higher than the positive gain in the roundwood industry. It hence is not a surprise that the total present value of GDP under the Scenario 1 would be less than that under the Base Case Scenario. Observing the amount of logs harvested annually, it can be seen that up until 2019, Scenario 1 requires more logs to be cut. After 2019, more logs are required to be harvested under the Base Case Scenario, since the wood processing industries have been much larger than they are under the Scenario 1. This result indicates that in the long-run, it might be beneficial to implement an LEB policy. Several conditions still make it unfavourable for the implementation of the LEB policy (Base Case), one of which being that more jobs are lost in the roundwood sector than are created in the processing sector. Some other sectors need to be able to absorb people who lose their jobs in the roundwood sector. Not implementing the LEB also generates higher incomes for agricultural households, many of which are among the poorest households in the country.

Observing the impact of other scenarios on the economy and on logs harvested, the following more important notes can be made. First, the introduction of a higher output tax in the roundwood industry (Scenario 4), although in the long-run effective in reducing the amount of timber harvested (Figure 6), might result in an adverse long-run impact, as the net gain in the present value of GDP is 1.27% lower than the Base Case. Compared to other scenarios, a tax that applies to wood products regardless of their destination of sales (export or domestic) may even create another significant distortion to the economy, with both wood supplier and processing industry suffering by losing their potential outputs. Household incomes across various groups fall, with the highest drop occurring among the urban high-income households.

Second, even for a long-run observation, Scenario 3 (relatively high export tax) seems to be the preferable option. It induces the highest total present value GDP gain compared to other scenarios and is relatively able to reduce the amount of logs harvested compared to the No LEB scenario (Scenario 1). There are three household groups however that experience a lower total present value gain of incomes under this scenario compared to their incomes under the Base Case.

Third, in the long-run, there is not much benefit in allowing the practice of bribing officials to avoid the LEB policy (Scenario 2). Tables 5 and 6, as well as Figure 6, show that the export tax scenario (Scenario 3) dominates this Scenario 2 in all indicators. Finally, let us observe Scenario 5, which assumes higher new investments in wood processing industries occurred during the 2006–2010 period due to the implementation of the LEB policy. This policy induces a higher total present value GDP gain compared to the gain under the Base Case, but not by much — only 0.06%. Total present value gains of value-added in sawnwood, plywood and paper are lower under this scenario compared to the situation under the Base Case Scenario. Influx of capital in these industries ends up lowering the demand of labour and rent to capital. Furthermore the impact of this

scenario on household incomes is not much different than that of the Base Case Scenario. Meanwhile, this scenario requires more wood to be cut even in the long run compared to the situation in the Base Case Scenario. This result indicates that expecting a fast and large capital accruing to the wood processing industries by implementing the LEB policy would probably not be that beneficial for the country's economy.

6. Conclusions

The first part of this paper reviews the on-going debates related to the LEB policy. The debates are centered around — though not limited to — the issues of downstream industrial development, job creation and environmental degradation, namely deforestation. Due to the complexity of the debates, this paper indicates the importance of conducting an empirical study to analyse this topic and a dynamic CGE model seems to be one of the most appropriate ones.

The case of Indonesia is chosen in this paper given the importance of the Indonesian forestry sector for the country as well as for international communities. Furthermore, at present Indonesia has implemented the LEB policy for the second time. This time concerns regarding the high rate of deforestation and the explosion in illegal logging are the main reasons. The debate as to whether or not an LEB policy is beneficial for the country is currently heated among policy-makers and others interested in the forestry sector. So far there is no consensus.

Before describing the main finding from a CGE analysis conducted in this paper, it is important to understand several weaknesses of the CGE utilised. First, the latest Social Accounting Matrix with details of the wood and wood processing industries required for the CGE model in this paper is not available at the moment. Hence, the data set for 1993 is utilised. Although all efforts have been conducted so that the CGE simulation can mimic the Indonesian economy from 1993 to 2004, the latest data set would still be preferable. Second, the underlying assumptions for the CGE model and the simulation scenarios should also be carefully examined (Resosudarmo, 1996). Third, the CGE model utilised is a pseudo-dynamic model, not a true forward-looking CGE model in which all agents maximizing their objectives through some future infinite time horizon are modelled. Hence, the dynamic simulation resulting from this model must be interpreted with caution. Fourth, although households have been classified into ten different socio-economic classes, each household category still covers a range of incomes and socio-economic characteristics. Consequently, some households in a particular class might be affected more than others in the same class. Nevertheless, several important conclusions can be drawn from the results of the simulation described in this paper.

First, observing several economic indicators, an implementation of the LEB policy is not beneficial for the country in the short term. The LEB policy lowers the country's GDP, causes negative gain of output (losses in the roundwood minus gains in the wood processing industries) as well as induces lower incomes for most household groups than if the LEB policy is not implemented. The LEB policy would most likely be

able to reduce the amount of logs harvested in the short-run, especially if this policy does not cause inefficient log utilisation behaviour in the wood processing industries.

Second, in the long-run, the LEB policy might eventually be able to deliver benefits to the country, with the growing wood processing industries maybe compensating for the reduced roundwood activity under the no LEB policy. However, these growing wood processing industries might require more logs to be cut compared to a situation in which they are not growing this fast.

Third, imposing an appropriately high tax on exported logs seems preferable than the LEB policy. This kind of tax policy does not fully wipe out potential gain from export, and hence induces higher GDP in the short-run as well as higher total present value of GDP gain in a long-run observation, compared to the condition under the LEB policy. And in the long-run period, this policy would be able to lower the rate of log harvesting compared to the rate under the LEB policy.

Fourth, allowing collusive practices when the LEB policy is implemented — people still being able to export their logs as long as they are willing to pay higher bribes — is not an appropriate option. The export tax policy clearly dominates this policy in almost all indicators. Besides, although not arising from the simulation in this paper, the Indonesian experience shows that allowing this kind of practice will only create political instability and unfair conditions.

Finally, although the common expectation in implementing the LEB policy is to attract much higher investment in the wood processing sectors, simulation in this paper shows that excessively high investment might not be that beneficial for the country. Furthermore, this rapid investment might in the future induce a higher level of deforestation.

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