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The Effectiveness of Forest Moratorium Policy and its Impacts on the Indonesia's Economy

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Abstract
This paper discusses the economic effects of the forest moratorium policy which has been launched by the government of Indonesia through the Presidential Decree no. 10 of 2011 dated 20th of May 2011. The issues addressed in the paper are the impacts on: land uses and natural forest area, carbon emissions, domestic prices, export-import, GDP, and poverty rate. Using the quantitative method of IRSA-Indonesia 5 – an inter-regional CGE model, the results show that the forest moratorium policy has both positive and negative impacts on Indonesia's economy.
Keywords: forest moratorium, CGE modelling, economic impact.

1. Background

Climate change has now become a global issue that must be addressed by any country. It has been broadly believed that climate change is not just an ordinary environmental issue. In fact, it has affected almost all aspects of humankind livelihood. Fighting the climate change impacts is then the sphere responsibility. Being part of the international community, Indonesia shows the world that Indonesia's commitment on climate change abatement has been increasingly stronger since 2007 when it hosted the 13th Conference of the Parties (COP) in Bali. During the conference, Indonesia introduced a national action plan on climate change. This plan was intended to provide a guideline for the government to conduct the series of steps and to create some necessary climate change policies in coordinated and integrated, and effective way.

At the national level, climate change policy is becoming increasingly important. This is because the policy has been included in the Medium Term Development Plan (Rencana Pembangunan Jangka Menengah/RPJM) 2009-2014. Within this national plan, the climate change top priority policies include forestry, agriculture, marine, as well as the improvement and development of institutional capacity on climate change (Bappenas, 2010).

The forestry sector is the biggest contributor of the greenhouse gas emissions. As Stern (2006) states, at the range of 18-20%, the GHG emissions come from forest degradation and deforestation occured in developing countries. The three largest tropical countries are Brasil, Indonesia, and China. Indonesia with its 132 million hectares of forest area has been expected to play a more significant role in stabilizing climate change.

Several factors cannot be ignored to be the main causes of Indonesian deforestation such as infrastructure and agriculture land needs; plantation market dynamics especially oil palm; and mining especially coal mining. In the last 15-20 years, deforestation rates in Indonesia have reached up to 1.17 million hectares. Forest and peat fires emerged in 1997-1998 has been a significant producers of the greenhouse gas emissions.

The president has launched the Presidential Instruction no. 10 of 2011 regarding the suspension of forest and peatland new concessions. This regulation aims to harmonize and balance the development of economy, social, culture, and environment. In addition, the objective of this decree is to reduce the greenhouse gas emissions from deforestation and forest degradation.

Based on the data from the Ministry of Forestry in 2009, the total of Indonesia's primary natural forest is 44.1 million hectares. Bappenas states that Indonesia also has 21.07 million hectares of peat land (Slette and Wiyono, 2011). Therefore, the total of forest area covered in forest moratorium (comprised of primary natural forest and peat land) is 65.17 million hectares.

Many businessmen concern with the adverse effects of the forest moratorium. They states that forest moratorium is a dangerous tool for land based development. They further foresee that the forest moratorium policy will slow down the oil palm expansion from the average 350,000 ha per year to become less than 200,000 ha per year in the next two years (Slette and Wiyono, 2011).

This paper tries to analyze the economic impacts of the forest moratorium policy mentioned above. Having knowledge of the economic consequences of such policy is important because it gives us an understanding of the policy impacts thoroughly either positive or negative empacts. It is expected that this article provides the readers

some new insights of the policy impact analysis. Moreover, it might give the government an inspiration to pursue some alternative solutions for overcoming the negative impacts of the forest moratorium policy through the prudent management. However, the economic impacts which will be examined in this paper are limited to the land uses, carbon emissions, domestic prices, export-import, Gross Domestic Product, and the poverty incidence. Given this limitation, further research needs to be conducted in order to achieve more wide-ranging knowledge.

2. Research Objectives

This research aims to provide an analysis of the economic impacts resulted from the forest moratorium policy. In addition, it gives some recommendations to the government in coping with the adverse impacts from the policy should any.

3. Methodology

This paper employs a quantitatvie method of inter-regional CGE model called IRSA-Indonesia 5 (Inter Regional of System Analysis for Indonesia-5 Regions). This model has been developed by Resosudarmo et al (2009) in part of the Analyzing Pathway to Sustainability in Indonesia (APSI) Project. Some parties has supported the project including CSIRO (Commonwealth Scientific and Industrial Research Organization), Bappenas, AusAid, and the World Bank. IRSA-Indonesia 5 has been created as an analytical tool for the policy makers to better understand the regional or national policy impacts.

The IRSA-Indonesia 5 model is a bottom-up approach inter-regional CGE model. It divides Indonesia's regions into five regions: Sumatera, Java-Bali, Kalimantan, Sulawesi, and East Indonesia. Each region has been classified into 35 sectors. The model uses the GAMS software to run the computable model program.

4. Review of Literatures

CGE models have been frequently used for medium to long term policy analysis in developing countries (De Melo, 1988). The coverage of the models range from international scale to sub-regional level.The CGE models are also claimed to be the answers of many disadvantages of the econometeris models (De Melo, 1988). The shortcomings of the econometric models revolve around the issues of data availability. In the econometric models, the data used are mostly time series data. These kinds of data often are not available in the consistent basis which cause the model must be adapted too much to overcome these deficiencies.

The CGE models have become the reliable tools for analyzing the impacts of international trade and development planning. They have been used for the analysis of tax reform, income distribution, global warming, agricultural management, sporting events, and even the analysis of the impact of the intifada demontrations (Mitra-Kahn, 2008). The issues addressed in the policy impact analysis using the CGE models are very broad. The use of CGE models include international trade, public finance, agriculture, structural reform, and income distribution (Devarajan et al, 2002).

A computable general equilibrium (CGE) model uses realistic economic data to model the condition as to how an economy reaches its general equilibrium condition (Resosudarmo et al, 2009). CGE then consists of a system of mathematical equations representing all agents' behavior; i.e. consumer's and producer's behaviors and the market clearing conditions of goods and services in the economy (Resosudarmo et al, 2009). This system of equations is usually divided into five blocks of equations, namely:

- The production block: equations in this block represent the structure of production activities and producers' behavior;
- The consumption block: This block consists of equations that represent the behavior of households and other institutions;
- The export-import block: this block models the country's decision to export or import goods and services;
- The investment block: equations in this block simulate the decision to invest in the economy, and the demand for goods and services used in the construction of the new capital;
- The market clearing block: equations in this block determine the market clearing conditions for labor, goods, and services in the economy. The national balance of payments also falls within this block (Resosudarmo et al, 2009).

Computable General Equilibrium (CGE) models are simulations that combine the abstract general equilibrium structure formalized by Arrow and Debreu with realistic economic data to solve numerically for the level of supply, demand and price that support equilibrium across a specified set of markets (Wing, 2004). CGE models are standard tools of empirical analysis, and are widely used to analyze the aggregate welfare and distributional impacts of policies whose effects may be transmitted through multiple markets, or contain menus of different tax, subsidy, quota or transfer instruments (Wing, 2004). CGE modelling is a way around the difficulties of

theoretical models, such that the concept of general equilibrium actually becomes useful for analyzing real economies and real problems (Markusen, 2002). A CGE model is "computable" in that an explicit numerical solution is computed (Bolnick, 1989). This means that all variables in the CGE model are measured to describe the dynamics of economic condition.

The CGE model is basically rooted from the economic general equilibrium concept. The economic equilibrium in the circular of economic flow can be viewed on the figure 1 far below. The equilibrium in the economic flow as shown on the figure 1 lies in the conservation of both product and value. This principle reflects the Walrasian general equilibrium. Conservation of product, by ensuring that the flows of goods and factors must be absorbed by the production and consumption activities in the economy, is an expression of no free disposability (Wing, 2004). It implies that firms' outputs are fully consumed by households, and that households' endowment of primary factors is in turn fully employed by firms (Wing, 2004). Hence, the quantities produced by firms have to be the same as the quantities demanded by the other firms and households. This condition is recognized as a state of market clearance. In the equilibrium condition, producers make zero profits as the implication that the values of a unit of each commodity must equal the values of all the inputs used to produce it. The equal values of cost and commodity produced is also known as a state of income balance. The three conditions of market clearance, zero profit, and income balance are employed by the CGE models (Wing, 2004).

Petersen (2004) introduces the family tree of economic models as shown on the figure 2 below. Petersen (2004) states that traditional macroeconomic models can be considered as a crossbreed between Vector Autoregressive (VAR) models and CGE models. While VAR models are full of statistical data without economic content, CGE models are the antipodeans. The basic modelling strategy with VAR models goes from data to theory, with CGE modelling it is the other way around-one starts with a theoretical model, and then finds data that fits the construct (Petersen, 2004). It implies that CGE models provide in-depth economic theory. The traditional econometric models are located somewhere in between, drawing both on classical statistical methods, as well as some economic theory (Petersen, 2004).

The CGE models for Indonesian economy analysis has been used since the late 1980s. Among the first generation of Indonesian CGE are those developed by BPS, ISS and CWS (1986), Behrman, Lewis and Lotfi (1988), Ezaki (1989), and Thorbecke (1991) (Resosudarmo et al, 2009). They were developed in close collaboration with the Indonesian National Planning and Development (Bappenas), the Ministry of Finance and the Central Statistics Agency (Resosudarmo et al, 2009). In the 2000s, the second generation of Indonesian CGE models were visible. Among others are the following: Abimanyu (2000) in collaboration with the Centre of Policy Studies (CPS) at Monash University developed an INDORANI CGE model based on the Indonesia IO table (Resosudarmo et al, 2009). It is an application of the Australian ORANI model for Indonesia (Dickson, 1982). There are two other derivatives of the ORANI model for Indonesia, which are the Wayang model by Warr (2005) and the Indonesia-E3 by Yusuf (Yusuf and Resosudarmo, 2008).

5. Results and Discussions

5.1. Simulation Results

5.1.1.The Impacts of Forest Moratorium on Land Use

The impacts of forest moratorium on land uses can be viewed on table 1 below. In general, land uses decline significantly both in Plantation sector (ESTCR) as well as forest sector (FORES). The most significant decline of land uses in plantation sector occurs in R1 region (Sumatera) which is reduced up to 254,181.6 ha with optimistic scenario or as much as 126,974 ha with pessimistic scenario. On the other hand, the most affected area of land uses in forest sector is R5 region (East Indonesia) with 529,794.2 ha area decreased under optimistic scenario or 264,297 ha using pessimistic simulation. Based on the simulation results on which table 1 shows below, the natural forest area increases considerably with the highest increase taken place in R5 region (East Indonesia) by 565,794.9 ha (optimistic) or 282,665.6 ha (pessimistic).

5.1.2.The Impacts of Forest Moratorium on Carbon Emission

The forest moratorium has succeeded to substantially reduce carbon emissions by 214.320.000 tonCO2e (optimistic scenario) or 107.215.000 tonCO2e (pessimistic scenario). We can view these results on the table 2 below. We cannot measure the impacts of forest moratorium on each region due to the limitation of the model.

5.1.3.The Impacts of Forest Moratorium on Domestic Prices

The commodity price for paddy decreases. The deepest decrease is in Sumatera (0,42% in optimistic scenario or 0,2% in pessimistic scenario) compared to other regions. On the other hand, the domestic forest commodity prices increase of which the highest increase is in Java Region (R2) by 5,08% (optimistic) or 2,36% (pessimistic). The increase of domestic commodity price also occurs to the estate crops price by 2,25% (optimistic) or 1,04% (pessimistic). The East Indonesia region (R5) experiences the highest increase of wood

prices by 0,54% (optimistic) or 0,25% (pessimistic). The domestic food prices do not significantly decrease. The model shows that in Sumatera region (R1), the food prices somewhat decrease by 0,056% (optimistic) or 0,027% (pessimistic).

5.1.4.The Impacts of Forest Moratorium on National Export-Import

The forest moratorium policy has different impacts on the sum of export commodity at the national level. In the one hand, the export for paddy and food beverages increase. On the other hand, the export for forest commodity, plantations, and wood products decline. As for national import, the amount of commodity imports generally increase, except for paddy and food.

5.1.5.The Impacts of Forest Moratorium on GDP and Poverty

Based on the model simulation, the forest moratorium policy has negative impacts on the GDP growth rate. At the national level, the GDP decreases by 0,109% with optimistic scenario or by 0,05% if we use the pessimistic scenario. As for regional GDP, the biggest hit occurs in Sulawesi region which decreases by 0,2% with optimistic scenario or by 0,09% with pessimistic scenario. The poverty rate in the rural area increases by 0,10% to become 20,42% using the optimistic scenario, while using the pessimistic scenario the poverty rate at the national level increases by 0,089% to become 20,41%. The highest increase of rural poverty rate occurs in the Eastern region of Indonesia by 0,42% to become 32,41% with optimistic scenario. Using pessimistic simulation, the poverty rate increases by 0,18% to become 32,17%. As for the poverty incidence in the urban area (urban poverty), the rate increases by 0,131% to become 12,48% at the national level using the optimistic scenario. If using the pessimistic scenario, the rate increases by 0,069% to become 12,41%. The highest increase of the urban poverty rate still appears in the Eastern part of Indonesia. Using the optimistic scenario, it increases by 0,365% to become 22,61%, whilst using pessimistic scenario it increases by 0,17% to become 22,42%.

5.2.Analysis

The model simulation results show that there are 4 sectors which have directly been affected by the forest moratorium policy. Those sectors are plantation, agriculture, forestry, and mining. At the plantation sector, especially oil palm, the core problem basically does not lie at the lack of plantation land availability. The government has provided vast area for oil palm plantation. The main problem of oil palm plantation can be devided into some factors as follows: low productivity, lack of research and development, lack of international market promotion, imperfect standard and seed certification, limited CPO processing manufactory, and underdeveloped downstream industry.

In the agriculture sector, the agglomeration policy can be introduced by clustering each region based on natural resource potentials. For instance, Sulawesi can be developed to be a new paddy barn instead of Kalimantan.

As for the forestry sector, there are no significant obstacles by and large, because Indonesia still has a huge amount of production forest area. The crucial governance issue is how all the stakeholders of forestry persevere to implement the principles of sustainable forest management.

In the mining sector, the main challenges lie in the national policy which prioritize the interest of the private companies, while at the same time marginalize the national interest. Another problem is mining behavior which does not recognize the environmental excess. The permits overlapping administration is also a crucial problem to overcome.

Indonesia has more than 30 million hectares of the degraded land to support the industrial development. The use of the degraded land, combined with the increase of productivity, will protect Indonesian forest while consistently stimulate further economic activities. Hence, mapping of the degraded land ought to be an integrated part of the peatland and forest map reform during the moratorium period.

The contents of forest moratorium decree has not yet reflected a breakthrough of the forest rescue effort. As such the mechanism shows the business as usual condition with many exceptions. Moreover, there is by no means penalty for the violation to this regulation. As a result, the forest conversion and deforestation will continuously occur as if the decree were not existent. Therefore, the key strategies to cope with the problems faced in all sectors above mentioned are:

- Lay out improvement;
- New permit management improvement (esp. in the forestry, mining, agriculture, and plantation sector);
- Incentive/disincentive policy in all sectors;
- Law enforcement.

6. Conclusion and Recommendation

The forest moratorium policy gives the positive impacts on the carbon emission reduction and the land use change. However, the policy also affects negatively to the several macroeconomic sectors.

To overcome the negative impacts of the forest moratorium, the government should implement the recommended policies as follows: in the plantation sector, the government should increase the productivity of the upstream industries while at the same time give the incentive for the downstream industries; In the agriculture sector, the agglomeration policy can be implemented; In the forestry sector, the sustainable forest management must be constituted by all stakeholders; and as for the mining sector, the national interest must be highly prioritized, environment safety must be recognized, and the tenurial problems must be very well addressed.

In order to optimize the effectiveness of the moratorium policy, the government needs to improve the endeavors as follows: forest lay out improvement, new permits management improvement (in all respective sectors), incentive/disincentive policy, and law enforcement.

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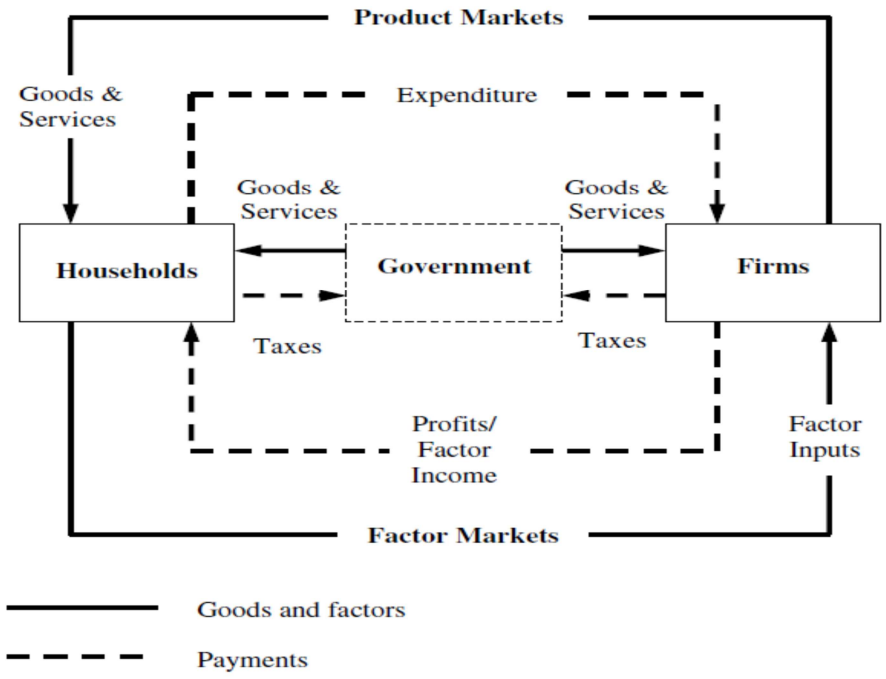

Figure 1: the Circular Flow of Commodities in a Closed Economy

Source: Wing (2004)

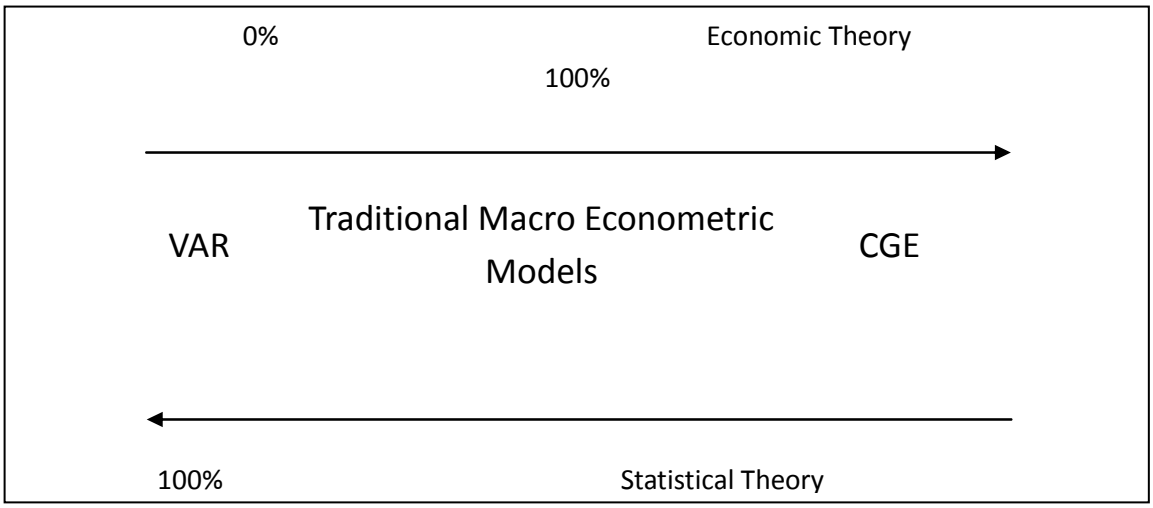

Figure 2: The Family Tree of Economic Models by Petersen

Source: Petersen (2004)

Table 1: The Impacts of Forest Moratorium on Land Use and Natural Forest Area

	R1 (Sumatera)	R2 (Java)	R3 (Kalimantan)	R4 (Sulawesi)	R5 (East Indonesia)
Optimistic Scenario					
C_LANDAREA					
ESTCR	-254.1816	-185.309	-51.5492	-75.0845	-36.2953
FORES	-147.4136	-79.2568	-376.6996	-87.8092	-529.4989
C_NFORAREA	401.5951	264.5659	428.2488	162.8937	565.7942
Pessimistic Scenario					
C_LANDAREA					
ESTCR	-126.974	-93.2671	-25.87	-37.6048	-18.3686
FORES	-73.8248	-38.9646	-188.1486	-43.8122	-264.297
C_NFORAREA	200.7987	132.2317	214.0186	81.417	282.6656

(X 1000 hectares)

Table 2: The Impacts of Forest Moratorium on Carbon Emission Reduction

Emissions (in 000 TCO2e)	**National**	**R1 (Sumatera)**	**R2 (Jawa)**	**R3 (Kalimantan)**	**R4 (Sulawesi)**	**R5 (East Indonesia)**
Optimistic scenario	- 214.320	N/A	N/A	N/A	N/A	N/A
Pessimistic scenario	- 107.215	N/A	N/A	N/A	N/A	N/A

Table 3: The Impacts of Forest Moratorium on Domestic Prices

Domestic Price	**R1 (Sumatera)**	**R2 (Jawa)**	**R3 (Kalimantan)**	**R4 (Sulawesi)**	**R5 (East Indonesia)**
Optimistic scenario					
PADDY	-0.4202	-0.3533	-0.0037	-0.1107	-0.1891
FOREST	4.1775	5.0837	3.5799	4.8923	4.6646
ESTCR	1.1707	2.2566	1.5436	1.0146	2.0825
WOODS	0.3396	0.3358	0.2142	0.3889	0.5412
FOODB	-0.0562	-0.0481	-0.0329	-0.0467	-0.0293
Pessimistic scenario					
PADDY	-0.2066	-0.1644	-0.0021	-0.0525	-0.089
FOREST	1.9764	2.3627	1.6946	2.3105	2.1935
ESTCR	0.5479	1.0421	0.721	0.4716	0.9735
WOODS	0.1602	0.1587	0.1016	0.1833	0.2544
FOODB	-0.0273	-0.0227	-0.0157	-0.0222	-0.0139

(In percentage of change)

Table 4: The Impacts of Forest Moratorium on Export-Import

	National Export	National Import
Optimistic scenario		
PADDY	0.536	-1.4502
FOREST	-19.4269	5.5657
ESTCR	-6.9397	4.2122
WOODS	-2.2471	0.7074
FOODB	0.1073	-0.099
Pessimistic scenario		
PADDY	0.2575	-0.6776
FOREST	-9.7965	2.6248
ESTCR	-3.3111	1.948
WOODS	-1.0672	0.3336
FOODB	0.0536	0.0536

(in percentage)

Table 5: The Impacts of Forest Moratorium on GDP and Poverty Incidence

		National	R1	R2	R3	R4	R5
Optimistic scenario							
GDP(% of change)		-0.1091	-0.1282	-0.1029	-0.0608	-0.2019	-0.1128
POVERTY RURAL (%)	**Incidence**	20.42	18.30	21.01	12.93	20.83	32.41
		0.102	-0.355	0.313	-0.073	-0.062	0.420
POVERTY URBAN (%)	**Incidence**	12.48	15.01	12.16	8.04	7.86	22.61
		0.131	0.113	0.141	-0.007	0.072	0.365
Pessimistic scenario							
GDP (% of change)		-0.0514	-0.0617	-0.0479	-0.0295	-0.0962	-0.0534
POVERTY RURAL (%)	**Incidence**	20.41	18.49	20.92	12.97	20.86	32.17
		0.089	-0.163	0.221	-0.034	-0.029	0.184
POVERTY URBAN (%)	**Incidence**	12.41	15.00	12.09	8.05	7.82	22.42
		0.069	0.103	0.065	-0.003	0.034	0.170

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