ECONOMIC GROWTH, TRADE AND ENVIRONMENTAL ISSUES: TESTING ENVIRONMENTAL KUZNETS CURVE[1]

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Abstract

ASEAN experiences a dynamic economic growth due to its liberalised markets. However concerns arise related to environmental issues resulting from the economic activities. It reflects tradeoffs between economic growth driven by trade and foreign direct investment (FDI), and environment. To investigate such a relation the Environmental Kuznets Curve was applied by regressing amount of carbon emission with gross domestic product (GDP), quadratic GDP, trade openness and FDI. The result reveals that amount of carbon emission is linearly and positively correlated with GDP per capita. It is predicted that as ASEAN economies grow, carbon emission increases. Trade openness is also found to contribute to carbon emission.

Keywords: Kuznets curve, carbon emission, gross domestic product, trade, foreign direct investment
JEL classification number: F15, F18

Abstrak

ASEAN telah mengalami pertumbuhan ekonomi yang dinamis karena adanya liberalisasi pasar. Namun kekhawatiran muncul terkait dengan isu lingkungan yang dihasilkan dari kegiatan ekonomi. Hal ini mencerminkan adanya *trade-off* antara pertumbuhan ekonomi yang didorong oleh perdagangan dan *foreign direct investment* (FDI), dengan lingkungan. Untuk menyelidiki hubungan tersebut maka *Environmental Kuznets Curve* diterapkan dengan meregresikan jumlah emisi karbon dengan produk domestik bruto (PDB), kuadrat PDB, tingkat keterbukaan perdagangan dan FDI. Hasil analisis mengungkapkan bahwa jumlah emisi karbon memiliki hubungan linier dan positif terhadap PDB per kapita. Hal ini mengidnikasikan tumbuhnya perekonomian ASEAN akan diikuti dengan peningkatan emisi karbon. Selain itu, keterbukaan perdagangan juga berkontribusi terhadap emisi karbon.

Keywords: *Kuznets curve*, emisi karbon, produk domestik bruto, perdagangan, *foreign direct invesmtment*
JEL classification number: F15, F18

INTRODUCTION

Externalities due to economic growth have been the concern of all countries in the world resulting in several agreements such as the Kyoto Protocol. This multilateral agreement is aimed at reducing greenhouse emissions which in the long run can reduce economic growth gains. In efforts to accelerate economic growth, developing countries use export-oriented policies instead of import substitution policies that require changes in production methods and supporting economic policies in order to pro-

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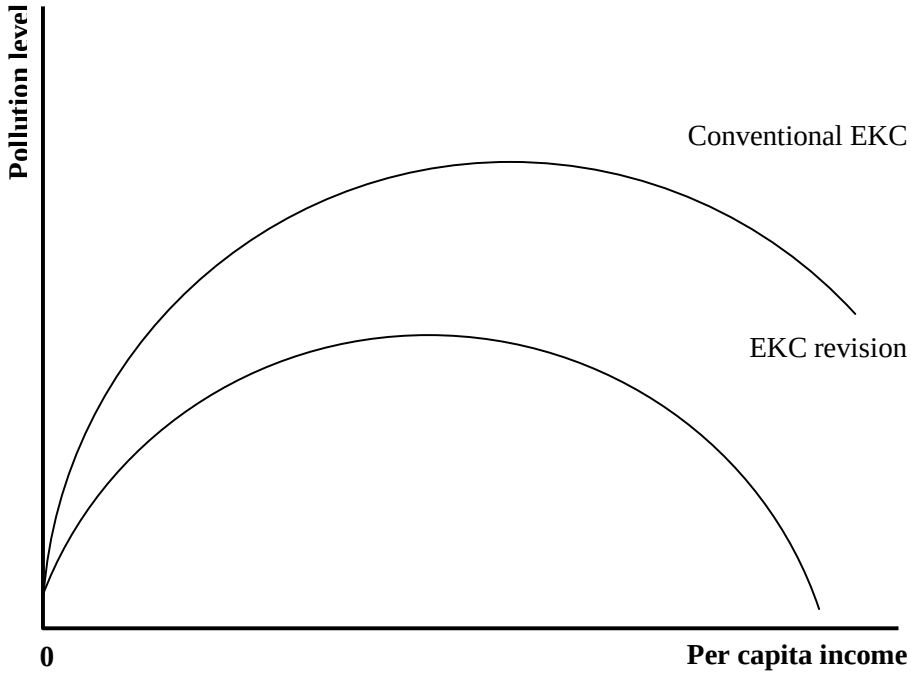
duce relatively lower priced products compared to their substitute products.

Exports determine economic growth through their economy stabilising effect in terms of foreign exchange. These exports are the resultant of industrialisation process in which production exceeds domestic demand capacity. Very expansive production has very significant environmental impact. In order to achieve economies of scale, the company will probably increase inputs which can suppress the sustainability of environmental resources or they can increase the by products in the form of environmental pollution. In addition, acceleration of economic growth is also supported by pro-market policies through a series of policies that can reduce the relative prices of domestic goods in world market and also increase capital stock availability in the country through Foreign Direct Investment (FDI) mechanism.

Kuznets (1955), the Nobel award winner, made a very famous hypothesis about the relationship between economic growth and environment. The hypothesis states that at initial economic growth, many industries release many air pollutants. Industries in low per capita income countries or at initial phase of industrialization are mainly focus on rapid economic growth and high absorption of labour force. Environmental issues are still not yet main agenda. The government has not been much involved in efforts to improve market system (read public goods). At this phase, due to many air pollutants, there is positive correlation between environmental depletion and economic growth.

However, there is turning point at certain income level. At this phase, awareness on importance of environmental quality has begun to develop. Public goods such as environmental quality as well as health have already become part of public demand. Pressure in these needs either forced or not, will compel industries to make policy changes in production methods. Graphically, Environmental Kuznets Curve (EKC) is described as below.



Source: Dasgupta *et al*., (2002).
Figure 1: Environmental Kuznets Curve

At conversional EKC, consumers in low income countries are not yet able to substitute to environmentally friendly products or in agricultural context, to organic agricultural products. Consumers still assume that there is no trade off between the two types of products. The concept that marginal utility of environmentally friendly products is greater than marginal disutility of environmental abatement is not yet a concept or base for decision making. Price-sensitive consumers still dominate in economic structure in low income countries.

With technological development and concern for environmental sustainability and quality, societies in high income countries have begun to respond to environmental issues. As a result, they are willing to spend more in order to get products that are more hygienic and contribute to the environment. Hence, EKC experiences revision that results in acceleration of pollution reduction. Industries begin to respond to development of perception that society is willing and able to pay more so that marginal utility of environment improvement is greater than its marginal damage. Furthermore, Panayotou (1993) states that there are four conditions that can accelerate process of improving environmental quality, that is, environmental awareness, tough regulation, use of environmentally friendly technology and substantial funds either at government level in terms of aid budget, companies in terms of research expenditure as well as community who are willing to buy relatively expensive products.

This paper is aimed to test whether Kuznets hypothesis is still applicable in ASEAN countries with relatively high economic growth. Economic growth in this region cannot be separated from a series of polities that encourage broader mo vement of goods and services as well as increase in FDI. Hence, the objective is to examine the effect of trade and FDI towards increase in carbon emissions in this region.

WTO and Environmental Issues

Environmental issues were the subject of long-lasting debates among the WTO members. Led by developed countries, a proposal to protect the earth using the so-called environmental trade barriers was then submitted. Developed countries argued that on the basis of a quality of human life and the sake of the sustainable development any production means should be in line with the environmental standard. On the contrary, developing countries are unwilling to accept such a proposal due to the fact that they are unable to meet such stringent requirements imposed by developed countries. Environmental measures such as "...standards, taxes, subsidies, charges and eco-labelling sometimes play a discriminatory role in terms of having an impact on international competitiveness. Domestic producers may be forced to adopt measures that impose additional costs on their foreign competitors due to environmentally motivated production process standards" (Centre for Policy Dialoge , 2009:5). Market access is perceived by developing countries as the only policy option to embark to the market in developed countries. Hence imposing environmental measures reflect a new wave of other trade barriers which producers in developing countries encounter.

In general environmental measures as mentioned earlier are categorized into 3three types: (i) Environmental regulations and standards, (ii) Environmental labelling, and (iii) Economic instruments (Center for Policy Dialogue, 2009).

Environmental regulations and standards

A country may impose regulation for exporting countries to comply with environmental standards in terms of product standard or producing standard where a particular means of producing goods conforms with required process. Whereas product standard refers for instance to nutritional

content of food or maximal contents of hazardous substances. Under the WTO auspice, members may contend a rejection of exported goods however by providing convincing evidences based on scientific research. Literally this clausul provides fair treatment for all members under the rule of non-discrimination. On the other side, developing countries lag far behind in relation to the provision of well-equipped laboratories to prove whether imported goods from developed countries might contain health-distorting chemical or micro organism. In addition, WTO excludes Mutual Recognition Arrangement (MRA) like in ASEAN to facilitate costly customs procedures in importing countries. Using MRA importing countries are not required to re-investigate the quality of imported goods and this hence reduce costs leading to create a lower relative price faced by consumers.

Environmental labelling

Consumers and also societies specifically in the developed countries are undoubtedly concerned with nutrional information for their health reason. It is important to note that with the different stage of economic development leading to different health perception, health concerns in this region steadily rise asking the government for stating accurate nutritional information provided by industries. However in the view of developing countries such legally required information results in an additional production cost that reduces their comparative advantage in the international market. The objection of developing countries is related to the process of investigating environmental effects from its first stage of production to the final disposal. Middle and small enterprises would be difficult to comply with such requirement when entering into international market. A first case of the success of the implementation of eco-labelling refers to the US government asked the industries for producing energy-saving products particularly in the electronic industries. Industries were initially voluntarily providing such information to the market. As expected the demand for these product was reported to rise indicating that markets responded positively to this proposed policy. In addition the Australian government also reported that eco-labelling in line with energy-saving-campaign has led to demand for more environmentally friendly products (WTO, 2011).

Economic instruments

Two above mentioned environmental measures are as technical trade berries that affect no-price changes in the market. Taxes, levies and subsidies are of several economic measures to reduce greenhouse gas emission by changing relative prices faced by industries. Imposing taxes or levies shifts the industry's supply curve to left making its market price higher than prior. As for example carbon emission is proportional to the number of goods produced, its shifted supply curve results in reducing goods in the market leading less carbon emission. A response of the market to the policies depends largely on whether such goods is environmental price demand elastic. The government also may provide additional budget given to industries in order to transform or change their production technologies into energy-saving technologies or less carbon-emission-producing technologies. On the other hand, subsidies on fuel energy for example are contra-productive to the effort of reducing carbon emission. This is because the cheaper fuel prices received by industries and households, the more carbon emission released by such activities.

In terms of foreign trade policies, developed countries would impose environmental tariffs or broader taxes to goods exported from developing countries with low enforcement of environmental regulation. Two objectives are behind such a policy; first on the ground of environmental

protection and second for the sake of protection of domestic industries prevented from deteriorating its comparative advantages.

As an institution to facilitate all concerns and interests of either developed or developing countries, World Trade Organisation (WTO) provides a direction of how environmental issues are incorporated into trade negotiation. Initially GATT did not include such interests of trade negotiation. This is because environmental pressure groups led by environmentalist were not considered as of importance. As WTO members looked into the multifunctional of agriculture such as providing food and fibre for the community and industries and also jobs for rural labour, preserving natural water and landscapes, a need for protecting environment arose (Oxley, 2001). However in the agreement of GATT in 1947 environmental issues have been accommodated in the article of XX specially in part (b) and (g) that states: "Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures:....(*b*) necessary to protect human, animal or plant life or health and (*g*) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption."

A main pillar of the WTO rule is non-discriminatory basis referring to all WTO members are granted to have an access to one member country. Using the so-called Most Favoured Nation (MFN) basis, as a WTO member reduces import tariff rates to one WTO member, the same level is also applied to other WTO member when exporting its products. Under the WTO article of XX part b, members may impose trade barries for the sake of human health but not specifically granted for one particular trading partner. It is important to note that any trade-related-barriers must be transparent to all members and be challenged by other members. Transparent trade policy will have a positive impact on the cost required to processing export or import as transaction costs facing all parties are reduced. Non-discriminatory basis also specifies that one importing country is not allowed to provide more favourable treatments to domestically-produced-products than of imported ones. Related to the implementation of the article of XX, trade policies imposed by members is not only conjunction with the protection itself but more importantly also with a need to preserve the environment from an increasing pressure of human demand for goods and services (Khalilian, 2009).

Developing countries assumed as small and open countries are varied in a response to on-going trade liberalisation in terms of environmental issues especially under the auspices of WTO (Brooks, 1998). Government policies responding to the environmental issues depend on whether goods are imported or exported. Table 1 below summarises the impact of trade liberalisation on policy responses. Two options available for the government to correct distorted markets allowing a better quality of environment are production tax and consumption tax. Such fiscal policies lead to re-arrange an allocation of resources in accordance with environmental standards demanded by the authority.

Hypothesis testing that the Environmental Kuznets Curve (EKC) has an inversed U shape with respect to economic growth is mostly done by many researchers using cross section and time series data. Their opinion is divided into two, i.e., those stating that economic growth experienced by high-income countries has resulted in demand for production methods with minimal externalities; see McCarney and

Adamowicz (2006) and Shahbaz et al., (2010). Demand for less emission producing technology cannot be separated from awareness of environmental quality. Countries that are already at this stage are characterised by highly educated community. This group is not only pressure group to industries but as well to government so as to implement set of policies that forces industries to embark on production process that supports improvement of environmental quality. This community is also willing to pay marginal cost that must be internalised by the industries in determining their cost structure. Elastic demand of this public good, that is, good environmental quality, is economic incentive for industries to always improve their production methods.

In contrast, the second group assumes that economic growth is not sufficient to provide incentive for changes in environmental quality. These cases usually arise in developing countries where economic growth is at expansionary phase. Demand to fulfil primary needs with poverty issue still dominates economic policy in these countries. The role of government as an institution that modifies the market is still limited, as a result does not get a significant portion in its economic policy agenda. This implies that not entire industries in developing countries have internalize these negative externalities because there is no strong law enforcement and society, in general, is still sensitive to changes in product prices (Boopen and Vinesh, 2011). In their research in Mauritius Island, it was found that income elasticity coefficient values obtained were increasing from 1975 to 2009. Notion that high per capita income countries will follow Kuznets hypothesis are not evident (De Bruyn *et al*., 1998). In their research using panel data from 1960 to 1993 for the Netherlands, Great Britain, Germany and the United States, GDP squared coefficient was discovered not affecting the increase in amount of carbon and sulphur emissions in the air. These results reject the assumption that developed countries are already in environmental improvement phase on the EKC.

Table 1: Effects of Trade Liberalization in a Small, Open Economy (and Policy Responses)

Location of Negative Externality	Importable Goods	Exportable Goods
Production	Positive for welfare and environtment if trade liberalisation leads to increased reliance on imports *(appropriate production tax)*	Negative for environment if trade liberalisation leads to increased export and production—see if efficiency effects of liberalised trade outweigh externality effects on environment *(appropriate production tax, whether for domestic or export market)*
Consumption	Negative for environment if trade liberalisation leads to greater consumption and imports *(appropriate consumption tax, whether domestic or imported product)*	Positive for environment if trade liberalisation leads to greater exports and lower domestic consumption *(appropriate consumption tax)*

Source: Anderson (1992)

The effect of globalization or policy that supports trade to carbon emission is very dependent on a country's economic structure (Antweiler *et al.,* 2001). If this is true then on scale effect case, trade policies that expand market access will have negative impact on CO_2 content in the air. Efforts to increase production in order to increase production surplus and or increase balance of trade surplus that will eventually have positive impact on national income must be paid expensively by low environmental quality. McCarney and Adamowicz (2006) using panel data from 1970 to 2000 covering 119 countries support the above statement. Ederington and Minier (2003) rejected the argument that trade flows have negative impact on the environment. Environmental regulation can be the second best policy taken by government to protect domestic markets from foreign product supply pressure that ignore externalities. Other important findings are that treatment of environmental variable in a model whether as endogenous or exogenous variable will affect the casualty relationship between trade and carbon emissions.

Third important issue that needs to be discussed is the role of FDI in affecting carbon emissions. Baek and Koo (2009) estimated the relationship between FDI and carbon emissions for China and India, the two countries with relatively high economic growth. Both in the short and long run, existence of multinational corporations in China have negative contribution to the environmental quality. Baek and Koo (2009) further discovered that the weak regulation in environmental field have contributed to the increased carbon content in the air. In the contrary, in India, in the short run, there was no casualty relationship. Cole *et al.,* (2011) tried to explore this issue in China by proposing a hypothesis that the FDI country of origin also affects this casualty relationship. Panel data for four years in 112 cities in China indicated that foreign-owned companies that are not associated with China (Taiwan and Hong Kong) mostly invest in petroleum, gas and sulphur dioxide industries that produce relatively high pollutants.

METHODS

This study uses data which are all sourced from the World Development Indicators. This database is a compilation of economic, social, environmental, population and education structures of all countries in the world. Four ASEAN countries namely Indonesia, Malaysia, Thailand and Vietnam are chosen because they fairly represent all ASEAN member countries. Malaysia is relatively more developed country; Indonesia and Thailand are in middle group while Vietnam represents relatively new ASEAN member countries and also a country in the process of economic transition and has embraced market system. From Table 2, it can be seen that there is considerable variation among the four ASEAN countries whereby Malaysia has a highest GDP per capita. Nevertheless, this GDP is strongly associated with carbon emissions and economic openness.

Table 2: Economic Growth in 4 ASEAN Countries in 2010

Country	CO_2 Emission (metric ton per capita)	GDP (constant 2000 US$)	Fossil Energy Consumption (% from total energy)	FDI (% Net Inflow GDP)	Trade (% GDP)
Indonesia	1.77	1038.16	65.66	1.60	54.83
Vietnam	1.31	617.12	52.57	9.42	169.64
Thailand	4.14	2592.49	81.20	4.58	138.39
Malaysia	7.32	5017.67	95.26	4.53	199.45

Source: World Bank (2011).

Data used include CO_2 emissions in metric ton per capita, GDP per capita at constant price, trade openness (TRADE), the ratio of trade to GDP, and Foreign Direct Investment (FDI) which is the ratio of FDI net inflow to GDP of a country. The mean and standard deviation of each variable used in this study are summarized in Table 2. Introduction of trade openness and FDI variables are to answer the hypothesis that in developing countries through trade liberalisation policies lead to expansion of production in order to achieve economies of scale. Weak environmental policies allow industries to use production technologies that produce pollutants into environment (scale effect). Developments of multinational or foreign-owned companies are expected that their production technology or methods refer to policies in their countries of origin which are more environmentally friendly (*composition effect*) (Cole *et al*., 2011).

Data used is the combination of cross section that includes the 4 ASEAN countries and time series data from 1986 to 2007; hence model analysis uses panel data. The use of panel data has more advantages (Baltagi, 1995), that is, (a) provide more information because data has N dimension (number of individual research objects) x t (total observation time), (b) can capture dynamic changes, (c) reduce potential bias and inconsistent, and (d) reduce multicollinearity problem. EKC hypothesis testing issue has attracted many researchers using panel data which are associated with different economic growth levels among countries that are focus of their researches, see Glaeser and Kahn (2008) and McCarney and W. Adamowicz (2006).

To test the hypothesis whether the Environmental Kuznets Curve (EKC) prevails in these 4 ASEAN countries, GDP squared variable is included in the following equation:

$$CO2_{nt} = \beta_0 + \beta_1 GDP_{nt} + \beta_2 GDP_{nt}^2 + \beta_3 FDI_{nt} + \beta_4 TRADE_{nt} + \varepsilon_{nt} \quad \text{..... (1)}$$

where n is country and t indicates year with expected coefficients as β_1, β_3, $\beta_4 > 0$ and $\beta_2 < 0$.

If β_2 is greater than zero and statistically significant at a determined significance level, then U-inverse curve is accepted which indicates that the amount of pollutants, especially CO_2, will reach maximum point and will decline in line with increase in economic growth. Studies that examine EKC try to determine income level at which pollutant content such as CO_2 or SO_2 will reach maximum point. Mooway and Unruh (1997) found that for United States, the income level is $12 813 which is lower than $15 300 found by Sengupta (1996).

Table 3: Statistical Data Used

Country	Indicator	Variable			
		CO_2 (metric tons per capita)	GDP (constant 2000 US$)	FDI (% GDP)	Trade (% GDP)
Indonesia	Mean	1.20	773.68	0.69	56.44
	Std Dev.	0.30	155.32	1.39	11.80
Vietnam	Mean	0.64	354.76	4.76	91.87
	Std Dev.	0.35	128.32	3.32	41.31
Thailand	Mean	2.82	1833.82	2.82	99.10
	Std Dev.	1.06	460.47	1.60	29.44
Malaysia	Mean	4.97	3551.26	4.21	177.60
	Std Dev.	1.59	870.53	2.11	35.63

Source: World Bank (2011)

RESULTS

Heteroscedasticity problem is often encountered in panel data analysis. To correct this problem, regression model is corrected with White Heteroscedasticity procedure. Fixed effect model is chosen in this study because to observe whether intercept differences exist among the four ASEAN countries (country dummy). Regression results are shown in Table 4 below.

Economy in ASEAN countries in recent decades shows a very dynamic growth. However, policies that support development process have contributed to increase in CO_2 in air like real GDP. However, the interesting part about the regression model above is that it does not accept the hypothesis that coefficient of GDP squared is smaller than zero. In other words, this study rejects U-inversed shaped environmental Kuznets curve. Results are in line with Choi *et al*., (2010) whereby Kuznets hypothesis was not evident in China and Korea. Developing countries are still at economic development phase which will relatively try to increase economic capacity. Public goods in terms of environmental quality have not yet become public policy discourse. In addition, the community is not yet willing to increase spending to earn products with relatively low externalities. The campaigns supporting environmental quality have not received large portion in economic policy because there is concern that it would create additional costs that will eventually increase relative prices which are not competitive in the international market. Results differ with Ehrhardt-Martinez *et al*., (2002) study which used data from 1980 to 1995 for 74 least developed countries in Africa, Asia and Latin America and found out that EKC curve was maxi mum at $ 1,150 income level.

In fact, GDP variable in the equation above has important implication related to policy instruments in anticipating environmental quality degradation. ASEAN economic integration plan within framework of the ASEAN Common Market 2015 has to include this component together with emission reduction in this region. It is recognised that carbon emission reduction, either directly or indirectly, will have negative impact on economic growth and ultimately on employment and poverty. Thus, governments have to give great attention to economic incentive instruments so that industries can restructure to environmentally friendly production methods.

Table 4: Regression Results

Variable	Coefficient	Std. Error	t-value	**P**robability
Constant	-1.793663	0.304560	-5.889350	0.0000
GDP	2.42E-07	1.16E-08	20.80390	0.0000
GDP^2	-0.000179	0.001981	-0.090536	0.9281
FDI	-0.020152	0.024677	-0.816622	0.4166
TRADE	0.050933	0.006088	8.366285	0.0000
Fixed Effects (Cross)				
INDONESIA	-0.046194			
MALAYSIA	0.802462			
THAILAND	0.185563			
VIETNAM	-0.941831			
R-squared	0.984805			
Adjusted R-squared	0.983476			
S.E. of regression	0.250275			
Sum squared reside	5.011013			
Log likelihood	1.224155			
F-statistic	740.7178			
Prob(F-statistic)	0.000000			

Source: calculated data

Trade liberalisation, as main agenda to ASEAN countries both bilaterally and multilaterally such as AFTA, APEC and WTO, has brought great contribution in economic growth of ASEAN countries. Reduction of trade barriers in the context of market access to maximize competitive and comparative competitiveness have been paid by increasing greenhouse gases. This is evidenced by the positive coefficient of TRADE variable at 5 percent significance level. These study results are in line with Shahbaz *et al*., (2010) and Azhar *et al*., (2007). The argument that consumers have positively responded to products with high environmental value is not evident in ASEAN countries. In the contrary, Dean (2002) contends that increase in trade accompanied by increase in income will have positive impact in improving environment, despite the fact that this argument is also challenged by whether the income effect can compensate change in exchange rate. In addition, Grossmann and Krueger (1995) states that economic openness will increase demand for labour intensive assembly activities that produce low pollution materials. This results support the fact that industries have not internalise marginal damage into social marginal cost. Industries have noticed that environmental regulations related to air pollution have not been limiting factor in their industrialisation process. Trade liberalisation through a series of fiscal and monetary policies is merely to increase volume and value of trade. This is also supported by absence of both bilateral and multilateral consensus on certification of environmentally friendly products, particularly from carbon emitting industries.

Relatively expensive capital costs in the country due to low supply of capital goods which correlates with low ratio of savings to GDP compel governments in ASEAN to conduct series of packages or policies that facilitate unilateral, bilateral or multilateral FDI. Increased supply of imported capital goods that are production factors, has positive impact on economic capacity[2]. It is recognised that increase in FDI in the region strengthens production base and also accelerates technology diffusion process due to technological spill-over effect. Nevertheless, relocation or expansion of foreign companies which are required to use environmentally friendly technology such as in their home countries cannot play a role in reduction of environmental degradation in ASEAN region as it seen from insignificance of FDI variable. From the negative coefficient of FDI variable, it can be expected that in the long run, FDI in ASEAN countries will have significant contribution in carbon emission reduction in addition to fiscal policy in the form of environmental tax and relatively high income elasticity of products produced with environmentally friendly production process.

One may draw a conclusion that based on the negative signs of the coefficients for trade and FDI.

Policy Implication

Some policy implication can be derived from the regression results as discussed above. Either under the AFTA agreement or APEC or WTO agreement the ASEAN economies have been committed to providing a better foundation for continuously dynamic economic growth. However as the members are to merge into the so-called ASEAN Economic Community, the policy makers would encounter pressures not only form environmentalist but also from the community who demand better environmental quality. Here are several policy implications available for reducing externalities caused by carbon emission:

[2] Strong dependence on FDI accompanied by relatively free foreign exchange policy is one of the criticisms of economic development strategies in developing countries. Relatively perfect capital mobility will always cause equilibrium of capital prices unstable. In extreme cases where there is derived economic shocks due to political and social factors.

Environmental Tax or Subsidies

Balancing economic growth rates and environmental standards is a matter of how ASEAN economies respond to an increasing demand for better quality of life. As GDP per capita grows enhanced by an increasing FDI flown into region and also trade liberalisation, relative prices due to an imposition of environmental taxes are not a mayor consideration when buying goods. Consumers may judge that an internalised carbon emission into operation cost would be compensated by benefiting more goods produced from environmentally friendly production technologies. With the inclusion of externalities into full economic cost, markets faced by producers and particularly consumers are not distorted. It implies that all economic resources are allocated more efficiently. Imposing environmental taxes into the industrial process lead to "fair and efficient" prices by re-distributing costs (Patterson III, 2000).

ASEAN governments are also encouraged to start implementing such environmental policies as they encounter budget deficit. Revenue from environmental taxes would reduce budget deficit resulting from more government expenditures than that of its revenue. Several countries such Japan and South Korea are reported to have been implementing such taxes. Report on OECD countries indicates that environmental taxes lead to new invention of technologies that are more efficient. In addition the reaction of citizen to environmental taxes imposed by the government will be positive as they change their behaviour to reduce carbon emission. In the long run, the government may provide a strong signal that they may maintain tax rates leading to high prices of carbon (OECD, 2010). In the short run, as marginal damage resulting from carbon emission is incorporated into the marginal social cost, relative prices facing consumers changes that are still affordable. In the long run as Patterson III (2000) insisted that nation as a whole benefits from environmental taxes. This is because more industries will invest in research and development activities to invent new and more efficient technologies. It is interesting to note that imposing environmental taxes will reduce the government control. "Under such a regime, those polluters that face higher costs for pollution reduction techniques will be more likely to pay the tax, while those who can reduce pollution more cheaply will be more likely to choose that option. Therefore, results will still be achieved without costly monitoring or oversight by the government" (Patterson III, 2000: 135). Government would reduce administrative cost of monitoring whether industries comply with the regulation. On the other side, government would have an additional fiscal capacities resulting in less budget deficit.

Technical Trade Barrier

Table 5: Most Prevalent NTBs. By Number of Tariff Lines

No	Non-tariff Barrier	Number of Tariff Line Affected
1	Customs surcharges	2,683
2	Additional Charges	126
3	Single Channel for Imports	65
4	State-trading Administration	10
5	Technical Measures	568
6	Product Characteristic Requirement	407
7	Marketing Requirements	3
8	Technical Regulations	3

Source: ASEAN Secretariat (2011)

Countries in ASEAN have been implementing to reduce import barriers especially import tariff rates under the ASEAN Common Effective Preferential Tariff (CEPT) ranging between 0 to 5 %. Considering that the benefits of lowering import tariff rates is very limited, the governments expanded its trade policies to be more liberalised by providing more conducive regulation, that is, trade facilitation. This includes a harmonisation of tariff nomenclature, ASEAN framework agreement on mutual recognition agreements (MRAs), harmonisation of customs valuation and harmonisation of customs procedure. In the same time, non tariff barriers are also subject to be further reduced in a response to an increased demand for widening market accesses (Table 5). This policy is reportedly leading to improve ASEAN intra-trade. Current ASEAN trade policies are found to have contributed to the remarkable economic growth in the region. In contrast, trade openness is positively correlated with carbon emission that partly reduces the economic benefit. As developed countries have started implementing technical trade barriers on imported goods that release carbon emission during the production process, developing countries may also take the same action to protect its environment. ASEAN trading partners may retaliate by proposing higher import tariff rates for goods exported from the ASEAN. Given that such trade policies are not against the WTO principles, imposing environmental technical trade barriers are expected to trigger a better production process worldwide. In order such technical trade barriers to be accepted by other countries, ASEAN members are encouraged to actively participate in the international negotiations as to bridge the differences in trade obstacles.

Pro-environment Foreign Direct Investment

A spill-over effect of Foreign Direct Investment is one of the important roles of what developing countries liberalise their domestic markets for foreign investors. Developing countries lag behind developed countries in relation to producing goods and services that comply with environmental standard. A relatively high cost of capital resulting from a capital shortage, developing countries as well as ASEAN economies attract foreign investors to establish industrial projects. These projects are hoped to absorb more labours, to improve country's terms of trade, and to increase foreign savings. It is knowledge that almost 60 percent of FDI in ASEAN are on service industries indicating that consumers in the region experience a relatively higher purchasing power. However, in some cases, the country's dependency on extractive industries which are mainly foreign companies are high and it should be minimised.

Regional Cooperation

The year of 2015 will be a very critical but also challenging period for the ASEAN as the members embark into the more opened and liberalised economy as described in the objectives of the ASEAN Economic Community. The ASEAN Economic Community Clausul enables production factors mobile within the region without any barriers. Highly qualified labours are granted to move freely which bring their perspectives on the environmental issues into other ASEAN countries. As a result, awareness on the demand for goods and services produced according to the environmental standard is expected to rise. Markets will expectedly respond positively by transforming their production method into less-carbon emission-releasing technologies. A report on ASEAN reveals that trade potentials on environmental goods and service are very promising (Dosch, 2010). Dosch (2010) also argued that countries in the Mekong Basin which are partly of the ASEAN confront a balance between trade and investment liberalisation and environmental protection. Therefore, initiatives on balancing economic growth and the envi-

ronmental protection should be well addressed in the upcoming economic meetings. ASEAN members are unfortunately reported to have a weak commitment in the context of trade and investment liberalisation. In fact, in the Roadmap for the ASEAN economic Community has also addressed the importance of promoting clean and green economics and any policies to pursue the greening of the ASEAN economy should be market based.

CONCLUSION

The hypothesis that CO_2 content will follow the hypothesised pattern by Kuznets has not transpired in ASEAN countries. Linear relationship between amount of CO_2 per capita and GDP per capita indicates that externalities will still increase in ASEAN in line with economic growth phase in the context to increase society welfare in this region. Increase in carbon emission is economic scale effect from industries in this region due to expansion in domestic market as well as in international market. This is supported by a series of economic policy package, particularly by active ASEAN countries in efforts to reduce trade and investment barriers.

In the long run, economic growth is estimated to increase. It is expected that there will be change in composition effect whereby industries embark on changing production methods to reduce these negative externalities. Governments in this region not only execute fiscal policy such as environmental tax in efforts to internalise these negative externalities, but also structure economic incentives for economic players or industries which have already met appropriate environmental standards.

Dependence on FDI will persistently provide enormous economic gains not only related to increase in foreign exchange but also in providing employment and most importantly spill-over in production techniques as well as in management of the company. The growing environmental awareness of society or consumers in addition to increase in income in the context to access environmentally friendly products will be the driving force behind the more environmentally friendly FDI. This policy is also expected to answer or reject the notion that foreign companies relocate from countries with strict environmental regulations to developing countries with relatively weak regulations as well as law enforcement.

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