Natural Gas in Thailand: Curse or Blessing?

Kensuke Yamaguchi, Manaskorn Rachakarakij, and Hisashi Yoshikawa

***Abstract*—** *ASEAN countries, especially the countries with weaker institutions of energy resources, have faced an increasing risk of "resource curse" as the region has deepened economic integrations with China. Yet, utilizing domestic energy resources, some countries have achieved economic development in ASEAN. Especially, Thailand has successfully added values to natural gas for the development of petro-chemical industry, which has led the country's remarkable economic development since 1980's. The case implies the significant role of government in contracting for transparent resource controls and planning for comparative advantages in a long run. Thus, rent-seeking behaviour in government should be one of the further analytical points to prevent the resource curse in the countries with weaker institutions.*

***Keywords*— ASEAN, Thailand, resource curse.**

1. INTRODUCTION

Recently, the "resource curse" theory has been increasingly attracting attention among ASEAN countries [1-4]. It is argued that a comparative advantage in natural resources contributes to low growth rates and thus to a divergence in per capita incomes between resource-rich and resource-poor economies. Pominent papers by [5] have asserted this finding on the basis of econometric results. The following explanations can be offered for this phenomenon.

First, with ''Dutch Disease'' natural resource exports can inhibit growth in manufacturing exports. As revenues from resource exports increases, the given nation's currency appreciates in relation to currencies of other nations, resulting in that nation's other exports becoming too expensive for other countries to buy, thereby making those sectors less competitive [6]. As manufacturing sectors are commonly believed to generate positive productivity externalities, the effect would reduce the economy's potential for dynamic growth. To make matters worse, the greater concentration of GDP and trade in the resource sectors magnifies the effects global market volatility, as world commodity prices fluctuate much more than do the prices of other goods [7].

Second, exploitation of natural resource wealth may reduce returns in human capital investments, which then decreases incentive for educational attainment [8]. Therefore, resource-rich countries risk falling into a form of low-level equilibrium trap in attempting to climb "the ladder" of product variety or quality in the manufacturing sector, where human capital inputs are increasingly intensively employed on each successive rung. Indeed, there are examples of countries currently facing the "middle-income trap" in this way.

Third, recent political economy papers argue that resource wealth promotes the emergence of the ''predatory state'' rather than the ''developmental state,'' either by actively encouraging the former through corruption related to resource rents, or by undermining the latter when revenue flows associated with resource extraction reduce the efficiency of policy and administration [9]. Examining cases in Latin America and sub-Saharan Africa, it has been suggested that extractive institutions in the predatory state tend to hamper national economic growth [10].

ASEAN has rarely attracted attention as a casualty of the resource curse, for resource-rich countries in this region appear to have succeeded in their economic growth. Coxhead shows the average per capita growth rates (1975-2001) for the group of countries in which primary exports made up at least 60% of merchandise exports in 1971 [11]. It can be seen that Malaysia, Indonesia, and Thailand form a distinct group which, though initial above-average resource-dependence, experienced average GDP growth rates in 1975–2001 notably higher than the mean for this sample of countries.

The most obvious explanation is that the Plaza Accord in 1985 resulted in currency appreciation for the region's exporting countries, which led to the boom in foreign direct investment (FDI) into the region's developing countries; net FDI flows to SE Asia (excluding Singapore) surged from $US1.1 billion in 1985 to more than $US7.2 billion in 1991. This massive increase in capital inflows ushered in a decade of labour-intensive industrialization and ensured the inclusion of Indonesia, Thailand and Malaysia in the World Bank's group of eight ''East Asian miracle'' economies.

The reason the resource curse has been attracting attention is that the regional economic integration with China has deepened. In the 1990s, ASEAN's share in

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China's total imports increased from 6% to 9%, which is much bigger than total exports [2][3]. Accordingly, recent analyses have indicated that China's increasing size and involvement in regional trade will cause SE Asia's resource-abundant economies to become less specialized in labour-intensive manufacturing, and more specialized in resource-based exports [1-4].

Furthermore, it has been said that the less developed countries with weaker institutions—Cambodia, Laos, Myanmar, and Vietnam—will possibly become trapped in the resource curse when they extract natural resources for potential economic development [11]. This paper aims to draw recommendations for institutional settings escaping from the curse, based on a successful case in this region. The second section will provide various diagnoses of the resource curse in Indonesia, Malaysia, and Thailand from broader perspectives other than economics. The third section highlights natural gas utilization in Thailand. Lastly, Section 4 concludes with recommendations for institutional settings.

2. RESOURCES CURSE IN INDONESIA, MALAYSIA, AND THAILAND

Overview of Energy Resources Development

Indonesia produced 852 thousand barrels per day (BPD) of crude oil in 2014, ranking 23rd in the world and 1st in ASEAN. The country has been producing crude oil since 1952, and in 1962 enrolled as a member in OPEC. Yet, after 1991, both the decreasing production and the increasing demand in the country have resulted in an increase in oil imports. Despite Indonesia still exporting approximately 500 thousand BPD, it has become an oil-importing country, even withdrawing from OPEC in 2009. Regarding natural gas, the annual production in 2014 was 7.1 billion cubic feet per day (BCFPD), which ranks as the 10th largest amount in the world and the largest in ASEAN. Throughout the 1980's and 1990's, liquefied natural gas (LNG) exports, especially to Japan, led the production. With the decreasing oil production, since 2005, gas utilization has been shifting from export to the domestic market; current domestic consumption now accounts for approximately 50% of the production.

Malaysia's crude oil production in 2014 was 666 thousand BPD, making it the 12th largest in the world and second-largest oil producer in South East Asian, just behind Indonesia. The production has increased since the 1970's, reaching its peak at 776 thousand BPD in 2004. As domestic demand rose, its export also became restricted, until eventually Malaysia became an oil-importing country in 2014. The country produced 6,4 BCFPD of natural gas in 2012, placing it 12th in the world and 2nd behind Indonesia in ASEAN. Production started in the 1970's, surging with LNG exports in the 1980's, for which domestic consumption has been restricted since the mid-2000's, resulting in the amount of LNG exports being second behind Qatar since 2007.

Thailand is the 32nd largest oil producing country in the world and 4th largest in ASEAN behind Indonesia, Malaysia, and Vietnam. Offshore production started commercially in the 1980's, but did not result in sufficient production to meet domestic consumption needs, forcing the country to import substantial amounts with increasing domestic consumption. Natural gas, on the other hand, is produced in substantial amounts, at 4.1 BCFPD, which is 19th largest in the world and 3rd largest in ASEAN, behind Indonesia and Malaysia. The country started production in 1981, targeting the domestic market and avoiding exporting. With an increase in domestic demand, however, the country began importing from Myanmar through the gas-pipeline in 1998 and even importing LNG from Qatar in 2011.

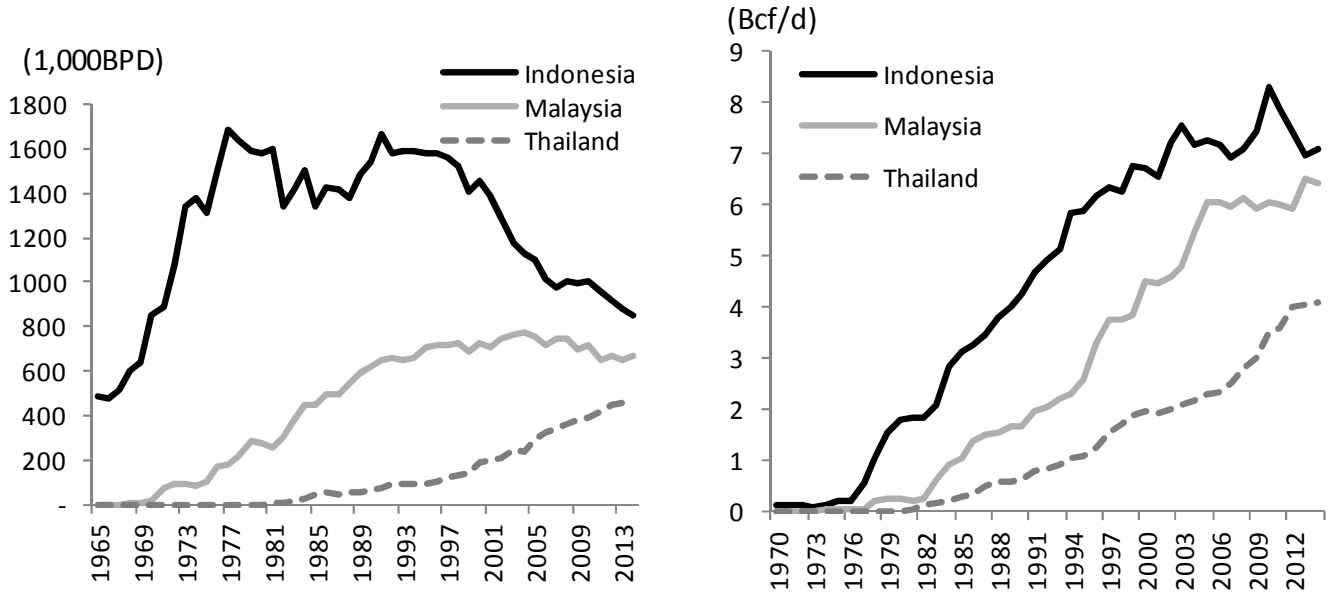

Fig. 1. Production and Export of Crude Oil in Indonesia, Malaysia, and Thailand.
Source: U.S, Energy Information Administration; BP.

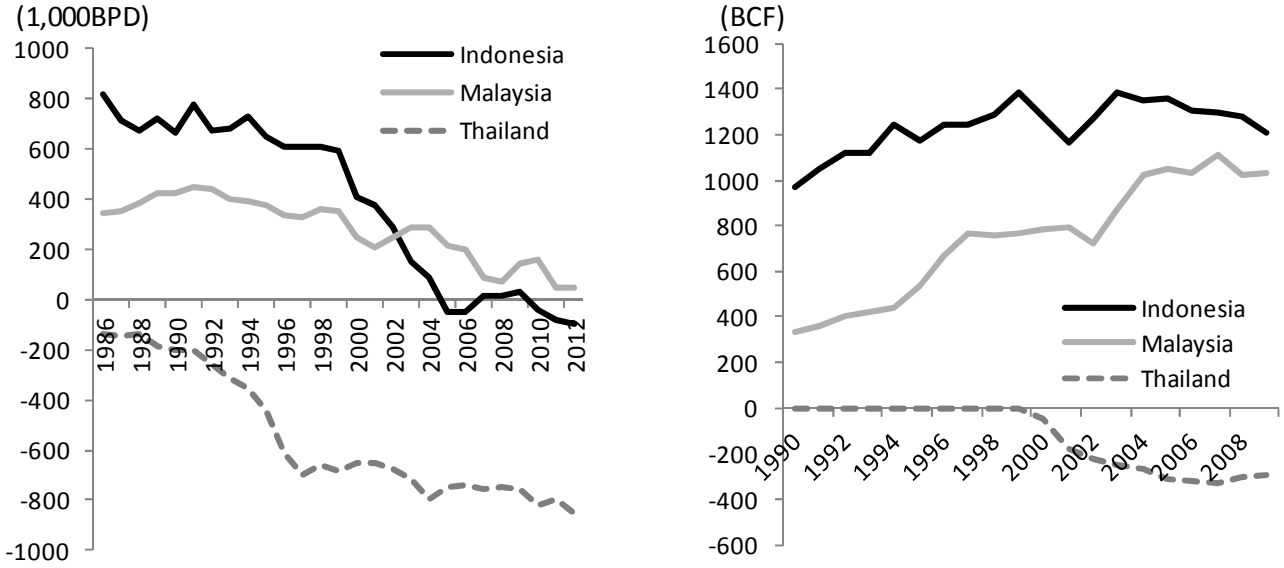

Fig. 2. Production and Export of Natural Gas in Indonesia, Malaysia, and Thailand.
Source: U.S, Energy Information Administration; BP.

Diagnosis of Resource Curse

After finding substantial amounts of energy resources, three ASEAN countries have commercialized their resource development since the 1980's. Referring to [12], these countries have been diagnosed with the resource curse using a political, social, and economic perspective. First, an economics assessment includes "GNP/GNI per capita", "% of population living on less than $2 a day", "Average annual rate of inflation" and other proper metrics. In the case of countries suffering from resource curse, the former two metrics would be lowered while the last metric would be increased due to Dutch Disease. Second, to measure the social aspect, metrics such as "Adult Literacy Rate", "Infant Mortality", and "Prevalence of Undernourishment" are used. All of these metric would be low in the provision of public goods being insufficient due to resource curse. Third, regarding the political aspect, "Transparency International Rating" is an appropriate metric, which assesses the amount of corruption in a country.

The diagnoses for the three study countries are summarized in Table 1. First, regarding the economic aspect, most of the applied metrics show a recent improvement in performance for each country. Only GNP/GNI per capita decreased between 1997 and 2007, as there was the Asian financial crisis in 1997. Despite this depressed economic environment, the macro-economy steadily grew. This validates the argument that these countries have not been trapped in a resource curse [11]. Moreover, most of the social and political metric values showed recent improvement. Not only from the economic perspective but also regarding non-economic aspects, thereby showing an absence of evidence of a resource curse in these countries.

Table 1. Resource Curse Indicators for Indonesia, Malaysia, and Thailand, 1987-2007.

	Indonesia			Malaysia			Thailand		
Economic Aspect									
Year	1987	1997	2007	1987	1997	2007	1987	1997	2007
GNP/GNI per capita	$762	$1,429	$1,349	$3,359	$6,025	$5,237	$1,732	$3,605	$2,866
% of population living on less than $2 a day	n.a.	59%	52%	n.a.	27%	9%	n.a.	24%	25%
Average annual rate of inflation	8.5%	11%	13%	1.3%	2.7%	2.3%	3.1%	4%	2.3%
Non-Economic Aspect									
Year	1987	1997	2007	1987	1997	2007	1987	1997	2007
Infant mortality (/ thousand live birth)	109	66	31	31	17	11	42	20	7
Undernourishment rate (% population)	n.a.	9%	6%	n.a.	3%	3%	n.a.	30%	22%
Transparency Rate	n.a.	80/85	126/180	n.a.	29/85	47/180	n.a.	61/85	80/180

Source: World Bank; Transparency International.

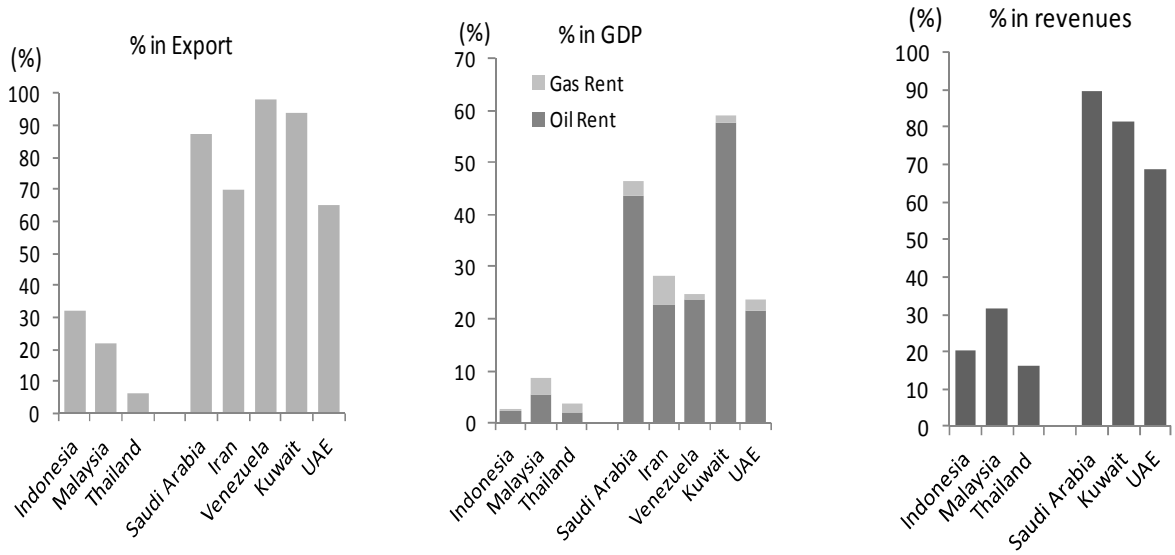

Fig. 3. Comparing the 3 study countries to OPEC countries in terms of export, GDP, and revenues.
Source: The World Bank; International Monetary Fund.

As for escaping from the resource curse, it is important to note that the macro-economy does not heavily depend on the windfall revenue from resources [13]. Indeed, the three study countries have achieved an independent macro-economic system compared to other OPEC countries faced with severe consequences due to the resource curse. First, oil and gas exports for the three study countries are around half that of OPEC countries: The three countries are less than 30% while OPEC countries are more than 60%. Second, oil and gas contribute much less to the three countries' GDPs than these resources do in OPEC countries. These energy resources in the three study countries contribute less than 10% to the GDP while OPEC countries rely heavily on oil rent. Third, the percentage of government revenue attributable to oil and gas in the three countries are around a third of that in OPEC countries.

Among the three countries, especially Thailand, the economy is independent from gas and oil. With a sound economic structure, the future possibility of the resource curse is low. Since the beginning of production, Thailand has never exported its energy resources. If the country had enjoyed the windfall revenue from resource export, the FDI inflow after the Plaza Accord would have benefited the other manufacturing sectors in this country less according to the orthodox resource curse theory. Indeed, the inflow benefitted this country better than Indonesia and Malaysia, which, to some extent, exported their energy resources to the international market. The domestic utilization of natural gas in Thailand will be reviewed in the next section.

3. ADDING VALUE ON NATURAL GAS IN THAILAND

Utilization of Natural Gas

Against the backdrop of oil shocks, resource development corporations began drilling for prospective oil in the Gulf of Thailand at the beginning of the 1970's. Ensuing that, in 1973, Unocal Corporation found offshore natural gas, followed by a number of drilling explorations carried out by international corporations such as Conoco, Texas Pacific, and MOECO. After other findings of natural gas reserves in the Gulf, the government decided to borrow $US50 billion from the World Bank for the construction of the natural gas pipeline. In 1978, Port Authority of Thailand signed the gas purchasing agreement with Unocal for 250 MMCFD. After the completion of the pipeline in 1981, commercial production started in 1982. While the country did start to import gas from Myanmar in 2000 and LNG from Qatar in 2011, Thailand's self-sufficiency remains around 80%.

The graph shows the utilization of domestic natural gas. Initially, all offshore natural gas was used for generation by EGAT with a take-or-pay contract ("Electricity"). In 1984, the Gas Separation Plant (GSP) started operating in the production of LPG, as well as Ethane and Propane. After 1986, gas was also starting to be used for industrial boilers and burners ("Industry") while alternative fuel had recently been produced ("Transportation"). Over the past 30 years, the utilization of domestic natural gas has been diversified from being generation-oriented to a multitude of purposes, especially GSP. For example, in 2007, GSP consumed around one-fourth of the domestic natural gas.

Development of Petro-chemical Industry

In Thailand, there are mainly three upstream sources for the petrochemical industry, which are Ethane and Propane separated from natural gas and Naphtha refined from crude oil and condensate. In the upstream, both Olefins and Aromatics are produced as a source for the downstream. Regarding Olefins, Ethylene is made from Ethane and Naphtha, while Propylene is made from Propane and Naphtha. As for Aromatics, mainly Benzene and Paraxylene are made from Naphtha. Through the intermediate process, the downstream produces commodities such as Polyethylene (PE), Polyvinyl Chloride (PVC), Polypropylene (PP), and Polystyrene

(PS). While PE and PVC are made from Ethylene, PP is made from Propylene, and PS is made from Aromatics.

During the 1980's, the utilization for GSP was still limited, as the downstream industry did not exist. The downstream industry developed after 1989 when National Petrochemical Corporation (NPC) I (37.99% owned by PTT) started operating to produce Ethylene and Propylene using Ethane derived from natural gas. Because imported Naphtha was less expensive compared to the domestic Ethane, Naphtha cracker was mainly constructed in the 1990's to produce Benzene and Paraxylene, in addition to Olefins (Ethylene and Propylene). In the 2000's, Ethane cracker was again focused on by the increasing price of imported Naphtha. In this way, after the 1990's, basic products (Ethylene, Propylene, Benzene, and Paraxylene) started to be domestically produced and their various downstream commodities, such as PE, PC, PP, and PS began to be commercially produced.

The added value in "Petroleum Refinery and Products" has always been larger than that in the total added value in "Crude Oil and Natural Gas", and the gap has been steadily increasing after downstream development. With this increase of petrochemical industries, the ratio of its added value to the total added value in manufacturing has increased, reaching 16% in 1998. Though both the added value and the ratio have recently decreased due to a competitive global market, the Thai petrochemical industry (Ethylene Derivative: 3.9 mil ton, Propylene Derivative: 2.3 mil ton) is much bigger than the other two resource countries: Indonesia (Ethylene Derivative: 1 mil ton, Propylene Derivative: 0.6 mil ton) and Malaysia (Ethylene Derivative: 1.4 mil ton, Propylene Derivative: 0.8 mil ton).

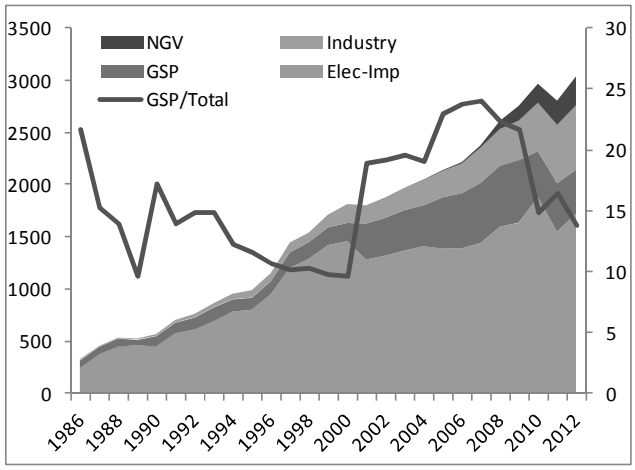

Fig. 4. Utilizations of Domestic Natural Gas in Thailand.
Source: Energy Policy and Planning Office, Thailand.

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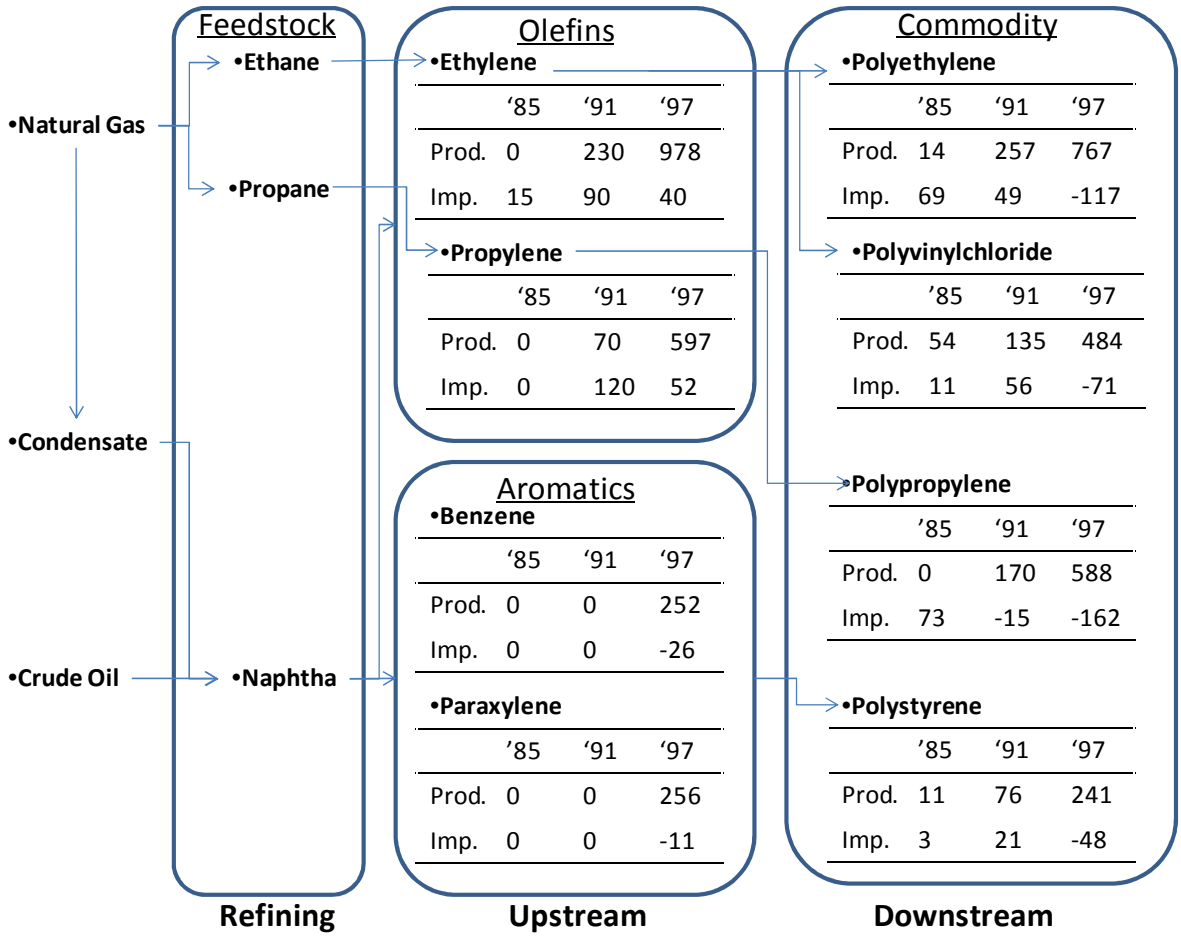

Fig. 5. Production and Import of downstream chemicals according to year, amount, and origin.
Source: The Heavy & Chemical Industries News Agency (1993; 1999)

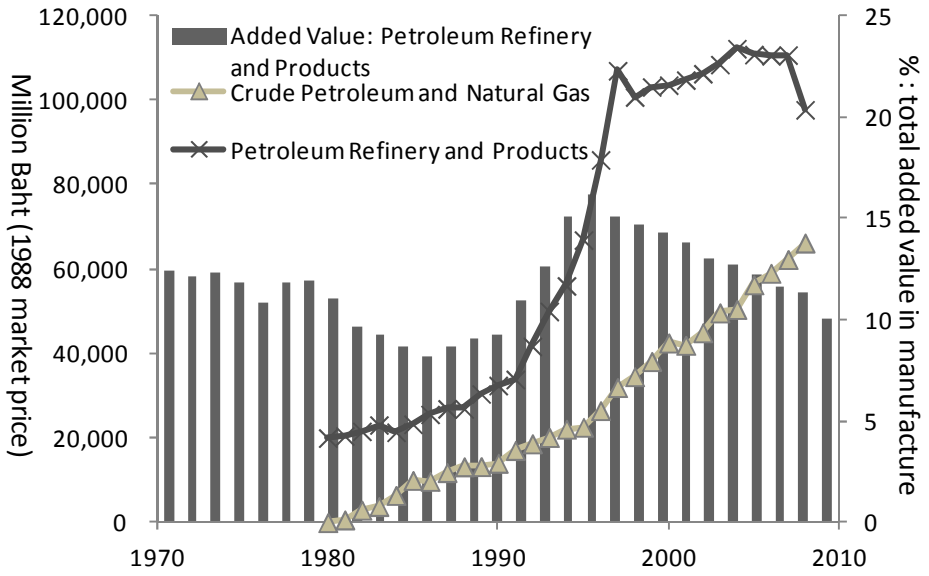

Fig. 6. Added Value in Petroleum Refinery and Products.
Source: Office of the National Economic and Social Development Board, Thailand.

The economic development in the Rayong province has been more remarkable than the other regions in the country since 1980's. For example, from 1981 to 1986, the Gross Provincial Product (GPP) of Rayong was remarkable thanks to the development of the natural gas industry. After this initial industry began, the development of the petrochemical industry has sustained growth in the province resulting in the GPP of Rayong currently being the biggest in the country, surpassing Bangkok. In this way, the natural gas and related industries have benefited the local region outside Bangkok, which has contributed to the nation's concerns regarding inequality.

This value-adding process after GSP is mostly located near the Map Ta Phut area in the Rayong Province. The National Economic and Social Development Board (NESDB) developed the region under the 5th National Economic Social Development Plan (1982-1986). With assistance from international donors, such as the Japanese Official Development Assistance (ODA), especially after the Plaza Accord, basic infrastructure has been rapidly developed. In fact, the average portion targeting ESB in the total Japanese ODA from 1982 to 1993 accounts for approximately 20%, which was utilized for a deep-sea port, roads, railways, waterlines, and the GSP [14].

4. CONCLUSION

Based on Thailand's experience in the previous section, three conclusions could be drawn regarding less developed countries considering utilizing their energy resources. First, Thailand controls the wealth from natural gas under the transparent contract with foreign resource companies. For example, PAT entered into the gas purchase agreement with UNOCAL, under which Thailand can control the way the natural gas is utilized. If this agreement had been one where the resource company had control, the natural gas could have been exported in accordance with soaring prices in the international market. Giving a disproportionate share of the resources' value to private foreign companies, the country might have been at risk of Dutch Disease.

Thailand's approach provides a good lesson for Myanmar. For example, due to its low domestic demand, Myanmar started exporting gas to Thailand in 2000 and to China in 2013. Yet, since opening the country in 2011 as an official democracy, the domestic oil demand has risen. As these exports are under long-term take-or-pay contracts, the country cannot reclaim resource control over current reserves. Yet, regarding the coming reserve, the country needs to claim resource control against international resource companies, instead opting for a transparent contract as Thailand has.

Second, Thailand has efficiently added value to its natural gas industrial region with its long-term economic plan. At the initial phase of resource extraction, Thailand had no comparative advantage in the petro-chemical industry. For example, there was insufficient infrastructure in the Rayong province to meet its hopes of being one of the biggest industrial regions in ASEAN. Against this disadvantage, NESDB crafted the long-term ESB development plan, which attracted the Japanese ODA after the Plaza Accord, to develop the needed infrastructure. Based on this development, the Thai petro-chemical industry was succeeded from upstream to downstream after the 1990's.

It is difficult to realize comparative advantages in the long run. For example, this challenge can be observed in Vietnam, a country producing and exporting crude oil since 1986. While the domestic demand of petrochemical products has increased, especially after enrolment in the World Trade Organization, the required investment for the value-adding process has been delayed. In 2009, Vietnam finally began operation of its oil refinery at Dung Quat, which produces far less than the domestic demand. Currently still exporting crude oil, the country imports petrochemical products, only worsening the

trade balance. Vietnam, therefore, needs a value-adding plan that targets a certain industrial region in the long run.

Third, the government role is essential during the initial phase of resource utilization in making a transparent contract with international companies and making a long-term plan for an industrial region. For example, Thailand's transparent contract with UNOCAL was agreed by PAT, which also shares the majority of NPC I. In addition, the fund procurement for basic infrastructure in Rayong was also planned by NESDB. In this way, the public sector had an essential function in the initial stage. On the other hand, this could also increase the risk of rent-seeking, which may have a negative effect on the national political economy [15][16]. This impact should be further studied focusing on Thailand and other resource countries in ASEAN.

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