Doctor of Philosophy's Dissertation

Macroeconomic Management for Sustainable Development in the Selected Resource-rich ASEAN Economies

- Lessons from experienced countries to Lao PDR -

September 2019

Graduate School of Humanities and Social Science
Saitama University

Khinsamone Soukvisan [17GD601]

Supervisor: Prof. Hiroyuki Taguchi
Sub-supervisor: Prof. Shu Ito
Sub-supervisor: Prof. Koki Hirota

Executive Summary

The economies of the Association of Southeast Asian Nations (ASEAN) have been a center of economic growth in Asia as well as in the world for the past decades. The annual growth rate of ASEAN economies recorded 5.0 percent on average during the period from 1990 to 2016, while those of Asian and the world economies showed 4.2 and 2.7 percent, respectively. The ASEAN, at the same time, contains a variety of economies with different stages of development. According to the World Bank Analytical Classifications in 2016, Brunei and Singapore are classified into "High income"; Malaysia and Thailand into "Upper middle income"; Cambodia, Indonesia, Lao PDR, Myanmar, Philippines and Vietnam into "Lower middle income". Among the middle-income economies, Malaysia, Thailand, Indonesia, and the Philippines have become middle incomers earlier than Cambodia, Lao PDR, Myanmar, and Vietnam, and so the former group is called "forerunners" while the latter is called "latecomers."

The heterogeneity in the ASEAN economies is also found from the perspectives of their abundance of natural resources and industrial structures. The contribution of resource sector in each ASEAN economy by the GDP share of mining and utility sectors indicated much difference in the GDP share of resource sector from Brunei (43.5%) to Singapore (1.5%). Focusing on the middle-income economies that have the resource contribution to their GDP by around 10 to 20 percent: Indonesia, Lao PDR, Malaysia, and Myanmar, their industrial structures in 2015 could be compared with those in 1980 as follows. The forerunners, Malaysia and Indonesia, reduced the GDP share of mining and utility sectors, and instead raised that of the manufacturing sector. In particular, Indonesia now has the larger share in manufacturing than in mining and utility sector, though she previously had a dominant share of mining and utility as an oil-producing country. The latecomers, Lao PDR and Myanmar, on the other hand, raised their shares of mining and utility as well as their manufacturing sector's shares. The critical question is, then, in what way the industrial structure should be designed in the future for the latecomers who are expected to sustain their economic growth, in other words, whether

the latecomers should continue to depend heavily on the resource sector or transform their industrial structures towards manufacturing-oriented ones just like the cases of forerunners of Malaysia and Indonesia.

From a theoretical perspective, this issue could be discussed in the context of the "resource curse" hypothesis initially proposed by Auty (1993): resource-rich countries tend to grow more slowly than resource-poor countries. The logic of this hypothesis is a crowding-out if we follow Sachs and Warner (2001): natural resources crow-out activity x; activity x drives growth; therefore, natural resources harm growth. As there is a diversity of views regarding what drives growth, we have a similar diversity of views on the natural resource question. As far as purely economic issues are concerned, however, the leading explanations could be summarized into two kinds of crowding-out logics as follows. One logic is that natural resources crowd-out manufacturing activities from a sectoral perspective, which has been often referred to as the applicability of the Dutch Disease. The other logic is that natural resources crowd-out savings and investment from an intertemporal perspective, which has been argued in the context of capital accumulation such as the Hartwick rule.

This dissertation aimed to examine the applicability of the resource curse hypothesis focusing on the selected resource-rich ASEAN economies by using a vector auto-regression (VAR) model as a quantitative analytical method. For the analytical samples, we targeted the four middle-income economies in which the GDP share of resource sector accounts for around 10 to 20 percent in 2015: Malaysia and Indonesia as the forerunners, and Lao PDR and Myanmar as the latecomers. As we observed, there is a contrast in the trends in their industrial structures for 1980-2015: the forerunners experienced the decline in the resource sector and the increase in manufacturing sector instead, and the latecomers showed the expansion in the resource sector. If the resource curse effect is found in the latecomers but not in the forerunners through the VAR model estimation, some lessons from the forerunners could be extracted to apply to the latecomers on the future design of the industrial strategies. The dissertation also discussed how to mobilize the resource revenues for a productive use in the context of public

financial management focusing on Lao PDR, in other words, how the current public financial management in Lao PDR should be transformed from resource-curse form to resource-blessing one.

The empirical study found that the latecomers of Lao PDR and Myanmar with the rising trends in their resource sector share have suffered from the Ditch Disease over the sample period with the declining share of manufacturing in their economies. Lao PDR has had the capital accumulation effect, but it may come from the intensive investment for natural resource development, thereby not being able to offset the Dutch Disease effect. In sum, the resource-rich latecomers of Lao PDR and Myanmar still stay at the phase of the resource curse. The forerunners of Indonesia and Malaysia have had no Dutch Disease effect at least in the post-crisis period and instead have enjoyed the capital accumulation effect, although Indonesia had experienced the Dutch Disease during the pre-crisis period. Thus, the forerunners of Indonesia and Malaysia that were previously resource-rich have transformed their economic structure from the Dutch Disease phase to manufacturing-oriented one through the capital accumulation effect. The lessons from the forerunners' experiences for the latecomers to escape from the Dutch Disease could be extracted as follows. First, some public financial system of allocating resource revenues for investment and development projects should be urgently established in Lao PDR and Myanmar, who have a rising share of resource sector and also get the Dutch Disease effect. Second, the diversification of industries by improving business environments should be facilitated for the latecomers of Lao PDR and Myanmar. Third, the latecomers of Lao PDR and Myanmar who suffer from the Dutch Disease could turn out to enjoy resource blessing with the improvement of their institutional qualities.

Focusing on the public financial management of Lao PDR, some structural reformations to overcome the Dutch Disease were suggested as follows. The current budget system in Lao PDR have mixed up the resource revenues with the ordinary budget, and it has brought about such difficulties as the volatility in revenue sources, the prevention of capital accumulation and the high risk of enlarging overall budget deficit. Thus the dissertation proposed to set up natural

resource funds to insulate the resource revenues from the ordinary budget for Lao budget system. Regarding the functions of the funds, they should focus on stabilization and investments. For the stabilization fund, the Chile's fund with a flexible operational rule could be a good reference, while the investment should concentrate on education, health and economic infrastructure to diversify the industries for the sustainable development. As for the institutional arrangements of the fund, the type of "virtual" funds is recommendable considering the Lao institutional quality, and the Special Account system in Japan could be a good reference.

Table of Contents

List of Figures

List of Tables

Chapter I Introduction

The economies of the Association of Southeast Asian Nations (ASEAN) have been a center of economic growth in Asia as well as in the world for the past decades. The annual growth rate of ASEAN economies recorded 5.0 percent on average during the period from 1990 to 2016, while those of Asian and the world economies showed 4.2 and 2.7 percent, respectively (see Figure 1-1).[1] The ASEAN, at the same time, contains a variety of economies with different stages of development. According to the World Bank Analytical Classifications in 2016[2], Brunei and Singapore are classified into "High income"; Malaysia and Thailand into "Upper middle income"; Cambodia, Indonesia, Lao PDR, Myanmar, Philippines and Vietnam into "Lower middle income." Among the middle income economies, Malaysia, Thailand, Indonesia, and the Philippines have become middle incomers earlier than Cambodia, Lao PDR, Myanmar and Vietnam, and so the former group is called "forerunners" while the latter is called "latecomers" (see Table 1-1).

The heterogeneity in the ASEAN economies is found also from the perspectives of their abundance of natural resources and industrial structures. Figure 1-2 displayed the contribution of resource sector in each ASEAN economy by the GDP share of mining and utility sectors, and indicated much difference in the GDP share of resource sector from Brunei (43.5%) to Singapore (1.5%). The other heterogeneity is shown in terms of population size, labor forces, industrial structure, fiscal and external balances in Table 1-2.

Focusing on the middle income economies that have the resource contribution to their GDP by around 10 to 20 percent: Indonesia, Lao PDR, Malaysia and Myanmar[3], we observe their industrial structures in 2015 compared with those in 1980 by Table 1-3. The forerunners, Malaysia and Indonesia, reduced the GDP share of mining and utility sectors, and instead raised that of manufacturing sector. In particular, Indonesia now has the larger share in manufacturing than in mining and utility sector, though she previously had a dominant share of mining and utility as an oil-producing country. The latecomers, Lao PDR and Myanmar, on the other hand,

[1] The growth rates are calculated by Gross Domestic Products at constant prices (2005), retrieved from UNCTAD STAT: http://unctadstat.unctad.org/EN/.

[2] See the website: https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries

[3] The justification of sampling the four countries as resource-rich economies in this study is described in Appendix 1-1.

raised their shares of mining and utility as well as their manufacturing sector's shares. The critical question is, then, in what way the industrial structure should be designed in the future for the latecomers who are expected to sustain their economic growth, in other words, whether the latecomers should continue to depend heavily on the resource sector or transform their industrial structures towards manufacturing-oriented ones just like the cases of forerunners of Malaysia and Indonesia.

From a theoretical perspective, this issue could be discussed in the context of the "resource curse" hypothesis initially proposed by Auty (1993): resource-rich countries tend to grow more slowly than resource-poor countries. The logic of this hypothesis is a crowding-out if we follow Sachs and Warner (2001): natural resources crow-out activity *x*; activity *x* drives growth; therefore natural resources harm growth. As there is a diversity of views regarding what drives growth, we have a similar diversity of views on the natural resource question. As far as purely economic issues are concerned, however, the leading explanations could be summarized into two kinds of crowding-out logics as follows. One logic is that natural resources crowd-out manufacturing activities from a sectoral perspective, which has been often referred to as the applicability of the Dutch Disease. The other logic is that natural resources crowd-out savings and investment from an intertemporal perspective, which has been argued in the context of capital accumulation such as the Hartwick rule.

This dissertation aims to examine the applicability of the resource curse hypothesis focusing on the selected resource-rich ASEAN economies by using a vector auto-regression (VAR) model as a quantitative analytical method. For the analytical samples, we target the four middle income economies in which the GDP share of resource sector accounts for around 10 to 20 percent in 2015: Malaysia and Indonesia as the forerunners, and Lao PDR and Myanmar as the latecomers.[4] As we observed, there is a contrast in the trends in their industrial structures for 1980-2015: the forerunners experienced the decline in resource sector and the increase in manufacturing sector instead, and the latecomers showed the expansion in resource sector. If the resource curse effect is found in the latecomers but not in the forerunners through the VAR model estimation, some lessons from the forerunners could be extracted to apply to the latecomers on the future design of the industrial strategies.

[4] The justification of sampling the four countries as resource-rich economies in this study is described in Appendix 1-1.

The rest of Chapter is structured as follows. Chapter II represents literature review and clarifies the contribution of this study; Chapter III conducts empirics with a VAR model estimation and discusses the policy implications derived from the estimation outcomes; Chapter IV discuss how to mobilize the resource revenues for a productive use in the context of public financial management focusing on Lao PDR, in other words, how the current public financial management in Lao PDR should be transformed from resource-curse form to resource-blessing one; and the last summarizes and concludes.

Chapter II Literature Review and Contribution

Regarding the selected resource-rich ASEAN economies, there is a contrast in the trends in their industrial structures for 1980-2015 as Chapter I described: the forerunners such as Malaysia and Indonesia experienced the decline in resource sector and instead the increase in manufacturing sector, and the latecomers like Lao PDR and Myanmar showed the expansion in resource sector. The crucial question is, then, whether the latecomer's economies can sustain their economic growth by continuously depending highly on natural resources. This question brings us to a popular argument on the relationship between natural resource abundance and economic growth, namely, the "resource curse" hypothesis. This study thus examines the applicability of the resource curse hypothesis for the targeted economies.

This Chapter first reviews the literature on the resource curse hypothesis including its mechanism and channels and also the literature on the application of the hypothesis to the ASEAN economies, and then demonstrates this study's contributions.

2.1 Resource Curse Hypothesis

The resource curse hypothesis, initially proposed by Auty (1993), refers to the paradoxical phenomenon that economies with rich natural resource wealth tend to grow more slowly than resource-poor economies. It has been typically observed in the contrasting fact that many African economies with rich oil, diamonds or other minerals have stayed behind at the least developed income level, whereas East Asian economies have attained higher growth in the world without natural resources, during the post-world-war II period.

The resource curse hypothesis has been put into a number of empirical studies, and the majority of them has provided supportive evidence (e.g., Sachs and Warner, 1995; Gelb, 1988; Gylfason et al., 1999; Manzano and Rigobon, 2008). In line with the evidence, Sachs and Warner (2001) argued that the empirical support for the resource curse is quite strong, by showing that there is little direct evidence that omitted geographical or climate variables explain the curse, or that there is a bias resulting from some other unobserved growth deterrent.

The experience of resource rich economies have, however, been still heterogeneous, as typically seen in Chile and Botswana who have utilized their resources effectively to boost

their economic performances. In fact, there has also been counter-evidence against the resource curse: Davis (1995) found no evidence of the natural resource curse, and Alexeev and Conrad (2009) showed that oil wealth and mineral wealth had even "positive" effects on income per capita, when controlling for a number of variables, particularly, dummies for East Asia and Latin America. Another impressive arguments have been presented by Van der Ploeg (2011), Mehlum et al. (2006) and Boschini et al. (2007). They argued that the "institutional quality" is a key factor to turn the resource curse into a blessing and with good institutions the effect of resources on growth could be transformed from a curse to a blessing.

2.2 Mechanism and Channels of Resource Curse

This section investigates the mechanism and channels behind the fact of the resource curse. It has been argued that the curse is caused by a variety of factors: some related to political economy and governance and the others related to macroeconomic transmission channels. Regarding the aspects of political economy and governance, for instance, Collier and Hoeffler (2000) pointed out the risk that natural resource revenues would cause a country's conflict and strife; Karl (1997) argued that the opportunities to access the rents associated with natural resources tend to induce a lack of transparency in the government.

The macroeconomic perspectives on resource curse are divided into short-term mechanism, and medium- and long- term ones. The short-run mechanism on resource curse is often explained by the volatility of natural resource prices. Ramey and Ramey (1995), for example, offered evidence that the adverse growth effect of natural resources results mainly from volatility of commodity prices.

In discussing the medium and long-term channels on resource curse, a logic of "crowding-out" proposed by Sachs and Warner (2001) has often been referred as in: natural resources crow-out activity *x*; activity *x* drives growth; therefore natural resources harm growth. As there is a diversity of views regarding what drives growth, we have a similar diversity of views on the natural resource question. As far as purely economic issues are concerned, however, the leading explanations could be summarized into two kinds of crowding-out logics as follows. One logic is that natural resources crowd-out manufacturing activities from a sectoral perspective, which has been often referred to as the applicability of the Dutch Disease.

The other logic is that natural resources crowd-out savings and investment from an intertemporal perspective, which has been argued in the context of capital accumulation such as the Hartwick rule.

2.2.1 Dutch Disease Hypothesis

The logic that natural resources crowd-out manufacturing activities is familiar as the Dutch Disease hypothesis. The Dutch Disease named by *the Economist* magazine on November 26, 1977 was originally inspired by side-effects of natural gas discoveries in the Northern Sea by the Netherlands in the late 1950s. The Disease was described as the negative impact on a country's economy due to large inflows of foreign income through the natural gas discovery. The logical process were explained as follows: the foreign currency inflows lead to currency appreciation; it makes domestic products less price competitive in international market; it further causes the decline in the exports and production in manufacturing sectors.

The theoretical framework for the Dutch Disease hypothesis was shown by the Salter-Swan-Corden-Dornbusch model. Corden and Neary (1982) described the model in the following way: the effects of a boom in the energy sector are decomposed of "resource movement effect" and "spending effect"; the former effect gives rise to "direct de-industrialization" such that the rise in the energy sector's labor demand causes labor to move out of the manufacturing sector through the wage hike; and the latter effect leads to "indirect de-industrialization" such that the higher real income resulting from the boom causes extra spending on services which raises a real exchange rate appreciation, and thus requires further adjustments towards reducing manufacturing employment (the mechanism of both effects will be explained in the later subsection). Sachs (2007) added the description of the Dutch Disease from the long-term perspective, by arguing that the boom in energy sector would further induce a decline in a technologically leading sector and squeeze a major source of technological progress in the economy with adverse consequences for long-term growth.

The Dutch Disease hypothesis has been verified in terms of a real currency appreciation caused by a boom in oil or other mineral and agricultural commodities. Edwards (1986), for instance, verified the causality from a commodity export boom to a real exchange rate through money-inflation link. Sachs and Warner (2001) found that resource-rich economies tended to

have higher price levels after controlling for the income effect, and demonstrated further that the subsequent loss of price competitiveness in manufacturing sectors impeded their export-led growth. More recent macroeconomic studies have also provided evidence directly to support the Dutch Disease effect. Harding and Venables (2013) indicated that the response to a resource windfall is to decrease non-resource exports by 35-70 percent, and Ismail (2010) revealed that a 10 percent oil windfall is on average associated with a 3.4 percent fall in value added across manufacturing sector.

When we focus on the studies on ASEAN economies, however, there have been limited evidence on the Dutch Disease effects in such selected individual economies as Indonesia, Malaysia, Lao PDR and Myanmar. On the repercussions of the oil bonanza in Indonesia during the late 1970s, Usui (1996 and 1997) argued that the Dutch Disease could be avoided due to such policy adjustments as the currency devaluation in 1978 and the subsequent accumulation of budget surpluses. Pangestu (1990), on the other hand, still emphasized the existence of the Dutch Disease in Indonesia during that period by demonstrating that the currency devaluation in 1978 only provided temporary relief to the nonoil traded goods sector. As for the current status of Indonesia and Malaysia, Rosser (2007) and Noh (2013) argued that they succeeded in escaping the resource curse by utilizing external political and economic conditions and by diversifying economic structure, respectively.

Regarding the case of Lao PDR with resource sectors still growing, Kyophilavong and Toyoda (2009) and Kyophilavong et al. (2013), by using a macro-econometric model and a computable general equilibrium model respectively, investigated the impacts of capital inflows in resource sectors on Lao macro-economy. They found two-side effects: positive impacts in the short run, and negative effects in the long run, i.e., Dutch Disease effect through appreciation of real exchange rate. Insisienmay et al. (2015) searched for evidence of the Dutch Disease on Lao economy by investigating the causal link from natural resource exports to real exchange rate, through estimating multiple regression equations. They found some symptoms of the disease and proposed policy options such as the investments of resource revenues for infrastructure and education.

2.2.2 Capital Accumulation Effect

The second logic on whether natural resources crowd-out savings and investment has often been argued in the context of capital accumulation, and could be evaluated by the criteria of the Hartwick rule (Hartwick, 1977). The rule holds that consumption can be maintained if the rents from nonrenewable resources are continuously invested rather than used for consumption. The economy, if its natural resources never crowd-out investment, can be said to follow the Hartwick rule, although many resource-rich developing countries in fact do not keep the rule. The World Bank (2011) quantified the crowding-out effects of natural resources on investment by comparing actual capital stocks with the hypothetical ones, i.e., the Hartwick rule counterfactual on what total capitals would be if countries had invested all the natural resource rents in produced capital. It represented the fact that the greater the dependence on natural resource rents, the greater the gap between actual capitals and hypothetical capitals. International Monetary Fund (2012) discussed the question of how much of resource windfall inflows to consume and how much to save/invest for resource-rich developing countries, and argued that a high saving/investment rate is necessary if there is to be a lasting impact on development, since the scaling up domestic investment would normally be part of an optimal development strategy.

There have also been some studies to describe the capital accumulation effect as a factor to mitigate the Dutch Disease effect within the aforementioned theoretical framework of the Dutch Disease (The details will be explained in the later subsection). Sachs (2007) proposed an economic model to explain that the Dutch Disease could be reversed if natural resource earnings were used not for consumption but for public investment, since the positive benefits of increased public investment on the non-energy traded sector through productivity improvement would outweigh any negative consequences of real exchange rate appreciation. Bourdet and Falck (2006) also pointed out the role of capital accumulation through domestic saving and investment as a long-term mechanism to offset the short-term Dutch Disease effect through a real exchange rate appreciation, although their argument is concerned with the economic impacts of not natural resource revenues but emigrants' remittances. Taguchi and Ni Lar (2016) conducted the empirical study of the capital accumulation effect together with the Dutch Disease effect in examining the applicability of the resource curse hypothesis focusing

on Asian economies. Their study identified the existence of Dutch Disease effect in 1980-1995 but not in 1995-2014, and instead found the capital accumulation effect in 1995-2014. They interpreted the dominance of capital accumulation in recent decades in Asian economies such that institutional improvements have transformed the resource effect from a curse to a blessing.

2.3 Theoretical Description for the Dutch Disease and Capital Accumulation

The purpose of this section is to clarify the theoretical framework of this study by combining the hypothesis of the Dutch Disease and the capital accumulation effect. The framework of the Dutch Disease hypothesis is based on Corden and Neary (1982), and that of capital accumulation effect is based on Sachs (2007) and Bourdet and Falck (2006).

The assumptions underlying the theoretical framework should be made clear for the first place as follows. First, the framework is one of a small open economy producing two goods (energy and manufactures) which are traded at exogenously given world prices, and third non-traded goods (services), the price of which moves flexibly to equalize domestic supply and demand. All good are used only for final consumption, and each of the three sectors uses labor which is perfectly mobile between sectors. Second, a boom in the energy sector originates from a once-and-for-all Hicks-neutral improvement in technology. Third, the models are purely real ones, and ignore monetary considerations: only relative prices (expressed in terms of the given prices of traded goods) are determined, and national output and expenditure are always equal, so that trade is always balanced overall. Fourth, there are no distortions in commodity or factor markets: in particular, real wages are perfectly flexible, ensuring that full employment is maintained at all times. Based on these assumptions, the pre-boom equilibrium, the Dutch Disease effect (divided into resource movement effect and spending effect), and capital accumulation effect will be explained as follows.

2.3.1 Pre-Boom Equilibrium

The labor market and the commodity market are displayed in Figure 2-1 and Figure 2-2, respectively. In the labor market, Figure 2-1, the wage rate in terms of manufactures is measured on the vertical axis, and the total labor supply is given by the horizontal axis $O_S O_T$.

Labor input into services is shown by the distance from O_S whereas labor input into two traded goods sector is shown by the distance from O_T. The labor demand for the manufacturing sector is denoted by L_M, and by being added to this by the initial labor demand for the energy sector, the pre-boom labor demand schedule for the two traded goods sector combined is obtained by L_T. The initial labor demand for the services sector, on the other hand, is drawn by L_S. Thus the initial full-employment equilibrium is at A, where L_T intersects L_S, and the initial wage rate is w_0. As for the commodity market in Figure 2-2, traded goods that aggregate energy and manufacturing output are measured on the vertical axis, and services are on the horizontal. The pre-boom production possibilities curve is shown by TS and the highest attainable indifference curve is I_0. The initial equilibrium is thus at point a, where TS is tangential to I_0. The initial real exchange rate (defined by the relative price of services to traded goods) is given by the slope of the common tangent to the two curves at a.

2.3.2 Effects of a Boom: Resource Movement Effect

Consider now the effects a boom in the form of Hicks-neutral technological progress in the energy sector under the assumption that the real exchange rate is unchanged. Beginning with resource movement effect in Figure 2-1, the energy sector's labor demand schedule shift upwards by an amount proportional to the extent of the technological progress. This causes the composite labor demand schedule L_T to shift upwards to L'_T, and so new equilibrium at B is attained through the rise in the wage rate to w_1. This effect thus causes labor to move out of both the manufacturing and services sectors. Since employment in manufacturing falls from O_TM to O_TM', the resource movement effect can be said to be "direct de-industrialization". Turning to Figure 2-2, the boom does not change the maximum output of services, OS, but it raises the maximum output of traded goods from OT to OT'. The production possibilities curve therefore shifts out asymmetrically to $T'S$ and the resource movement effect at a constant real exchange rate is represented by the movement of the production point from a to b. The movement of labor out of both the manufacturing and services sectors leads to a fall in their outputs.

2.3.3 Effects of a Boom: Spending Effect

Consider next the spending effect in Figure 2-2. Provided the demand for services rises with income (i.e. services are normal goods), demand at the initial real exchange rate moves along an income-consumption curve such as O_n, which intersects *T'S* at point *c*. Since there is excess demand for services at the initial real exchange rate, a real appreciation must occur. But the new equilibrium must lie somewhere between *j* (a point with the income-elasticity of demand for services being zero) and *c* at point *g*, so that the output of services rises compared with the initial situation. Returning to Figure 2-1, the services sector's labor demand schedule shifts upwards to *L's* because of the rise in the relative price of services to traded goods, i.e. the real appreciation, and so the final equilibrium is attained at point *G* through the further rise in the wage rate to w_2. Since employment in manufacturing falls further from O_TM' to O_TM'' thereby reducing further manufacturing output, the spending effect can be said to be "indirect de-industrialization".

To sum up, the boom in the energy sector gives rise to both "direct de-industrialization", reflected in the fall from O_TM to O_TM' through the resource movement effect, and "indirect de-industrialization", reflected in the fall from O_TM' to O_TM'' through the spending effect.

2.3.4 Intertemporal Effect: Capital Accumulation Effect

The Dutch Disease description above based on Corden and Neary (1982) belongs to the sectoral argument rather from the short-term perspective. Sachs (2007) and Bourdet and Falck (2006), on the other hand, add the longer term intertemporal perspective, namely capital accumulation effect, to the Dutch Disease framework. Sachs (2007) argued that production possibilities curve, *T'S*, could be shifted outwards to *T''S'* in Figure 2-2, if the proceeds of the energy earnings were invested in infrastructure (roads, power, telecoms) that raises the productivity of workers in both the traded goods and services sectors. Sachs (2007) also emphasized that the boom in the energy sector could lead to even a real exchange rate depreciation at a point *k*, if the public investment financed by the energy earnings raised the productivity of nontraded sector (e.g. by financing improved seed varieties for smallholder farmers in developing countries). Bourdet and Falck (2006) also insisted that the capital

accumulation through domestic investment financed by emigrants' remittances could shift the production possibilities curve outwards, and that a real exchange rate could depreciate if the domestic investment were directed towards the production of nontrade sector.

In sum, from a sectoral dimension, the boom in the energy sector might sacrifice the manufacturing production under the Dutch Disease story. From an intertemporal dimension, however, this sectoral repercussion of the boom might be offset through capital accumulation financed by the energy sector.

2.4 Contributions of this Study

This section clarifies this study's contributions in the reviewed literature. In the literature, there have been a limited number of empirical studies to examine the applicability of the resource curse hypothesis in Asian economies. The Asian economies, in particular, the ASEAN economies would be an attractive target to be investigated on the resource curse issue, since they have heterogeneity in their natural resource abundance and also most of them belong to a group of middle incomers. Now that most of the ASEAN economies, including such latecomers as Lao PDR and Myanmar, have entered the middle income stage, they might encounter the danger of "middle income trap" as Gill and Kharas (2007) suggested. It would thus be vitally important for them to transform the resource effect from a curse to a blessing to sustain their growth and to avoid "middle income trap".

Within the limited studies, those have concentrated only on the analyses of individual economies without any comparative researches among the economies, and only on sectoral Dutch Disease analyses without intertemporal perspective such as capital accumulation effect. Regarding the analytical methodologies, there have been a few quantitative studies and they have usually depended on a single-equation regression without considering the endogeneity problem among the interdependent variables.

The contributions of this study are summarized based on the reviewed literature as follows. First, the analysis of this study addresses not an individual economy but a group of resource-abundant economies in the ASEAN by applying a common analytical methodology to investigate the resource curse effect. It enables us to compare the applicability of the resource curse hypothesis among a variety of economies with different stages of development. If the

resource curse effect is found in the latecomers but not in the forerunners among the ASEAN, some lessons from the forerunners could be extracted to apply to the latecomers for avoiding the resource curse. The lessons could also contribute to avoiding the "middle income trap" for the latecomer' economies through ensuring their sustainable economic growth.

Second, this study adopts a comprehensive approach for the resource curse issue: the sectoral approach to examine the Dutch Disease effect that is composed of resource movement effect and spending effect; and the intertemporal approach to examine the capital accumulation effect. This approach corresponds to the two kinds of crowding-out logics in the long-term channels on resource curse: the crowding-out of manufacturing activities as a sectoral allocation, and the crowding-out of savings and investment as an intertemporal allocation. It makes it possible to analyze the resource curse effect in the sample economies from the multiple time-horizon.

Third, for an analytical method, this study adopts a VAR model estimation with Granger causality and impulse response tests. The VAR makes it possible to trace directly the causality and dynamic responsive effect of resource abundance to manufacturing activities and to capital accumulation. The causality issue would, in particular, be critical, since manufacturing activities might also affect the share of resource sector resources to GDP. Suppose that manufacturing sectors in an economy boosts its economic growth for a while and makes the economy reach a high income stage. The economy would eventually appear to have a low share of resource sector to GDP. Similarly, the lack of manufacturing activities in an economy might make the economy stay at a resource-rich status. The variables of resource sector and manufacturing sector as a percentage of GDP, therefore, have an endogenous relationship. In that case, a single-equation regression causes an estimation bias. A VAR model, instead, allows for potential endogeneity between the variables of concerns. The model lets the data determine the causality between the variables, and makes it possible to trace out the dynamic responses of variables to exogenous shocks overtime. The VAR model estimation, thus, makes it possible to strictly examine the existence of the resource curse effect.

In sum, the contributions of this study are to deal with a group of resource-abundant economies in the ASEAN by applying a common analytical methodology for the comparison of the applicability of the resource curse effect, to adopt a comprehensive approach for the resource curse issue, containing the sectoral approach to examine the Dutch Disease effect and the

intertemporal approach to examine the capital accumulation effect, and to analyze directly the causality and dynamic responsive effect of resource curse by using a VAR model as an analytical method.

Chapter III Empirics

This chapter turns to the empirics for examining the resource curse effect, namely, the Dutch Disease effect and the capital accumulation effect, focusing on the four selected resource-rich ASEAN economies by utilizing a VAR estimation method. In this section we clarify the key variables and methodology for the estimation, and the estimation outcomes with their policy implications.

We sample the four middle income economies among ASEAN in which the GDP share of resource sector account for around 10 to 20 percent in 2015[5]: Malaysia and Indonesia as the forerunners and Lao PDR and Myanmar as the latecomers, for the purposes of making their comparisons and extracting some lessons from the forerunners to apply to the latecomers. The sample period differs according to the data availability of targeted economies: 1970-2015 for Indonesia and Malaysia, 1980-2015 for Lao PDR and 1986-2015 for Myanmar. The sample period for Indonesia and Malaysia is further divided into 1970-1996 and 1997-2015, since both economies have experienced the large change in their economic structure since the Asian currency crises in 1997. All the data are retrieved from UNCTAD STAT and International Financial Statistics (IFS) of International Monetary Fund (IMF)[6].

3.1 Key Variables

We herein clarify the key variables for a VAR model estimation to examine the resource curse hypothesis. For estimating the Dutch Disease effect, the four variables are used as follows: mining and utility production (*mau*), price index – consumer price index (*cpi*) or GDP deflator (*def*), manufacturing-GDP ratio (*moy*), and real GDP per capita (*ypc*). For estimating the capital accumulation effect, the three variables are used as follows: mining and utility production (*mau*) again, investment-consumption ratio (*ioc*), and foreign direct investment (*fdi*). The reason why we focus only on these limited variables is to maximize the degree of freedom in the estimation within the short-range of time-series data. We further describe each variable's characteristic as follows.

[5] The justification of sampling the four countries as resource-rich economies in this study is described in Appendix 1-1.
[6] See the website of IMF: http://www.imf.org/en/data.

The mining and utility production (*mau*), for the first place, represents natural resource abundance in an economy. The UNCTAD STAT database has the series of "Mining, manufacturing, utilities" and "Manufacturing" as GDP (value added) by kind of economic activity in terms of US dollars at constant prices (2005) in millions. The mining and utility production is calculated by subtracting "Manufacturing" from "Mining, manufacturing, utilities" in this series. The data is available for the full sample period of 1970-2015 in all sample economies except Myanmar. For Myanmar, the sample period is confined to 1986 onward, since the values of the mining and utility production before 1985 are negligible, namely, less than 10 million US dollars at constant prices (2005).

The second variable is the price index, i.e. consumer price index (*cpi*) or GDP deflator (*def*). This variable is used as a proxy of real exchange rate to represent the "spending effect" in the context of the Dutch Disease effect. The positive causality from the mining and utility production to the price index implies the existence of the spending effect in the Dutch Disease hypothesis. The reason for not using an exchange rate is that the four sample ASEAN economies had ever controlled their exchange rates more or less during their sample periods. According to Ilzetzki et al. (2011), for instance, Indonesia had ever adopted "de facto crawling band and peg to US dollar" for 1974-1997; Lao PDR had done "de facto crawling band around US dollar" for 2007-2009; Malaysia had done "peg to US dollar" and "de facto band around the dollar" for 1998-2010; and Myanmar had done "de facto moving band around US" for 1994-1996. Frankel (2010) argued in the context of Dutch Disease that the real appreciation in the currency takes the form of nominal currency appreciation if the country has a floating exchange rate, whereas taking the form of money inflows and inflation if the country has a fixed exchange rate. Since the four sample ASEAN economies had ever taken the currency regime similar to a fixed one, we adopt the price index as a proxy of real exchange rate, following the argument of Frankel (2010). The data is taken from IFS of IMF in terms of the series of "consumer price index (2010=100)" and "Gross Domestic Product, Deflator (2010=100). Considering the data availability, the consumer price index is used for 1970-2015 in Indonesia, Malaysia and Myanmar[7], and the GDP deflator is used for 1980-2015 in Lao PDR. The data constraint of GDP deflator confines total sample periods to 1980-2015 for Lao PDR.

[7] Myanmar' sample of the consumer price index is actually used only for 1986-2015 due its data constraint of the mining and utility production.

The third variable of manufacturing-GDP ratio (*moy*) is introduced for examining directly the crowding-out effect on manufacturing activities, i.e., the total effect of the Dutch Disease. In the context of the theoretical framework described by Corden and Neary (1982), the manufacturers are assumed to be a proxy of non-energy traded goods. The manufacturing-GDP ratio is derived by dividing "Manufacturing in value added" by "Gross domestic product (GDP)" in terms of US dollars at current prices in millions in the category of GDP by kind of economic activity of the UNCTAD STAT dataset. The data for this variable is available for 1970-2015 in all the sample economies. The negative causality from the mining and utility production to the manufacturing-GDP ratio implies the existence of the total Dutch Disease effect. This effect represents the total de-industrialization, containing "direct" de-industrialization (shown by "resource movement effect") and "indirect" de-industrialization (shown by "spending effect"). If the spending effect were identified from the positive causality from rom the mining and utility production to the price index, the effect on the manufacturing-GDP ratio may have the mixed effects of "resource movement effect" and "spending effect". If the spending effect were not found, on the contrary, the effect on the manufacturing-GDP ratio may be occupied by "resource movement effect".

The fourth variable, i.e., real GDP per capita (*ypc*) is included as a control variable in the Dutch Disease estimation, since the manufacturing-GDP ratio might also be affected by development stage of an economy, for example, according to the Petty-Clark's Law (Clark, 1940). The data for real GDP per capita is retrieved from the series of "US Dollars at constant prices (2005) per capita" in the UNCTAD STAT dataset, which is available for 1970-2015 in all the sample economies.

The fifth variable of investment-consumption ratio (*ioc*) is for investigating the capital accumulation effect. The ratio is produced by dividing "gross fixed capital formation" by "final consumption expenditure", both of which are also retrieved from UNCTAD STAT in the category of GDP by type of expenditure. The data for this variable is available for 1970-2015 in all the sample economies. The positive causality from the mining and utility production to the investment-consumption ratio implies the existence of the capital accumulation effect.

The sixth variable, i.e., foreign direct investment (*fdi*), is included as a control variable in the estimation, since the investment-consumption ratio might also be affected by the degree of accepting foreign direct investment in the host economies. The data of foreign direct

investment is expressed as a percentage of GDP of inward foreign direct investment in the flow term in the UNCTAD STAT dataset, which is available for 1970-2015 in all the sample economies.

Figure 3-1 simply displays main three variables for looking through the total effects of the Dutch Disease and the capital accumulation: mining and utility production (*mau*), manufacturing-GDP ratio (*moy*), and investment-consumption ratio (*ioc*). We cannot identify any clear relationships from simple observation among variables, since the variables are interacting each other and affected by the other variables as real GDP per capita and GDP and foreign direct investment. There comes the necessity to conduct a VAR model estimation in the next section.

3.2 Methodology for a VAR Model Estimation

This section deals with the methodological issue for a VAR model estimation. The section first examines the property of each variable's data used for the estimation and then specify the VAR model.

3.2.1 Data Property

We herein investigate the property of each variable's data, by employing a unit root test, and if needed, a co-integration test for a set of variables' data. The unit root test is conducted on the null hypothesis that a level and/or a first difference of the individual data have a unit root. In case that the test tells us that each variable' data has a unit root in the level, but not in the first-difference, a set of variables' data corresponds to the case of $I(1)$, and then can be further examined by a co-integration test for the "level" data. If a set of variables' data are identified to have a co-integration, the use of the "level" data is justified for a VAR model estimation. For a unit root test, we adopt the augmented Dickey-Fuller (ADF) test (see Said & Dickey, 1984), and for a co-integration test, we employ the Johansen test (see Johansen, 1995).

Table 3-1 reports the result of both unit root and co-integration tests. For the data of all variables in each sample economy, the unit root test identified a unit root in their levels except the series of *fdi* in Malaysia and *cpi* and *fdi* in Myanmar, but rejected it in their first differences

in all the series at the conventional level of significance, thereby a set of the variables' data following the case of *I*(1). The co-integration test was, thus, conducted further on the combination of variables, and both the trace test and the Maximum-eigenvalue test implied that the level series of a set of variables' data were co-integrated. We thus utilize the level data for a VAR model estimation on all sample economies.

3.2.2 Model Specification

We now specify a VAR model equation for estimation in the following way.

$$y_t = \mu + V_1 y_{t-1} + V_2 z_t + \varepsilon_t \qquad (1)$$

where y_t is a column vector of the endogenous variables with year t, i.e., $y_t = (mau_t\ cpi\ (or\ def)_t\ moy_t)'$ for examining the Dutch Disease effect and $y_t = (mau_t\ ioc_t)'$ for examining the capital accumulation effect; μ is a constant vector[8]; $V_1\ and\ V_2$ are a coefficient matrix; y_{t-1} is a vector of the lagged endogenous variables; z_t is a vector of the control variable, i.e., real GDP per capita (*ypc*) for the Dutch Disease effect and foreign direct investment (*fdi*) for the capital accumulation effect; and ε_t is a vector of the random error terms in the system. The lag length (-1) is selected by the Schwarz Information Criterion with maximum lag equal to (-2) under the limited number of observations. The data of all the variables are converted into natural logarithm form for the estimation to avoid the heteroskedastic in the error terms.

Based on the VAR model (1), for the Dutch Disease analysis, we examine the Granger causality among mining and utility production (*mau*), price index (*cpi* or *def*) and manufacturing-GDP ratio (*moy*) by controlling real GDP per capita (*ypc*). When the negative causality from *mau* to *moy* and the positive causality from *mau* to *cpi* (or *def*) are identified at a conventionally significant level, those outcomes imply the existence of the total Dutch Disease effect and the spending effect, respectively. In that case, we further investigate the impulse responses of *moy* and *cpi* (or *def*) to the *mau* shock so that we can trace the dynamic

[8] In case that the coefficient of the constant term is insignificant, the term is omitted to maximize the degree of freedom in the estimation. Regarding the estimation for Lao PDR, the dummy variable is inserted in 1988, due to the serious economic downsizing in that year.

effect. Regarding the capital accumulation analysis, we investigate the causality between mining and utility production (*mau*) and investment-consumption ratio (*ioc*), and the impulse response of *ioc* to the *mau* shock. When the causality and impulse response from *mau* to *ioc* were confirmed in positive ways, that suggests the existence of the capital accumulation effect.

3.3 Estimation Outcomes and Interpretations

This section reports the estimation outcomes of the VAR model, the Granger causalities and the impulse responses for the four ASEAN economies. We first explain them by the sample economies and then summarize the outcomes with their interpretations.

3.3.1 Indonesia

The estimation outcomes for Indonesia are reported in Table 3-2 and Figure 3-2. The sample period is the one for 1970-2015, but it is also divided into 1970-1996 and 1997-2015, since Indonesia has experienced the large change in its economic structure since the Asian currency crises in 1997. The structural change could be examined by Chow's breakpoint test to diagnose a breakpoint by the F-statistics with probabilities for the hypothesis of parameter stability over different periods for the combination of mining and utility production (*mau*) and manufacturing-GDP ratio (*mos*), and that of mining and utility production (*mau*) and investment-consumption ratio (*ioc*). The test result verified the existence of a breakpoint in 1997 in Indonesia (see Table 3-2-1).

Regarding the total Dutch Disease effect, the result of the Granger causality test showed that it was not in 1970-2015 and 1997-2015 but in 1970-1996 that the causality from mining and utility production (*mau*) to manufacturing-GDP ratio (*moy*) was identified at the conventionally significant level (see Table 3-2-3). Considering the estimated VAR model as shown in Table 3-2-2, the sign of the causality in 1970-1996 was negative, thereby implying the existence of the total Dutch Disease effect. Figure 3-2 shows the test of the impulse response focusing on the period of 1970-1996 also revealed that manufacturing-GDP ratio (*moy*) negatively responded to the shock of mining and utility production (*mau*) beyond a 95 percent error band during four-year interval. As for the spending effect, the weak positive

causality from mining and utility production (*mau*) to price index (*cpi*) was found only in 1970-2015, but it was not meaningful since the total Dutch Disease effect was not found in that period. It was speculated, therefore, that the Ditch Disease effect in 1970-1996 would come from the resource movement effect.

Looking as the capital accumulation effect, the outcome of the Granger causality test indicated that in all sample periods for 1970-2015, 1970-1996 and 1997-2015 the causality from mining and utility production (*mau*) to investment-consumption ratio (*ioc*) was identified at the conventionally significant level (see Table 3-2-3). Considering the estimated VAR model as shown in Table 3-2-2, the sign of the causality was positive in all cases, thereby implying the existence of the capital accumulation effect. Figure 3-2 shows the test of the impulse response focusing on the period of 1970-2015 also revealed that investment-consumption ratio (*ioc*) positively responded to the shock of mining and utility production (*mau*) beyond a 95 percent error band.

3.3.2 Lao PDR

The estimation outcomes for Lao PDR are reported in Table 3-3 and Figure 3-3. In the sample period for 1980-2015, regarding the total Dutch Disease effect, the result of the Granger causality test reported in Table 3-3-2 that the causality from mining and utility production (*mau*) to manufacturing-GDP ratio (*moy*) was identified at the conventionally significant level. Considering the estimated VAR model as shown in Table 3-3-1, the sign of the causality was negative, thereby implying the existence of the total Dutch Disease effect. Figure 3-3 shows the test of the impulse response also indicated that manufacturing-GDP ratio (*moy*) negatively responded to the shock of mining and utility production (*mau*) beyond a 95 percent error band during seven-year interval. As for the spending effect, the causality from mining and utility production (*mau*) to price index (*def*) was not found, thereby the Ditch Disease effect coming from the resource movement effect.

Looking as the capital accumulation effect, the outcome of the Granger causality test indicated in Table 3-3-2 that the causality from mining and utility production (*mau*) to investment-consumption ratio (*ioc*) was identified at the conventionally significant level. Considering the estimated VAR model as shown in Table 3-3-1, the sign of the causality was

positive, thereby implying the existence of the capital accumulation effect. Figure 3-3 shows the test of the impulse response also indicated that investment-consumption ratio (*ioc*) positively responded to the shock of mining and utility production (*mau*) beyond a 95 percent error band.

3.3.3 Malaysia

The estimation outcomes for Malaysia are reported in Table 3-4 and Figure 3-4. The sample period is the one for 1970-2015, but it is also divided into 1970-1996 and 1997-2015, since Malaysia has experienced the large change in its economic structure since the Asian currency crises in 1997. Similar to the case of Indonesia, the result of the Chow's breakpoint test verified the existence of a breakpoint in 1997 in Malaysia for the combination of mining and utility production (*mau*) and manufacturing-GDP ratio (*mos*), and that of mining and utility production (*mau*) and investment-consumption ratio (*ioc*) (see Table 3-4-1).

Regarding the total Dutch Disease effect, any negative causalities from mining and utility production (*mau*) to manufacturing-GDP ratio (*moy*) were not found in 1970-2015 as well as in 1970-1996 and 1997-2015, thereby implying no existence of the Dutch Disease effect including the spending effect (see Table 3-4-2 and 3-4-3).

As for the capital accumulation effect, the outcome of the Granger causality test indicated that the causality from mining and utility production (*mau*) to investment-consumption ratio (*ioc*) was identified not in 1970-2015 but in 1970-1996 and 1997-2015 (see Table 3-4-3). Considering the estimated VAR model as shown in Table 3-4-2, the sign of the causality was positive in both cases, thereby implying the existence of the capital accumulation effect. Figure 3-4 shows the test of the impulse response focusing on the periods of 1970-1996 and 1997-2015 also revealed that investment-consumption ratio (*ioc*) positively responded to the shock of mining and utility production (*mau*) beyond a 95 percent error band.

3.3.4 Myanmar

The estimation outcomes for Myanmar are reported in Table 3-5 and Figure 3-5. In the sample period for 1986-2015, regarding the total Dutch Disease effect, the result of the Granger

causality test reported in Table 3-5-2 that the causality from mining and utility production (*mau*) to manufacturing-GDP ratio (*moy*) was identified at the conventionally significant level. Considering the estimated VAR model as shown in Table 3-5-1, the sign of the causality was negative, thereby implying the existence of the total Dutch Disease effect. Figure 3-5 shows the test of the impulse response also indicated that manufacturing-GDP ratio (*moy*) negatively responded to the shock of mining and utility production (*mau*) beyond a 95 percent error band during four-year interval. As for the spending effect, the causality from mining and utility production (*mau*) to price index (*cpi*) was not found, thereby the Ditch Disease effect coming from the resource movement effect.

Looking as the capital accumulation effect shows in Table 3-5-2, the outcome of the Granger causality test indicated that the causality from mining and utility production (*mau*) to investment-consumption ratio (*ioc*) was not found in the sample period, thereby implying no existence of the capital accumulation effect.

3.3.5 Summary and Interpretations

The estimation outcomes can be summarized as follows (see Table 3-7). The Dutch Disease effect (that comes from not spending effect but resource movement effect) was found in Lao PDR and Myanmar in their full sample periods, and in Indonesia in the pre-crisis period, whereas the effect was not identified in Malaysia and the post-crisis Indonesia. The capital accumulation effect was found in Indonesia, Lao PDR and Malaysia but not in Myanmar.

These outcomes can be interpreted in the following ways. The latecomers of Lao PDR and Myanmar with the rising trends in their resource sector share have suffered from the Dutch Disease over the sample period with the declining share of manufacturing in their economies. Lao PDR has had the capital accumulation effect, but it may come from the intensive investment for natural resource development, thereby not being able to offset the Dutch Disease effect. In sum, the resource-rich latecomers of Lao PDR and Myanmar still stay at the phase of the resource curse. The forerunners of Indonesia and Malaysia have had no Dutch Disease effect at least in the post-crisis period and instead have enjoyed the capital accumulation effect, although Indonesia had experienced the Dutch Disease during the pre-crisis period. Thus, the forerunners of Indonesia and Malaysia that were previously resource-rich, have transformed

their economic structure from the Dutch Disease phase to manufacturing-oriented one through the capital accumulation effect.

3.4 Policy Implications

This section discusses the policy implications derived from the estimation outcomes in the previous section. To be specific, the questions are why the forerunners of Indonesia and Malaysia have currently no Dutch Disease effect and have enjoyed the capital accumulation effect, and in particular why Indonesia has been able to escape from the Dutch Disease; and what kinds of lessons from the forerunners could be extracted to apply to the latecomers of Lao PDR and Myanmar who are currently suffering from the Dutch Disease. We herein pick up the following three perspectives on this issue.

The first perspective is whether an economy is mobilizing its resource revenues for a productive use, namely, investments necessary for its future development. From the theoretical viewpoint, Sachs (2007) proposed an economic model to explain that the Dutch Disease could be reversed if natural resource earnings were used not for consumption but for public investment. In reality, Demachi and Kinkyo (2014) introduced the following advanced practices of Indonesia and Malaysia: Indonesia directed its oil revenues to rural infrastructure, in particular, to implementing large-scale projects for school construction; and Malaysia achieved resource-based industrialization by directly allocating natural resource revenues to investments in heavy industries. The revenue management can also be evaluated by the Resource Governance Index. The latest index in 2017 in Table 3-8 indicated that Lao PDR and Myanmar are far behind Indonesia and Malaysia in the rankings of “revenue management” as well as composite index and the other items. From these points, some public financial system of allocating resource revenues for investment and development projects should be urgently established in Lao PDR and Myanmar, who have a rising share of resource sector and also get the Dutch Disease effect.

The second perspective is whether an economy is promoting strategic policies to diversify its industries without depending heavily on resource sector. As we observed in Table 1-3, the forerunners of Indonesia and Malaysia depend no more on resource sector by getting a dominant GDP share of manufacturing sector in 2015. As we mentioned in the literature review,

Rosser (2007) and Noh (2013) argued that Indonesia and Malaysia succeeded in escaping from the resource curse by diversifying economic structure, respectively. In order to diversify domestic industries, the most effective way would be to invite foreign direct investment (FDI), when the economy is lacking in technological capability and entrepreneurship. Kimura (2006) argued that the ASEAN forerunners had started applying the "accept everybody" policy for incoming FDI in the latter half of the 1980s or the early 1990s, and had enhanced locational advantages through various measures to compete over hosting FDI. As a consequence, the business environments in Indonesia and Malaysia are far better than those in Lao PDR and Myanmar as shown in the rankings of the "Doing Business 2017" in Table 3-9. The diversification of industries by improving business environments should, therefore, be facilitated for the latecomers of Lao PDR and Myanmar.

The last perspective is whether an economy is improving its institutional quality to transform its economic structure from "resource curse" to "resource blessing". Van der Ploeg (2011) argued that "good institution" made it possible to turn the resource effect from a curse to a blessing. A typical example was found in the case of Indonesia. Asanuma (2008) argued that the "Pertamina", the largest state-owned enterprise in Indonesia, fell into a crisis in 1975 due to its mismanagement in the resource-curse era; and since then it had been the "Technocrats" that had taken over the control of oil and gas revenues and had carried out a series of reforms for reducing the country's dependence on oil and gas and for diversifying the economy. The institutional quality could be represented by the Worldwide Governance Indicators in Table 3-10. The indicator takes the value of -2.5 in the worst quality and of 2.5 in the best one, and the value of around zero in the world average. We observed that during the past two decades, the indicator of Indonesia improved and that of Malaysia kept high scores, while those of Lao PDR and Myanmar stayed still behind those of Indonesia and Malaysia. The latecomers of Lao PDR and Myanmar who suffer from resource curse in terms of the Dutch Disease could turn out to enjoy resource blessing with the improvement of their institutional qualities.

Chapter IV Dutch Disease and Public Financial Management in Lao PDR

The empirical study in the previous chapters suggested that the resource-rich latecomer's economies, Lao PDR and Myanmar, have suffered from the Dutch Disease, and also argued as one of the policy implications that these economies should mobilize their resource revenues for a productive use, namely, investments necessary for its future development to offset the Dutch Disease.

This chapter aims to discuss how to mobilize the resource revenues for a productive use in the context of public financial management focusing on Lao PDR, in other words, how the current public financial management in Lao PDR should be transformed from resource-curse form to resource-blessing one. The first session in this chapter reviews the presence of natural resource sectors in Lao economy, and the second session discusses her strategies in public financial management to get out of the Dutch Disease.

4.1 Natural Resource Development in Lao Economy

This section first introduces the outline of Lao economy, and then clarifies the presence of natural resource sectors in her economy.

4.1.1 Outline of Lao Economy

This sub-section starts to describe the profile of Lao Economy. From the geographical perspective, Lao PDR is located in the central part of the Indochina Peninsula, and is the only landlocked country in Southeast Asia. It borders with five countries: China in the north part, Vietnam in the east part, Cambodia in the south part, Thailand in the southwest part, and Myanmar in the northwest part.

The short history of Lao economy is as follows. Lao PDR was established in 1975. During 1975-1985, Lao economy had been a centrally planned one under a socialist regime. Since 1986, however, the country has introduced the New Economic Mechanism and transformed its economic system from centrally planned one to a market-oriented one. This change in economic system has brought a remarkable economic growth for the last two decades.

One of the driving forces of rapid growth has been, as we explain in the next section, natural resource development such as hydropower and mining.

The current economic status is shown by key indicators in 2016 based on the database of the World Bank, Asian Development Bank and United Nations Conference on Trade and Development in Table 4-1. According to it, the total population size is 6.8 million; the GDP is 15.8 billion US dollars; the GDP per capita is 2,339 US dollars, in which the economy is classified into the category of "Lower Middle Income" according to the World Bank Analytical Classifications. Regarding the industrial structure, the share of agriculture, industry and services are 2:3:5 as percentage of GDP. As for the external balance, imports exceed exports, thereby leading to the deficits in trade and current balance.

The recent economic trend is presented by Figure 4-1. The real GDP growth, though it declined sharply in 1998 due to the repercussion from the Asian Financial Crisis, has achieved 7.3 percent during 2001-2016, one of the fastest growth in the Southeast Asia. As a result, the real GDP per capita has jumped up from 326 US dollars in 2001 to 2,339 in 2016, by 7.2 times.

4.1.2 Presence of Natural Resource Sectors in Lao Economy

Natural resource sectors have shown high presence in Lao economy during the recent decades. IMF (2012) identified 29 countries as resource-rich developing countries by the criteria that at least 20 percent of their total exports were natural resources or they derived at least 20 percent of their revenue from natural resources, using average data for 2006–10, and Lao PDR is included in this group.

The main natural resources in Lao economy are considered to be hydropower and mining as was discussed in Appendix 1-1 by referring to World Bank (2010) , i.e. Lao PDR Development Report, and thus this Chapter defines natural resource sectors as those of hydropower and mining. The two sectors' share in GDP, government revenue and export value in 2016 are shown as follows: the value added of mining and utility accounts for 17.4% of total GDP as Table 4-1 indicated; the government revenue from the two sectors of hydropower and mining accounts for around 10 % of total tax revenue (which will be analyzed later on); and the export value of mining and electricity accounts for 54 % of total export[9]. When it comes to

[9] The data source of export value is Bank of Lao PDR.

the comparison in the share of mining and utility to GDP among ASEAN economies, Lao PDR is the third largest country as shown in Figure 1-2 of Chapter I. The followings are the description of hydropower and mining sectors.

[Hydropower sector]

We first introduce the short history of hydropower development. The very first project named “Nam Ngum I hydropower project” was completed in 1971, and installed the capacity of 30 MW. The capacity expanded to 150 MW by 1987. In 2015, 38 electricity generation plants are working with the capacity of 6,256 MW. The Ministry of Energy and Mines still has the plan to install further 60 electricity generation plants with the capacity of more than 10,000 MW by 2020, and also recognizes a potential to develop the maximum capacity by more than 26,000 MW.

Through the capacity expansion, the electrification ratio of total households across the country has improved from 36 percent in 2000 to 90 percent in 2015, and is expected to reach further 98 percent by 2020. In this sense, Lao PDR is said to be the most successful country for its rapid nation-wide electrification development in the world.

The hydropower development has two targets: for satisfying domestic electricity demand and for earning foreign currency through electricity exports. For the electricity exports, Lao PDR has signed the Memorandum of Understanding (MOU) with Thailand for supplying 7,000 MW in 2007 and expanding to 9,000 MW in 2016, and with Vietnam for supplying 3,000 MW in 2008. Figure 4-2 shows electricity generation, its domestic consumption and its exports in Lao PDR for 2005-2015. Since 2009, the electricity generation has recorded a rapid increase and most of it has been allocated for exports to Thailand and Vietnam for fulfilling their intensive demands. In 2015, about 70 percent of the generated electricity is allocated for exports to Thailand and Vietnam. Figure 4-3 indicates that the value of electricity export has also increased rapidly since 2010: in 2005 the value of electricity export was only about 100 million US dollar, and then jumped up to more than 1,000 million US dollar by 10 times. In this way, the hydropower development in Lao PDR has contributed to the domestic socio-economic development and also to the battery supply for neighboring economies.

[Mining sector]

Mining industry in Lao PDR is identified as one of the priority sectors in the country's socio-economic development. The mining sector has been rapidly becoming an important source of economic growth, national revenue and a driver for local community development. The mining development in Lao PDR has such targets as promoting mineral processing to increase the value added of mineral products and ensuring that the benefits from this minerals contribute to improving people's livelihoods.

Lao PDR is also considered to be one of the most mineral-resource-rich economies in Southeast Asia. According to World Bank (2006), more than 570 mineral deposits have been identified, including gold, copper, zinc, lead, tin, iron ore, bauxite, gypsum, limestone, potash, coal, gemstone, etc. The mining development has started with large-scale mining development project: the Sepon Mine project for gold mining from 2003 and Phu Bia Mines project for copper mining from 2005, and since then, the mineral production has expanded rapidly as Table 4-2 indicates. According to Ministry of Energy and Mines of Lao PDR, there are currently 297 mining projects in 2015, including 107 projects for prospection and qualifying, 125 projects for exploration and 65 projects for mining operation. As for the mining export shown in Figure 4-4 for 2005-2015, its value was only about 216.6 million US dollar in 2005, and jumped up to 1,313.5 US million dollar in 2016 by around 6 times.

4.2 Public Financial Management for Resource Revenues in Lao PDR

The section addresses what the public financial management for natural resource revenues in Lao PDR should be to get out of the Dutch Disease. The section first clarifies the budget structure and the presence of resource revenues, demonstrates the challenges in public financial management, and finally proposes the establishment of natural resource funds in Lao PDR.

4.2.1 Budget Structure and Presence of Resource Revenues

This subsection first clarifies the revenues and expenditures of central government in Lao PDR by Table 4-3. The revenues comprises domestic revenues and grants for foreign donors. The domestic revenues are composed of tax revenue (profit tax, income tax, value added tax, natural resource tax, royalties, etc.) and non-tax revenue (leasing fees, concessions, fines, etc.). The major source of the revenues is the tax revenue, which accounts for 15.7 percent of GDP while the total revenues account for 23.7 percent of GDP in FY 2014. The expenditure is divided into current expenditure (salaries for officials, material supplies, debt payment, etc.) and capital one (investment for infrastructure): each ratio to GDP is 28.9, 17.6 and 11.3 percent, respectively. As an overall balance, therefore, the government suffers from the deficit by 5.2 percent of GDP, and the deficit is financed by domestic and foreign sources.

Regarding the resource revenue, the sources of revenue can be focused on hydropower and mining, as this Chapter previously defines natural resources as these two sectors. For the hydropower, the government gets the royalty and profit tax from developers and project companies: more than 5 percent of their sales revenue as the royalty and 10-24 percent of their net profit as the profit tax, which depend on the financial ability of the project. In the mining sector, the government also obtains the natural resource tax and profit tax from developers and project companies: 5-10 percent of their sales revenue as the natural resource tax and 10-24 percent of their net profit as the profit tax, which depend on the financial ability of the project. These revenues constitute a total resource revenue as a part of tax revenue: profit tax from two resource sectors, natural resource tax and hydropower royalty account for 4, 4, and 2 percent of tax revenue, respectively, summing up to 10 percent as a total in FY 2014. The share of the total resource revenue to tax revenue has changed year by year during FY 2010-2015 as shown in Table 4-4, with the maximum share being 21 percent in FY 2011 and with the minimum one being 10 percent in FY 2014.

4.2.2 Challenges in Public Financial Management

In general, the public financial management in resource-rich countries faces the following difficulties if resource revenues are directly mixed up with an ordinary budget

account. First, fiscal management would be heavily affected by volatile resource revenues caused by the fluctuation of resource prices, which would exacerbate boom-and-bust cycles of an economy in a pro-cyclical way (e.g., Frankel, 2011). Second, the resource revenues would be allocated for a part of the current expenditure (including salaries, etc.) of non-resource balance, in particular, when the overall budget depends highly on resource revenues (e.g., JICA, 2016). The usage of resource revenues for the government consumption accelerates the expenditure of non-traded goods, and also discourages the capital accumulation effect (which were argued in Section 2.3), thereby leading to the Dutch Disease effect.

When it comes to the budget trends in Lao PDR, the resource revenues show high fluctuations as shown in Table 4-4. During FY 2010-2015, although the hydropower royalty has shown its stability relatively, the profit tax from resource sectors and natural resource tax have fluctuated, reflecting the price fluctuation in mining sectors such as copper and gold. This resource revenue fluctuation makes it difficult for Lao PDR to manage its fiscal policy in a counter-cyclical way.

Another challenge in public financial management in Lao PDR, which is more serious, is that the resource revenues are predominantly utilized for current expenditure. Figure 4-5 represents the national budget balance in FY 2014 in Lao PDR. The total expenditure (29,090 billion Kip, only number hereafter) is composed of current expenditure (17,685) and capital expenditure (11,405). The current expenditure (17,685) is financed by the domestic tax and non-tax revenue (18,534) containing the resource revenue (1,522). Then the remaining domestic revenue (18,534 – 17,685 = 849) and the grants (5,323) are allocated for the capital expenditure (11,405), but not covering the expenditure fully. Finally, the overall deficit (11,405 – 849 – 5,323 = 5,233) is compensated by domestic financing (374) and foreign financing (4,859). The structure of the revenue allocation above is legally based on the Fundamental Principles of the State Budget (Article 6-5 of the State Budget Law 2015): the state budget shall ensure balancing between total revenue and total expenditure; in the event of the state budget deficit, only capital expenditure shall be authorized. Following this principles, the domestic revenue including the resource revenue as tax revenue shall finance such current expenditure as salaries for officials predominantly. This structure incurs the following problem for resource revenue management. The resource revenue accelerates the expenditure of non-traded goods and does not contribute to any capital accumulation effect, thereby leading to the

Dutch Disease effect. In addition, since the resource revenue shows high fluctuation as mentioned above, there would be a large risk that the current overall deficit will be enlarged under the situation in which the downturn of resource revenue will not be able to cover rather constant current expenditure.

Hence comes the necessities to set aside natural resource revenues from ordinary public financial management.

4.2.3 Proposal to Establish Natural Resource Funds for Lao PDR

As was discussed above, mixing up the resource revenues with an ordinary budget in Lao PDR has brought about such difficulties as the volatility in revenue sources, the prevention of capital accumulation and the high risk of enlarging overall budget deficit. There would, therefore, be the necessity to insulate the resource revenues from an ordinary budget, and for that purpose, setting up natural resource funds could be one of the useful tools in the public financial management in resource-rich countries. Establishing the funds would also contribute to institutional quality in resource-rich countries. In the previous section 3.4, the significance of the "good institution" was emphasized to transform its economic structure from "resource curse" to "resource blessing". Tsani (2013), for instance, investigated the relationship between resource funds, governance and institutional quality in resource-rich countries, and its estimation results suggested that resource funds might prove useful tools in the hands of the policymakers in the attempt to address governance and institutional quality deterioration induced by resource abundance.

This section first describes the general framework of the natural resource funds, and then proposes the establishment of the funds by customizing the fund concept to Lao PDR.

4.2.3.1 Natural Resource Funds in General

There have been many kinds of natural resource funds and several ways of their classifications. IMF (2012) classifies the existing natural resource funds into the following three categories according to their functions: the funds for stabilization to insulate the budget and economy from volatile commodity prices; the funds for savings to transfer wealth across

generations or across time[10] (e.g., pension funds); and the funds for development to allocate resources to propriety socioeconomic projects (investments).

Table 4-5 represents the selected examples of actual resource funds by their functional categories. The funds in Chile, Kazakhstan and Russia are classified in the funds for stabilization; those in Angola, Ghana and Nigeria are in the funds for investments; and those in Canada, Kuwait and Norway are in the funds for savings.

There are also different modalities of institutional arrangements for natural resource funds. IMF (2013) and World Bank (2016) classified the funds into two types according to their institutional arrangements: "virtual" funds and extra-budgetary resource funds. The "virtual" funds are a kind of separate treasury accounts that are managed in coordination with the ordinary budget process, and so require no separate institutional structure for the management of the funds. The extra-budgetary resource funds are, on the other hands, established as separate institutions with their own legal personalities, institutional independence, and authority to spend resource revenues for certain uses.

Regardless of the fund's institutional arrangements, World Bank (2016) emphasized the importance of "governance", "transparency" and "accountability" in the fund's management. The extra-budgetary resource funds, however, tend to require more of governance, transparency and accountability, since the funds are less integrated with the ordinary budget. In the case of developing countries, the extra-budgetary funds seem to be more difficult to be managed. IMF (2013) argued that: in low-income resource-producing countries, the rule of law is generally weak, and accountability and transparency mechanisms need substantive improvements; most low-income countries have difficulty finding citizens with the appropriate skills, experience, and independence of action to place themselves in opposition to government decision; and setting up the separate bodies in countries with weak institutions just creates dual budgeting with poor performances and even conflicts with the ordinary budget system.

[10] The idea for the funds for savings is often referred to as the well-known "permanent income hypothesis".

4.2.3.2 Application of Fund Scheme to Lao PDR

This section proposes the establishment of the fund for Lao PDR by customizing the fund concept. The section discusses first the suitable functions of the fund, and then its appropriate institutional arrangements.

[Functions of Fund]

As was discussed above, there are three kinds of funds in terms of their functions: the funds for stabilization, investments and savings. Since the section 4.2.2 pointes out the resource revenue fluctuation as one of the challenges in Lao public financial management, establishing the funds for stabilization would be justified in Lao PDR. World Bank (2010), i.e. Lao PDR Development Report, also supported the building-up of a sizeable stabilization fund as Lao optimal strategy.

To cope with another challenge, i.e. the dominant usage of resource revenues for current expenditure containing salaries for officials, the funds for investments or savings could be a matter of choice. In fact, there has been is a serious controversy on whether the funds should be saved or invested in general. This would depend on the development stage of a country, and in the case of developing countries like Lao PDR, the funds should be used for investments. Baunsgaard et al. (2012) argued that low-income countries usually have the less capital, which might be below the “steady state level”; under their capital scarcity the rate of return to capital is likely to be higher than that to financial assets; and investing more resource revenues domestically could raise potential non-resource growth in their countries. The concept of the funds for investments is consistent with the argument of Sachs (2007) with an emphasis on the role of public investment in a resource-rich economy, which was described in the section 2.3.4. World Bank (2010), i.e. Lao PDR Development Report, also suggested that the resource revenues need to be spent on public investment as part of the implementation of the government’s development program.

In sum, the natural resource fund for Lao PDR should be equipped with the functions of stabilization and investments. This proposal on the fund’s function would be consistent with

the guiding matrix for macro-fiscal frameworks presented by IMF/FAD[11] in Table 4-6. In this Table, Lao PDR is classified into the group with long-lasing resource revenues (e.g. hydropower energy) and with high capital scarcity. The macro-fiscal objectives in this category are macroeconomic stability, managing volatility and development, which would be corresponding to the fund's functions of stabilization and investments.

[Fund for Stabilization]

The modality of the stabilization fund is described in general as follows. According to World Bank (2016), most of the stabilization funds have rigid price- or revenue-contingent deposit and withdrawal operational rules, where deposits and withdrawals depend on the realization of an outcome of resource price or revenue relative to a specified trigger; the entire "excess revenue" relative to the revenue computed at the level of the benchmark trigger is mandated to be deposited in the fund, while the same applies to permissible withdrawals. The benchmark trigger could be set by using an automatic formula or by an independent committee.

For Lao PDR, the Chile's stabilization fund could be a good reference for setting up the fund. The Chile' Economic and Social Stability Fund (FEES) has been established since 2006, by replacing the former Copper Stabilization Fund. IMF (2013) illustrated its experienced performance as the successful case of "structural balance rule" as follows: until 2008, the FEES accrued substantial financial assets, since Chile ran large fiscal surpluses due to a substantial increase in copper prices relative to the projected long-term copper prices used in the calculation of structural mineral revenue and in the determination of the structural balance; then Chile has subsequently withdrawn resources from the FEES to finance fiscal deficits caused by a fall in actual copper prices and by fiscal stimulus packages introduced during the 2008-09 global economic crisis. The Fund is characterized by the flexible rule where not automatic formula but an independent committee of experts makes a judgement on medium- to long-term reference prices. Since implementation of the rule has revealed several challenges in recent years, however, the Fund has continued to improve its system by simplifying the

[11] Please see the presentation material by IMF/FAD in 2016: http://www.greenfiscalpolicy.org/wp-content/uploads/2016/11/Session-2-Oana-Luca-Macro-fiscal-policy-frameworks.pdf

calculation of the structural balance, strengthening transparency and accountability, since 2010 (for the details, see Daban, 2010).

[Fund for Investments]

The question here is what kinds of investments financed by resource revenues should be promoted in general. Coutinho (2011) represented the investment strategies for managing resource revenues, which could be drawn as common lessons from successful practices in Botswana, Indonesia, Malaysia and Chile, as follows: the resource revenues should be invested in 1) education and health as a way of boosting permanently incomes and also spreading benefits across generations; and 2) economic infrastructure to diversify the economy so as to insulate it from specific shocks in the resource-rich sector in the medium and long term.

The suggestion of Coutinho (2011) on the usage of public investments could be applied to Lao PDR for the following reasons. First, Lao PDR has less public expenditure in the area of education and health than the other ASEAN countries. Table 4-7 shows that Lao PDR is the third and the second to last in the education and health expenditure as percentage of GDP, respectively. Hence comes the urgent need to enhance these two expenditure in Lao PDR.

Second, the industrial diversification is a vital requirement for Lao economy to sustain its growth by enhancing the resilience against resource sector's volatilities. Table 4-8 compares industrial structure among Lao PDR, Indonesia, Malaysia and the average of developing economies. The mining and utility production as a percentage of GDP in 2016 in Lao PDR is 17.4 %, while those of Indonesia, Malaysia and the average of developing economies are 8.7%, 12.5% and 7.6%, respectively. At the same time, the production concentration indices[12] of exports in 2016 in Lao PDR is 0.20, whereas those of Indonesia, Malaysia and the average of developing economies are 0.13, 0.17 and 0.09, respectively. These indicators show that Lao PDR industrial structure concentrates highly on mining and energy sectors. Looking at the change in industrial structure from 1980, Indonesia, for instance, reduced the GDP share of the mining and utility production from 23.0% in 1980 to 8.7% in 2016, and instead changed the share of the manufacturing from 12.4% to 21.3%. Indonesia could thus be an example of

[12] The Product Concentration Indices are measured by a Herfindahl-Hirschmann Index. The indices are retrieved from UNCTAD Stat and are defined in UNCTAD Handbook of Statistics 2016.

transforming industrial structure from oil-driven one to manufacturing-oriented one through diversification. Likewise, Lao PDR needs to diversify its industries and to develop economic infrastructure for the purpose.

World Bank (2010), i.e. Lao PDR Development Report, also demonstrated that the resource revenues need to be spent on such public investment as infrastructure, human resource development and health care. It should be noted, however, that the usage of public investments tends to be influenced by political pressure, in particular, in developing countries. Coutinho (2011) also suggested that an independent public investment evaluation unit should evaluate alternative uses of funds and judge where they can be best applied.

[Institutional Arrangements for Fund]

As was discussed in the section 4.2.3.1, there are two types of institutional arrangements for natural resource funds: "virtual" funds and extra-budgetary resource funds, but under weak institutions in developing countries, the extra-budgetary funds seem to be difficult to be managed. In case of Lao PDR, therefore, the type of "virtual" funds is recommendable as an institutional arrangement.

As an accounting system to allocate development investment from resource revenues, the Special Account system in Japan could be a good reference for its application to resource-rich developing countries including Lao PDR, as JICA (2016) suggested. JICA (2016) described the Special Account system in Japan as follows: the Special Account was initiated as a powerful tool to support the country's economic recovery after the World War II, as a system with separate account from ordinary budget, for the purpose of building economic infrastructure, energy and industrial development and export promotion; the Special Account is required with accountability to the Diet, by responsibility of the government, in a same way as ordinary budget. The same budgetary procedures as ordinary budget could be applied to the Special Account, and thus the same level of governance, transparency and accountability as ordinary budget would at least be assured in the Special Account. The introduction of the Special Account would, therefore, make it possible to allocate specific public investment form resource revenues, while it would avoid such downsides as complexity and even conflicts under the dual budget system.

Summary and Conclusions

This dissertation aimed to examine the applicability of the resource curse hypothesis focusing on the selected resource-rich ASEAN economies by using a vector auto-regression (VAR) model as a quantitative analytical method. For the analytical samples, we targeted the four middle-income economies in which the GDP share of resource sector accounts for around 10 to 20 percent in 2015: Malaysia and Indonesia as the forerunners, and Lao PDR and Myanmar as the latecomers. As we observed, there is a contrast in the trends in their industrial structures for 1980-2015: the forerunners experienced the decline in the resource sector and the increase in manufacturing sector instead, and the latecomers showed the expansion in the resource sector. If the resource curse effect is found in the latecomers but not in the forerunners through the VAR model estimation, some lessons from the forerunners could be extracted to apply to the latecomers on the future design of the industrial strategies. The dissertation also discussed how to mobilize the resource revenues for a productive use in the context of public financial management focusing on Lao PDR, in other words, how the current public financial management in Lao PDR should be transformed from resource-curse form to resource-blessing one.

Followed by Introduction in Chapter I, Chapter II reviewed the literature on the resource curse hypothesis including its mechanism and channels and also the literature on the application of the hypothesis to the ASEAN economies, and then demonstrated this study's contributions. The contributions of this study were to deal with a group of resource-abundant economies in the ASEAN by applying a common analytical methodology for the comparison of the applicability of the resource curse effect, to adopt a comprehensive approach for the resource curse issue, containing the sectoral approach to examine the Dutch Disease effect and the intertemporal approach to examine the capital accumulation effect, and to analyze directly the causality and dynamic responsive effect of resource curse by using a VAR model as an analytical method.

Chapter III turned to the empirics for examining the resource curse effect, namely, the Dutch Disease effect and the capital accumulation effect, focusing on the four selected resource-rich ASEAN economies by utilizing a VAR estimation method. In this section, we clarified the key variables and methodology for the estimation and the estimation outcomes with their policy implications. The empirical study found that the latecomers of Lao PDR and Myanmar seemed to suffer from the Dutch Disease over the sample period for 1980-2015 and 1986-2015 respectively; and the forerunners of Indonesia and Malaysia, on the other hand, appeared to have no Dutch Disease effect at least in the post-crisis period of 1997-2015, although Indonesia had experienced the Dutch Disease in the pre-crisis period of 1970-1996. The capital accumulation effect was found in Indonesia, Lao PDR, and Malaysia but not in Myanmar. In sum, the resource-rich latecomers of Lao PDR and Myanmar still stay at the phase of the resource curse. On the contrary, the forerunners of Indonesia and Malaysia have had no Dutch Disease effect at least in the post-crisis period and instead have enjoyed the capital accumulation effect, although Indonesia had experienced the Dutch Disease during the pre-crisis period. Thus, the forerunners of Indonesia and Malaysia that were previously resource-rich have transformed their economic structure from the Dutch Disease phase to manufacturing-oriented one through the capital accumulation effect. The lessons from the forerunners' experiences for the latecomers to escape from the Dutch Disease could be extracted as follows. First, some public financial system of allocating resource revenues for investment and development projects should be urgently established in Lao PDR and Myanmar, who have a rising share of resource sector and also get the Dutch Disease effect. Second, the diversification of industries by improving business environments should be facilitated for the latecomers of Lao PDR and Myanmar. Third, the latecomers of Lao PDR and Myanmar who suffer from the Dutch Disease could turn out to enjoy resource blessing with the improvement of their institutional qualities.

Chapter IV aimed to discuss how to mobilize the resource revenues for a productive use in the context of public financial management focusing on Lao PDR. The current budget system

in Lao PDR have mixed up the resource revenues with the ordinary budget, and it has brought about such difficulties as the volatility in revenue sources, the prevention of capital accumulation and the high risk of enlarging overall budget deficit. Thus the dissertation proposed to set up natural resource funds to insulate the resource revenues from the ordinary budget for Lao budget system. Regarding the functions of the funds, they should focus on stabilization and investments. For the stabilization fund, the Chile's fund with a flexible operational rule could be a good reference, while the investment should concentrate on education, health and economic infrastructure to diversify the industries for the sustainable development. As for the institutional arrangements of the fund, the type of "virtual" funds is recommendable considering the Lao institutional quality, and the Special Account system in Japan could be a good reference.

References

Alexeev, M. and Conrad, R., 2009. The elusive curse of oil. *The Review of Economics and Statistics*, *91*(3), pp.586-598.

Asanuma, S., 2008. Natural Resource Abundance and Economic Development: A Curse? or A Blessing?–Lessons from Indonesia's Experience. Preliminary Draft for Discussion at Hitotsubashi University. In http://policydialogue.org/files/events/Asanuma_nat_resource_abundance_and_economic

Auty, R., 1993. *Sustaining Development in Mineral Economies: The Resource Curse Thesis*. Oxford University Press: New York.

Boschini, A.D., Pettersson, J. and Roine, J., 2007. Resource curse or not: A question of appropriability. *The Scandinavian Journal of Economics*, *109*(3), pp.593-617.

Bourdet, Y. and Falck, H., 2006. Emigrants' Remittances and Dutch Disease in Cape Verde. *International Economic Journal*, *20*(3), pp.267-284.

Baunsgaard, T., Villafuerte, M., Poplawski-Ribeiro, M. and Richmond, C., 2012. Fiscal Frameworks for Resource Rich Developing Countries. *IMF Staff Discussion Note*, SDN/12/04.

Clark, C., 1940. *The Conditions of Economic Progress*. Macmillan, New York.

Collier, P. and Hoeffler, A., 2000. Greed and Grievance in Civil War. *Policy Research Paper (The World Bank)*, (No. 2355).

Corden, W.M. and Neary, J.P., 1982. Booming sector and de-industrialisation in a small open economy. *The economic journal*, *92*(368), pp.825-848.

Coutinho, L., 2011. The Resource Curse and Fiscal Policy. *Cyprus Economic Policy Review*, 5(1), pp.43-70.

Daban, T., 2010. Strengthening Chile's Rule-based Fiscal Framework. *IMF Working Paper*, WP/11/17.

Davis, G.A., 1995. Learning to love the Dutch disease: Evidence from the mineral economies. *World development*, *23*(10), pp.1765-1779.

Demachi, K. and Kinkyo, T., 2014. Macroeconomic Management in Resource-Rich Developing Economies. *Kokuminkeizaizassi*, *210*(3), pp.55-67.

Edwards, S., 1986. A Commoidty Export Boom and the Real Exchange Rate: The Money-Inflation Link, in Neary, J.P. and van Wijnbergen, S. (Eds.), *Natural Resources and the*

Macroeconomy, MIT Press, Cambridge.

Frankel, J.A., 2010. The Natural Resource Curse: A Survey. *NBER Working Paper Series*, (No.15836).

Frankel, J.A., 2011. A Solution to Fiscal Procyclicality: The Structural Budget Institutions Pioneered by Chile (No.16945).

Gelb, A.H., 1988. *Windfall Gains: Blessing or Curse?*. Oxford University Press: New York.

Gill, I. and Kharas, H., 2007. *An East Asian Renaissance*. IBRD and World Bank.

Gylfason, T., Herbertsson, T.T. and Zoega, G., 1999. A mixed blessing: natural resources and economic growth. *Macroeconomic dynamics*, *3*(2), pp.204-225.

Harding, T. and Venables, A.J., 2013. The Implications of Natural Resource Exports for Non-Resource Trade. OxCarre Research Paper, 103.

Hartwick, J.M., 1977. Intergenerational equity and the investing of rents from exhaustible resources. *The american economic review*, *67*(5), pp.972-974.

Ilzetzki, E., Reinhart, C. and Rogoff, K., 2011. The Country Chronologies and Background Material to Exchange Rate Arrangements into the 21st Century: Will the Anchor Currency Hold?. In http://personal.lse.ac.uk/ilzetzki/data/ERA-Country_Chronologies_2011.pdf.

Insisienmay, S., Nolintha, V. and Park, I., 2015. Dutch disease in the Lao economy: Diagnosis and treatment. *International Area Studies Review*, *18*(4), pp.403-423.

International Monetary Fund (IMF), 2012. *Macroeconomic Policy Frameworks for Resource-Rich Developing Countries*. IMF.

International Monetary Fund (IMF), 2013. *Public financial management and its emerging architecture*. IMF.

Ismail, K., 2010. *The Structural Manifestation of the 'Dutch Disease': The Case of Oil Exporting Countries* (No. 10-103). IMF.

Japan International Cooperation Agency (JICA), 2016. *Study on Economic and Fiscal Policies in Resource-Rich Countries, Final Report*.

Johansen, S., 1995. *Likelihood-based inference in cointegrated vector autoregressive models*. Oxford University Press on Demand.

Karl, T.L., 1997. *The paradox of plenty: Oil booms and petro-states* (Vol. 26). University of California Press.

Kimura, F., 2006. International production and distribution networks in East Asia: Eighteen

facts, mechanics, and policy implications. *Asian Economic Policy Review*, *1*(2), pp.326-344.

Kyophilavong, P. and Toyoda, T., 2009. Foreign capital inflows in the natural resources sector: Impacts on the Lao economy. Paper presented in International Seminar on Skills Development for the Emerging New Dynamism in Asian Developing Countries under Globalization at the First Annual Conference of the University Network for Development in Asia (UNDA), Pathumwan Princess Hotel, Bangkok, Thailand, January 23-25, 2009.

Kyophilavong, P., Senesouphap, C. and Yawdhacksa, S., 2013. Resource Boom, Growth and Poverty in Laos: What Can We Learn from Other Countries and Policy Simulations?. *PEP (Partnership for Economic Policy) Working Paper*, (No. 2013-05).

Mehlum, H., Moene, K. and Torvik, R., 2006. Institutions and the resource curse. *The economic journal*, *116*(508), pp.1-20.

Manzano, O. and Rigobon, R., 2008. Resource Curse or Debt Overhang. *National Bureau of Economic Research Working paper*, (8390), Cambridge, MA.

Noh, A., 2013. Natural Resources and Economic Diversification: A Case of Malaysia. *Universiti Tun Abdul Razak, Working Paper*, (2013/02).

Pangestu, M., 1990. ADJUSTMENT PROBLEMS OF A SMALL OIL-EXPORTING COUNTRY Did Indonesia Suffer from the Dutch Disease?. *Economic Development in East and Southeast Asia: Essays in Honor of Professor Shinichi Ichimura, Institute of Southeast Asian Studies*, pp.121-137.

Ramey, G. and Ramey, V.A., 1995. Cross-Country Evidence on the Link between Volatility and Growth. *American Economic Review*, *85*(5), pp.1138-51.

Rosser, A., 2007. Escaping the resource curse: The case of Indonesia. *Journal of Contemporary Asia*, *37*(1), pp.38-58.

Sachs, J.D. and Warner, A.M., 1995. *Natural resource abundance and economic growth* (No. w5398). National Bureau of Economic Research.

Sachs, J.D. and Warner, A.M., 2001. The curse of natural resources. *European economic review*, *45*(4-6), pp.827-838.

Sachs, J.D., 2007. How to handle the macroeconomics of oil wealth. *Humphreys, M./Sachs, JD/Stiglitz, JE (Ed.)*, pp.173-193.

Said, S.E. and Dickey, D.A., 1984. Testing for unit roots in autoregressive-moving average

models of unknown order. *Biometrika*, *71*(3), pp.599-607.

Taguchi, H. and Ni Lar, 2016. The Resource Curse Hypothesis Revisited: Evidence from Asian Economies. *Bulletin of Applied Economics*, 3(2), pp.31-42.

Tsani, S., 2013. Natural resources, governance and institutional quality: The role of resource funds. *Resources Policy*, 38, pp.181-195.

Usui, N., 1996. Policy adjustments to the oil boom and their evaluation: the Dutch disease in Indonesia. *World Development*, *24*(5), pp.887-900.

Usui, N., 1997. Dutch disease and policy adjustments to the oil boom: a comparative study of Indonesia and Mexico. *Resources policy*, *23*(4), pp.151-162.

Van der Ploeg, F., 2011. Natural resources: curse or blessing?. *Journal of Economic Literature*, *49*(2), pp.366-420.

World Bank 2006. Final Report for Economic Geology FR-2 Sector Plan for Sustainable Development of the Mining Sector in the Lao PDR, the World Bank.

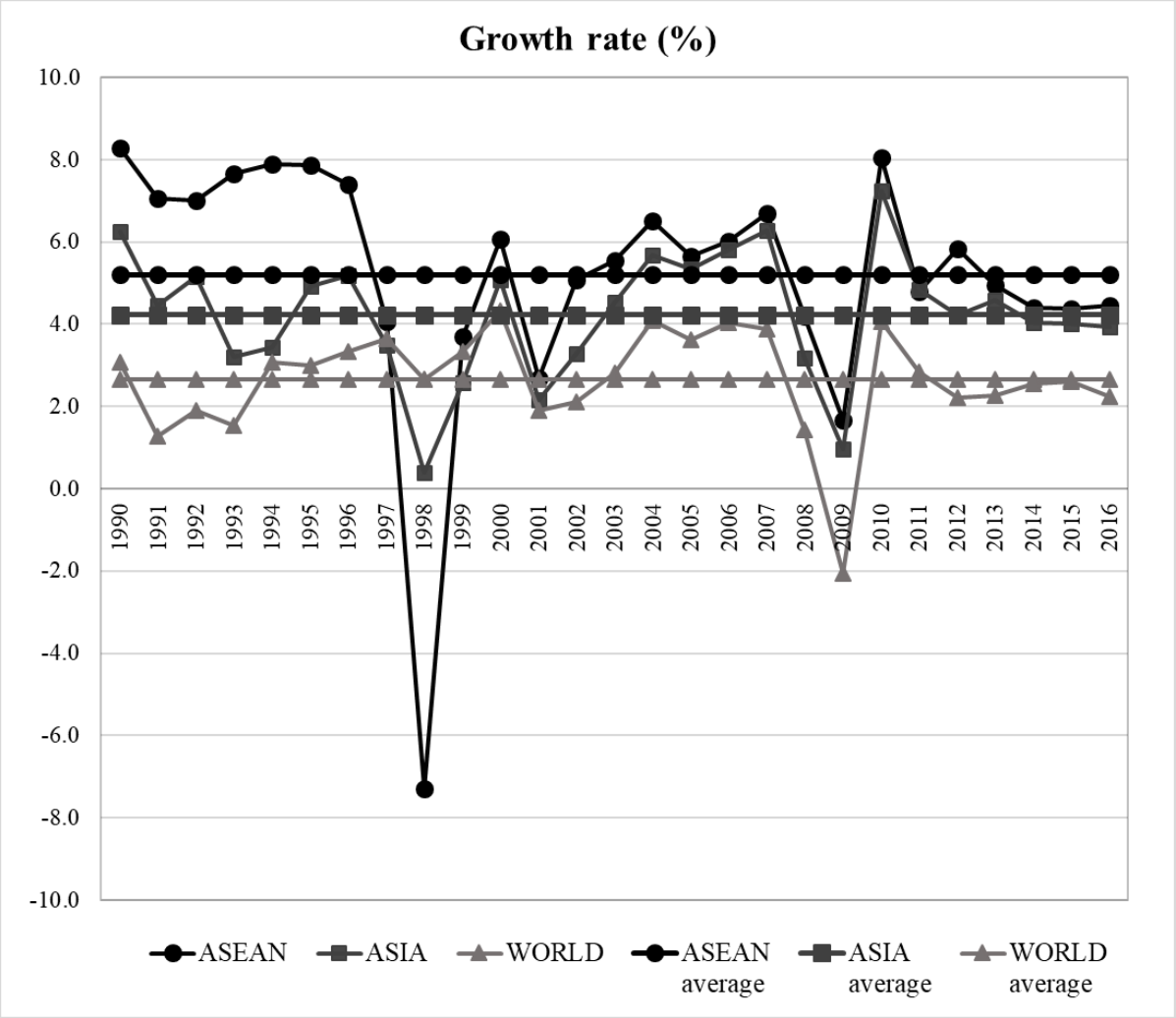
World Bank 2010. *Lao PDR Development Report 2010: Natural Resource Management for Sustainable Development. Hydropower and Mining*. the World Bank.

World Bank 2011. *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium*. the World Bank.

World Bank 2016. *Fiscal Management in Resource-Rich Countries: Essentials for Economists, Public Finance Professionals, and Policy Makers*. the World Bank.

Figure & Table

Figure 1-1 Growth rate of ASEAN, Asia and the World during 1990-2016



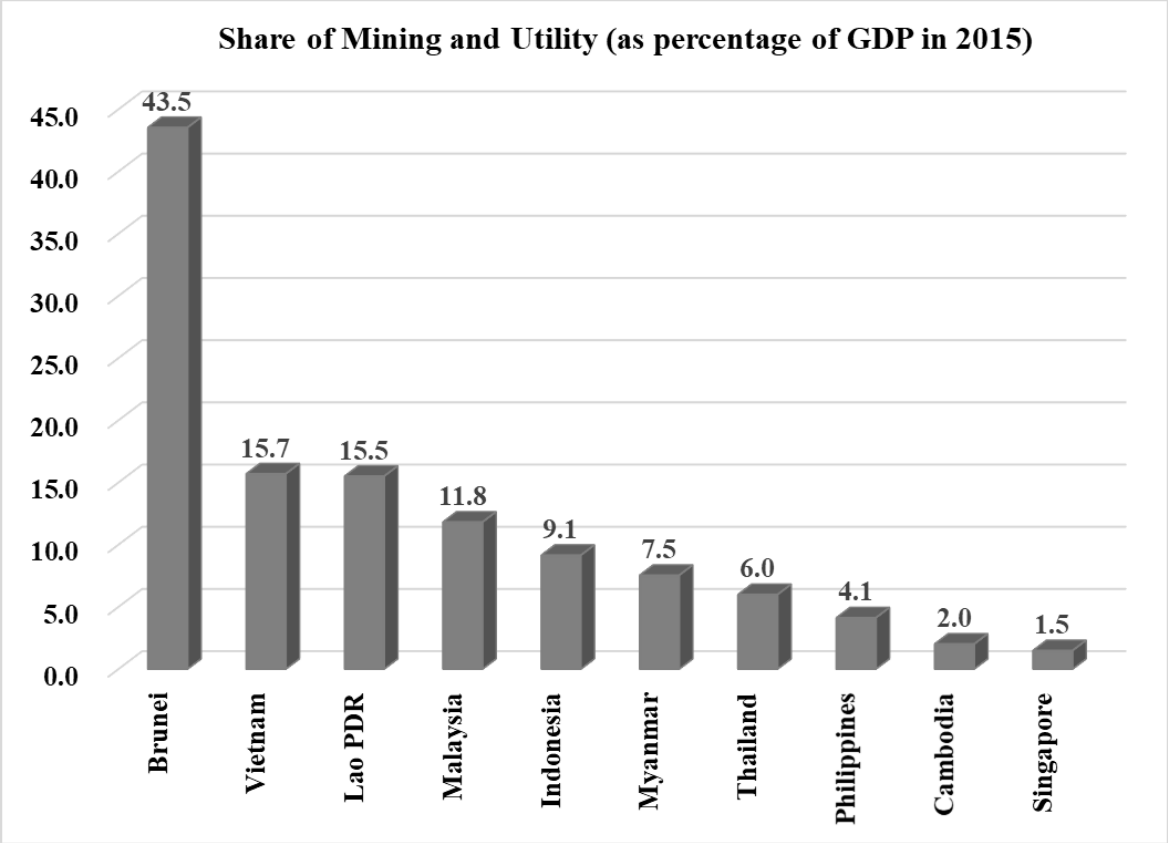
Source: UNCTAD STAT.

Table 1-1 World Bank Analytical Classification

No.	Country	Income Classfication
1	Brunei	High income
2	Singapore	
3	Malaysia	Upper middle income
4	Thailand	
5	Cambodia	Lower middle income
6	Indonesia	
7	Laos	
8	Myanmar	
9	Philippines	
10	Vietnam	

Source: World Bank Analytical Classifications in 2016.

Figure 1-2 Comparison in Resource Abundance among ASEAN in 2015



Source: UNCTAD STAT.

Table 1-2 Overview of ASEAN economies in 2015

	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
Population *million*	0.4	15.5	258.2	6.7	30.7	52.4	101.7	5.5	68.7	91.7
GDP *billion US dollar*	12.9	18.0	861.3	14.4	296.4	59.7	292.8	296.8	399.2	193.2
GDP Per Capita *US dollar*	30,967.9	1,163.2	3,336.1	2,159.4	9,648.6	1,139.0	2,878.3	53,629.7	5,814.9	2,107.0
Labor Force *thousand people*	203.7**	8,250.0**	122,380.0	3,079.8*	14,518.0	21,959.8	41,344.0	3,610.6	38,548.2	53,980.0
Employed	189.7**	8,235.0**	114,819.2	3,021.2*	14,067.7	21,791.3	38,741.0	3,516.0	38,016.2	52,840.0
Unemployed	14.1**	15.0**	7,560.8	58.6*	450.3	168.5	2,602.0	94.6	340.6	1,140.0
Unemployment rate *percent*	6.9**	0.2**	6.2	1.9*	3.1	0.8	6.3	2.6	0.9	2.1
Economic Structure *percent of GDP*										
Total value added	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Agriculture, hunting, forestry, fishing	1.08	28.25	13.93	19.66	8.56	26.77	10.26	0.04	8.72	18.89
Industry	60.22	29.42	41.34	30.96	39.63	34.47	30.94	26.14	36.39	36.95
Mining, utilities	43.53	2.01	9.15	15.50	11.81	7.53	4.11	1.48	5.98	15.69
Manufacturing	14.26	17.02	21.65	9.16	23.08	20.81	20.04	19.47	27.63	15.22
Construction	2.43	10.39	10.54	6.31	4.74	6.13	6.79	5.18	2.78	6.05
Services	38.70	42.33	44.73	49.38	51.81	38.76	58.80	73.83	54.89	44.16
Wholesale, retail trade, restaurants and hotels	5.98	15.20	16.80	16.97	18.97	18.92	19.86	17.02	19.08	15.40
Transport, storage and communications	3.82	8.55	8.82	3.45	8.92	13.41	6.43	11.80	7.31	3.82
Other activities	28.89	18.58	19.11	28.96	23.91	6.43	32.52	45.01	28.49	24.94
Government Finance *percent of GDP*										
Total revenue	20.3	16.8	13.0	15.5	18.9	21.7	15.8	22.5	19.2	23.5
Taxes	-	14.7	10.8	13.4	14.3	8.7	13.6	13.6	16.3	18.2
Total expenditure	34.3	19.4	15.7	23.5	22.1	26.0	16.7	18.1	20.5	28.5
Overall budgetary surplus/deficit	-14.0	-2.6	-2.6	-3.4	-3.2	-4.3	-0.9	4.4	-1.3	-4.6
Balance of Payments *percent of GDP*										
Exports	47.2	46.8	17.3	19.2	58.9	16.0	14.8	127.9	53.6	83.8
Imports	24.9	65.9	15.7	-36.4	49.4	-22.0	22.7	100.0	46.9	80.0
Balance on goods	22.4	-19.2	1.6	-17.1	9.4	-6.1	-8.0	27.9	6.7	3.8
Current account balance	15.9	-9.3	-2.0	-15.7	3.0	-4.0	2.5	18.1	8.1	-0.2
Overall balance	73.6	4.3	-0.1	1.2	0.3	0.2	0.9	0.4	1.5	-3.1

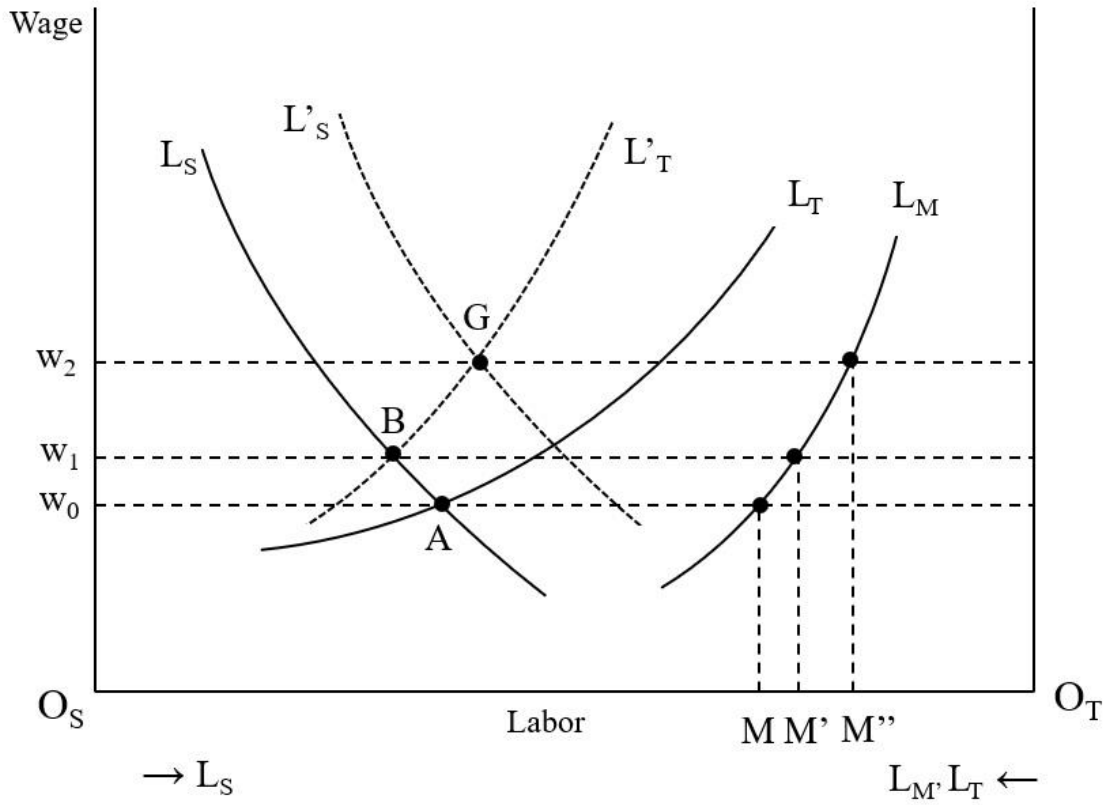
Source: Population, GDP and GDP per Capita are retrieved from World Development Indicators by the World Bank.
Labor Force, Government Finance, Balance of Payments are retrieved from Key Indicators for Asia and the Pacific 2017 by Asian Development Bank.
Economic Structure are retrieved from UNCTAD STAT.
Note: *, ** denotes 2010 and 2014 data respectively which are retrieved Key Indicators for Asia and the Pacific 2017 by Asian Development Bank.

Table 1-3 Industrial Structure in Selected ASEAN Economies

GDP Ratio %	2015		1980	
	Mining & Utility	Manufacturing	Mining & Utility	Manufacturing
Lao PDR	**17.8**	**8.5**	**5.6**	**3.8**
Malaysia	**11.8**	**23.1**	**15.2**	**21.9**
Indonesia	**9.1**	**21.5**	**23.0**	**12.4**
Myanmar	**7.8**	**20.7**	**1.5**	**9.5**

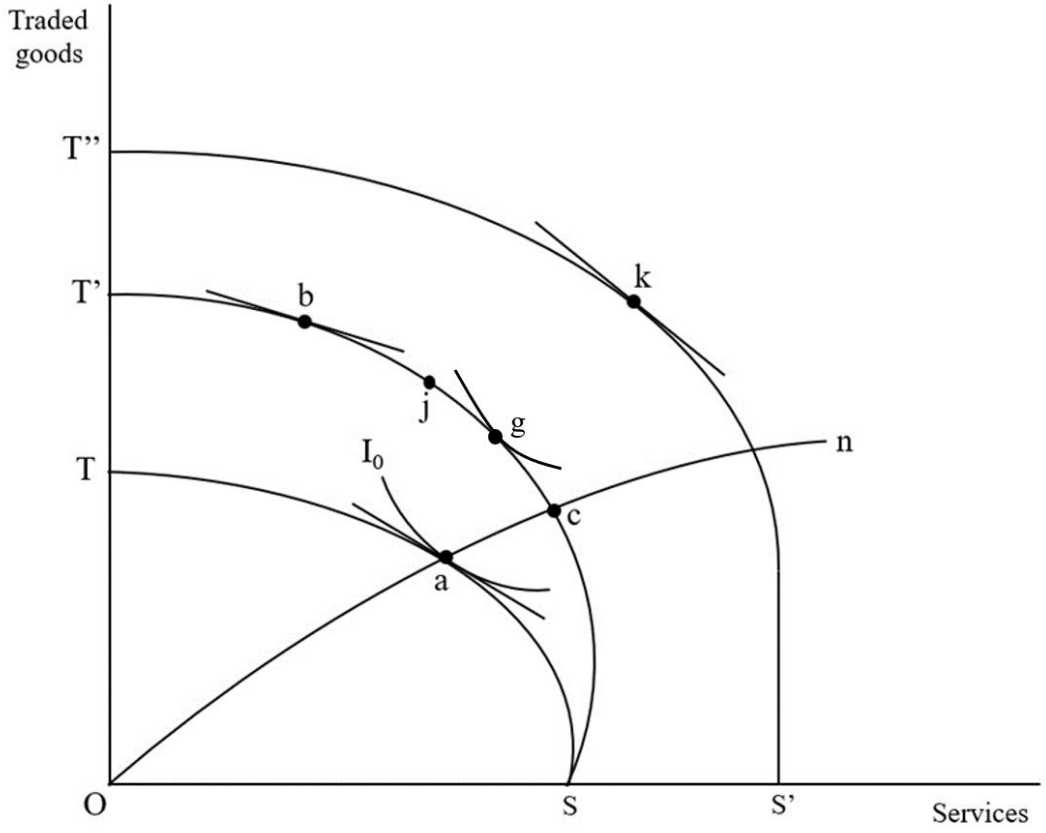
Source: UNCTAD STAT.

Figure 2-1 Effect of the boom on the labor market



Note: This diagram is based on Corden and Neary (1982).

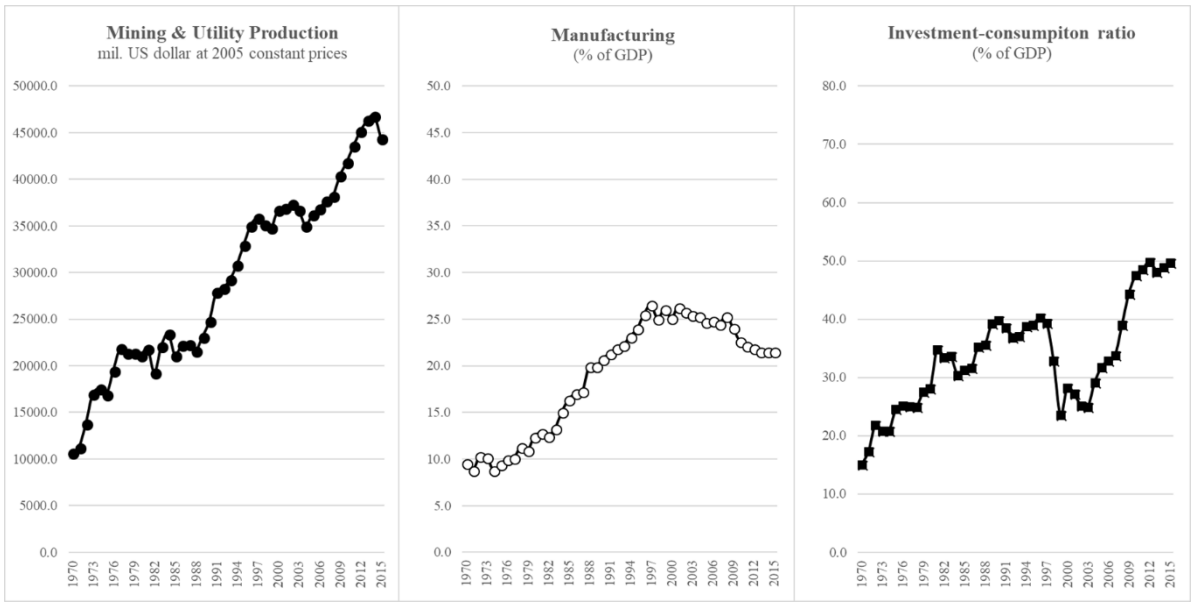
Figure 2-2 Effect of the boom on the commodity market



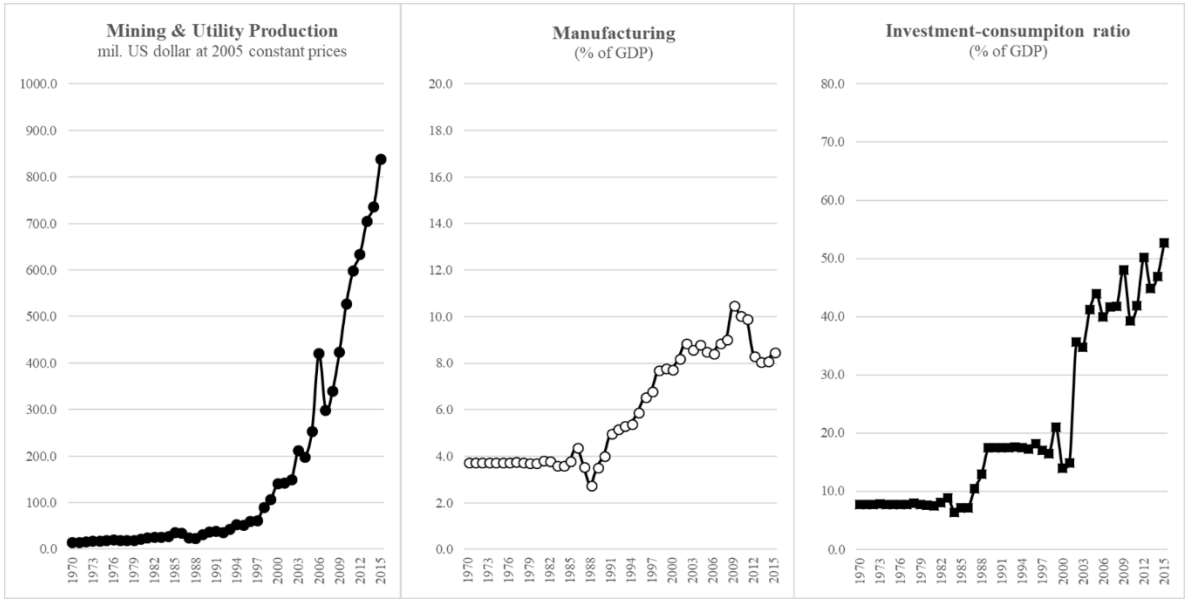
Note: This diagram is based on Corden and Neary (1982), Sachs (2007) and Bourdet and Falck (2006).

Figure 3-1 Overview of Key Variable

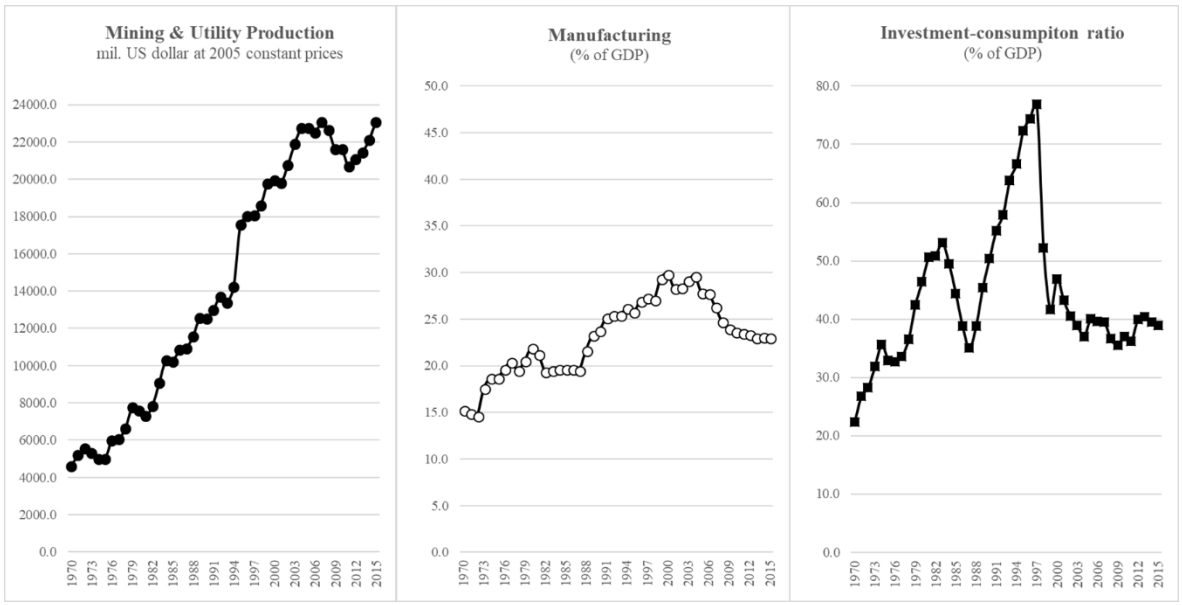
[Indonesia]



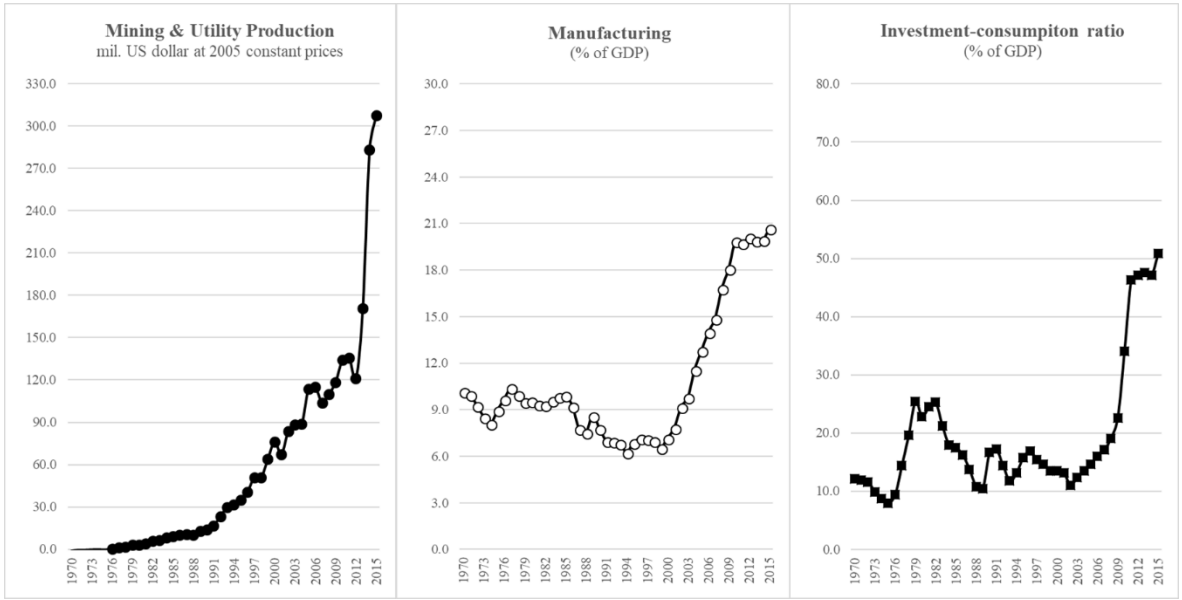
[Lao PDR]



[Malaysia]



[Myanmar]



Source: UNCTAD STAT.

Table 3-1 ADF Unit Root Test and Johansen Co-integration Test

[Indonesia]	Unit Root Test (ADF Test)		Cointegration Test (Johansen Test)	
	Level	First Difference	Trace	Max-eigen
For Dutch Disease Analysis				
mau	-1.12	-5.62 ***	56.98***	34.11***
moy	-1.65	-6.47***		
cpi	7.01	-2.78 *		
ypc	2.30	-4.44 ***		
For Capital Accumulation analysis				
mau	-1.12	-5.62 ***	35.50***	28.80***
ioc	-1.31	-5.37***		
fdi	-3.58	-13.05***		

[Lao PDR]	Unit Root Test (ADF Test)		Cointegration Test (Johansen Test)	
	Level	First Difference	Trace	Max-eigen
For Dutch Disease Analysis				
mau	4.18	-3.87***	56.18***	26.95**
moy	-0.59	-5.60***		
def	1,96	-3.55***		
ypc	2.60	-6.41***		
For Capital Accumulation analysis				
mau	4.18	-3.87***	25.31***	21.67***
ioc	-0.01	-7.85***		
fdi	-1.38	-3.94***		

[Malaysia]	Unit Root Test (ADF Test)		Cointegration Test (Johansen Test)	
	Level	First Difference	Trace	Max-eigen
For Dutch Disease Analysis				
mau	-0.69	-5.37***	61.53***	32.25***
moy	-2.01	-5.28***		
cpi	1.13	-5.39***		
ypc	1.54	-5.97***		
For Capital Accumulation analysis				
mau	-0.69	-5.37***		
ioc	-2.37	-4.58***	22.83**	18.29**
fdi	-2.81*	-7.43***		

[Myanmar]	Unit Root Test (ADF Test)		Cointegration Test (Johansen Test)	
	Level	First Difference	Trace	Max-eigen
For Dutch Disease Analysis				
mau	-0.07	-3.92**	56.35***	37.50***
moy	0.34	-3.62***		
cpi	-6.40***	-11.77***		
ypc	-1.17	-3.71**		
For Capital Accumulation analysis				
mau	-0.07	-3.92**		
ioc	-0.53	-3.69***	25.09**	22.98***
fdi	-4.62***	-5.30***		

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively; ADF, augmented Dickey-Fuller.

Table 3-2 Estimation for Indonesia

Table 3-2-1 Chow Test for Indonesia

Indonesia	Breakpoint	F-statistic	Probability
mau & moy	1997	10.761	0.000
mau & ioc	1997	26.538	0.000

Table 3-2-2 Estimated VAR Model for Indonesia

Indonesia 1970-2015			
For Dutch Disease	*mau*	*cpi*	*moy*
mau-1	0.808*** [14.284]	0.148* [1.942]	-0.016 [-0.272]
cpi-1	-0.074*** [-4.070]	1.006*** [40.877]	-0.016 [-0.844]
moy-1	-0.014 [-0.281]	0.085 [1.218]	0.972*** [17.916]
ypc	0.327*** [3.420]	-0.245* [-1.897]	0.044 [0.448]
adj. R^2	0.974	0.996	0.974

Indonesia 1970-2015		
For capital accumulation analysis	*mau*	*ioc*
mau-1	1.013*** [54.065]	0.062*** [3.322]
ioc-1	-0.029 [-0.532]	0.827*** [14.948]
fdi	0.017 [1.577]	0.015 [1.439]
adj. R^2	0.964	0.934

Indonesia 1970-1996			
For Dutch Disease	*mau*	*cpi*	*moy*
mau-1	0.497*** [4.014]	0.133 [0.945]	-0.275** [-2.299]
cpi-1	-0.131*** [-4.258]	0.969*** [27.571]	0.052* [1.753]
moy-1	-0.341* [-1.941]	0.117 [0.585]	0.419** [2.464]
ypc	0.952*** [3.770]	-0.226 [-0.788]	0.649** [2.661]
adj. R^2	0.947	0.993	0.974

Indonesia 1970-1996		
For capital accumulation analysis	*mau*	*ioc*
mau-1	1.007*** [35.812]	0.076*** [2.856]
ioc-1	-0.003 [-0.046]	0.785*** [9.913]
fdi	0.034** [2.038]	-0.000 [-0.032]
adj. R^2	0.909	0.908

Indonesia 1997-2015			
For Dutch Disease	*mau*	*cpi*	*moy*
mau-1	0.812*** [7.826]	0.286 [0.990]	0.105 [0.914]
cpi-1	0.002 [0.096]	0.891*** [11.951]	-0.024 [-0.813]
moy-1	0.235* [1.751]	-0.309 [-0.824]	0.822*** [5.514]
ypc	0.169 [1.491]	-0.205 [-0.646]	-0.061 [-0.490]
adj. R^2	0.914	0.970	0.803

Indonesia 1997-2015		
For capital accumulation analysis	*mau*	*ioc*
mau-1	0.987*** [56.642]	0.080** [2.569]
ioc-1	0.041 [0.818]	0.772*** [8.345]
fdi	-0.000 [-0.084]	0.048** [2.288]
adj. R^2	0.903	0.936

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively. The Figure in [ ] are t-value.

Table 3-2-3 Granger Causality Test for Indonesia

Indonesia 1970-2015			
	Null Hypothesis	Lags	Chi-sq
For Dutch Disease analysis	*mau* does not Granger Cause *moy*	1	0.074
	mau does not Granger Cause *cpi*	1	3.774*

	Null Hypothesis	Lags	Chi-sq
For Capital Accumulation analysis	*mau* does not Granger Cause *ioc*	1	11.041***

Indonesia 1970-1996			
	Null Hypothesis	Lags	Chi-sq
For Dutch Disease analysis	*mau* does not Granger Cause *moy*	1	5.288**
	mau does not Granger Cause *cpi*	1	0.893

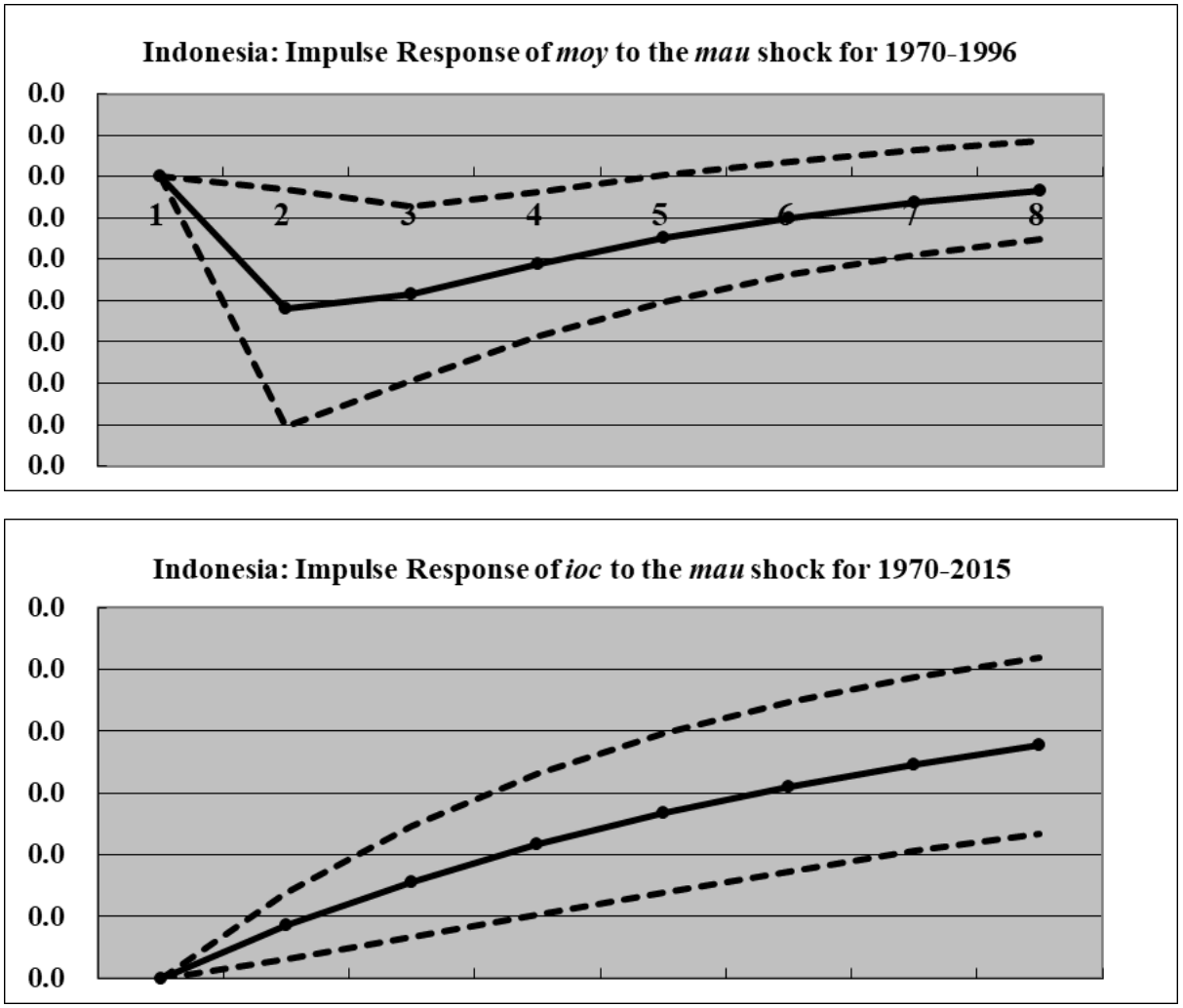
	Null Hypothesis	Lags	Chi-sq
For Capital Accumulation analysis	*mau* does not Granger Cause *ioc*	1	8.158***

Indonesia 1997-2015			
	Null Hypothesis	Lags	Chi-sq
For Dutch Disease analysis	*mau* does not Granger Cause *moy*	1	0.835
	mau does not Granger Cause *cpi*	1	0.981

	Null Hypothesis	Lags	Chi-sq
For Capital Accumulation analysis	*mau* does not Granger Cause *ioc*	1	6.600**

Note: ***, **, * denotes rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively.

Figure 3-2 Impulse Responses for Indonesia



Note: The dotted lines represent a 95 percent error band over 8-year horizons.

Table 3-3 Estimation for Lao PDR

Table 3-3-1 Estimated VAR Model for Lao PDR

Lao PDR 1980-2015			
For Dutch Disease	*mau*	*def*	*moy*
mau- 1	0.875*** [11.416]	-0.093 [-1.188]	-0.092*** [-2.903]
def- 1	0.047 [1.279]	0.965*** [25.401]	0.062*** [3.902]
moy- 1	0.068 [0.340]	0.117 [0.570]	0.726*** [8.690]
ypc	0.070 [1.104]	0.086 [1.323]	0.131*** [4.943]
adj. R^2	0.979	0.993	0.965

Lao PDR 1980-2015		
For capital accumulation analysis	*mau*	*ioc*
mau- 1	0.902*** [15.604]	0.150** [2.319]
ioc- 1	0.186** [2.142]	0.818*** [8.382]
fdi	0.005 [0.159]	-0.122*** [-3.100]
adj. R^2	0.979	0.861

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively. The Figure in [ ] are t-value.

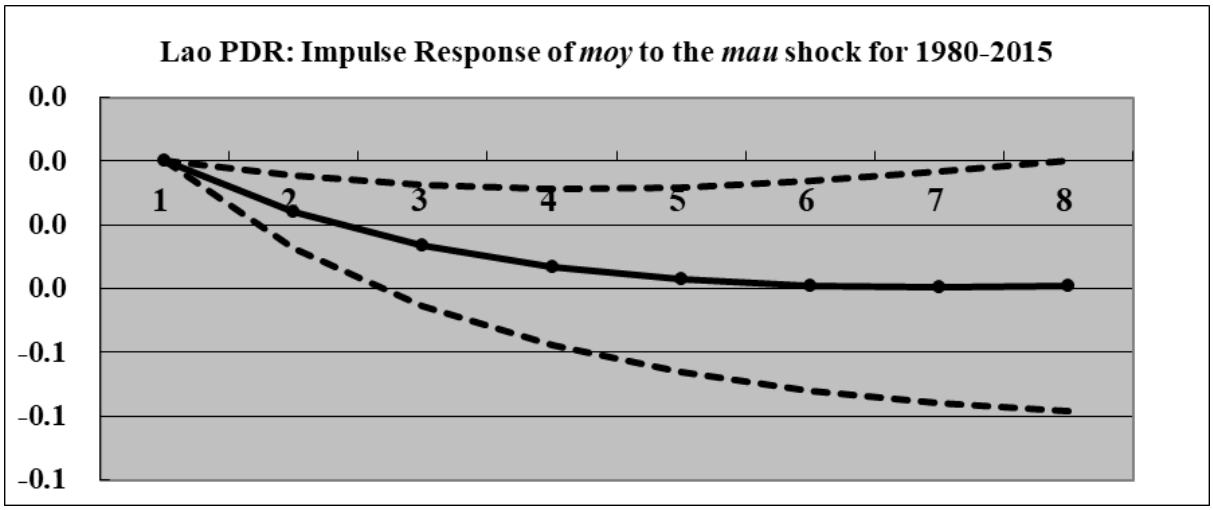
Table 3-2-2 Granger Causality Test for Lao PDR

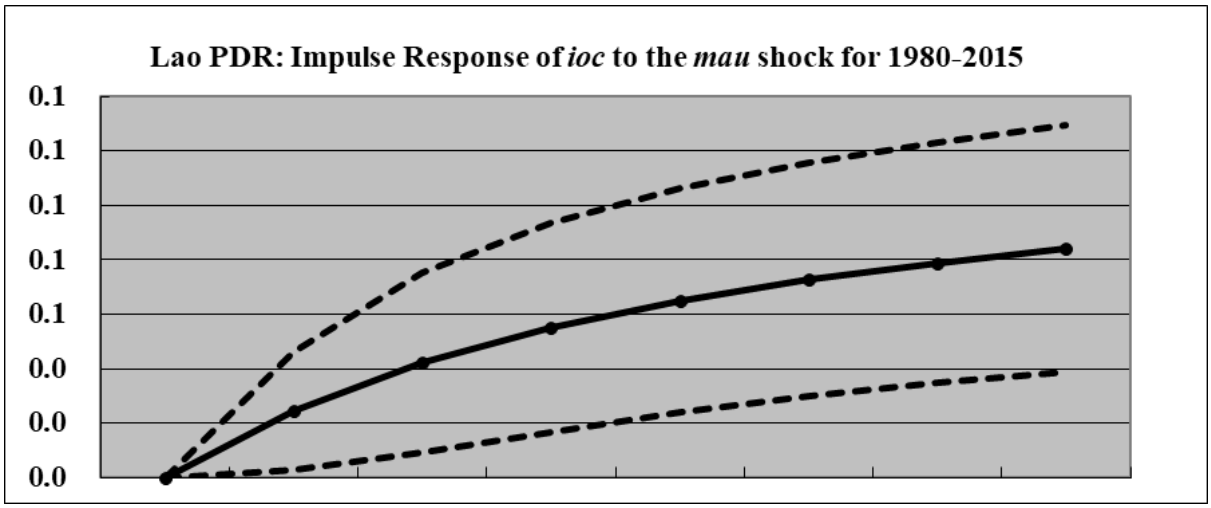
Lao PDR 1980-2015			
	Null Hypothesis	Lags	Chi-sq
For Dutch Disease analysis	*mau* does not Granger Cause *moy*	1	8.429***
	mau does not Granger Cause *def*	1	1.412

	Null Hypothesis	Lags	Chi-sq
For Capital Accumulation analysis	*mau* does not Granger Cause *ioc*	1	5.380**

Note: ***, **, * denotes rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively.

Figure 3-3 Impulse Responses for Lao PDR





Note: The dotted lines represent a 95 percent error band over 8-year horizons.

Table 3-4 Estimation for Malaysia

Table 3-4-1 Chow Test for Malaysia

Malaysia	Breakpoint	F-statistic	Probability
mau & moy	1997	3.303	0.046
mau & ioc	1997	40.792	0.000

Table 3-4-2 Estimated VAR Model for Malaysia

Malaysia 1970-2015			
For Dutch Disease	*mau*	*cpi*	*moy*
mau-1	0.862*** [10.319]	-0.056* [-1.820]	0.117* [1.910]
cpi-1	-0.057 [-1.295]	0.918*** [55.878]	-0.086** [-2.653]
moy-1	0.128 [1.311]	0.038 [1.049]	0.880*** [12.189]
ypc	0.142 [1.633]	0.095*** [2.959]	-0.046 [-0.717]
adj. R^2	0.986	0.997	0.935

Malaysia 1970-2015		
For capital accumulation analysis	*mau*	*ioc*
mau-1	0.973*** [68.379]	0.038 [1.633]
ioc-1	0.077* [2.014]	0.879*** [13.965]
fdi	-0.004 [-0.258]	0.080** [2.654]
adj. R^2	0.986	0.834

Malaysia 1970-1996			
For Dutch Disease	*mau*	*cpi*	*moy*
mau-1	0.517*** [3.632]	-0.034 [-0.532]	0.068 [0.582]
cpi-1	0.175** [2.181]	0.897*** [24.440]	-0.037 [-0.559]
moy-1	-0.569** [-2.397]	0.097 [0.897]	0.765*** [3.880]
ypc	0.698*** [3.312]	0.057 [0.597]	0.031 [0.179]
adj. R^2	0.975	0.992	0.894

Malaysia 1970-1996		
For capital accumulation analysis	*mau*	*ioc*
mau-1	0.972*** [25.990]	0.131*** [4.374]
ioc-1	0.093 [0.969]	0.647*** [8.355]
fdi	-0.033 [-0.962]	0.130*** [4.731]
adj. R^2	0.965	0.956

Malaysia 1997-2015			
For Dutch Disease	*mau*	*cpi*	*moy*
mau-1	0.618*** [3.412]	0.087 [1.193]	0.006 [0.026]
cpi-1	0.117 [0.540]	0.797*** [9.074]	-0.190 [-0.676]
moy-1	0.446** [2.133]	-0.138 [-1.633]	0.963*** [3.553]
ypc	0.210 [1.292]	0.059 [0.899]	0.104 [0.496]
adj. R^2	0.842	0.992	0.857

Malaysia 1997-2015		
For capital accumulation analysis	*mau*	*ioc*
mau-1	0.991*** [91.781]	0.106*** [3.081]
ioc-1	0.021 [0.735]	0.698*** [7.440]
fdi	0.016 [1.362]	0.034 [0.882]
adj. R^2	0.833	0.710

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively. The Figure in [ ] are t-value.

Table 3-4-3 Granger Causality Test for Malaysia

Malaysia 1970-2015			
	Null Hypothesis	Lags	Chi-sq
For Dutch Disease analysis	*mau* does not Granger Cause *moy*	1	3.649* (positive)
	mau does not Granger Cause *cpi*	1	3.314* (negative)

	Null Hypothesis	Lags	Chi-sq
For Capital Accumulation analysis	*mau* does not Granger Cause *ioc*	1	2.667

Malaysia 1970-1996			
	Null Hypothesis	Lags	Chi-sq
For Dutch Disease analysis	*mau* does not Granger Cause *moy*	1	0.339
	mau does not Granger Cause *cpi*	1	0.283

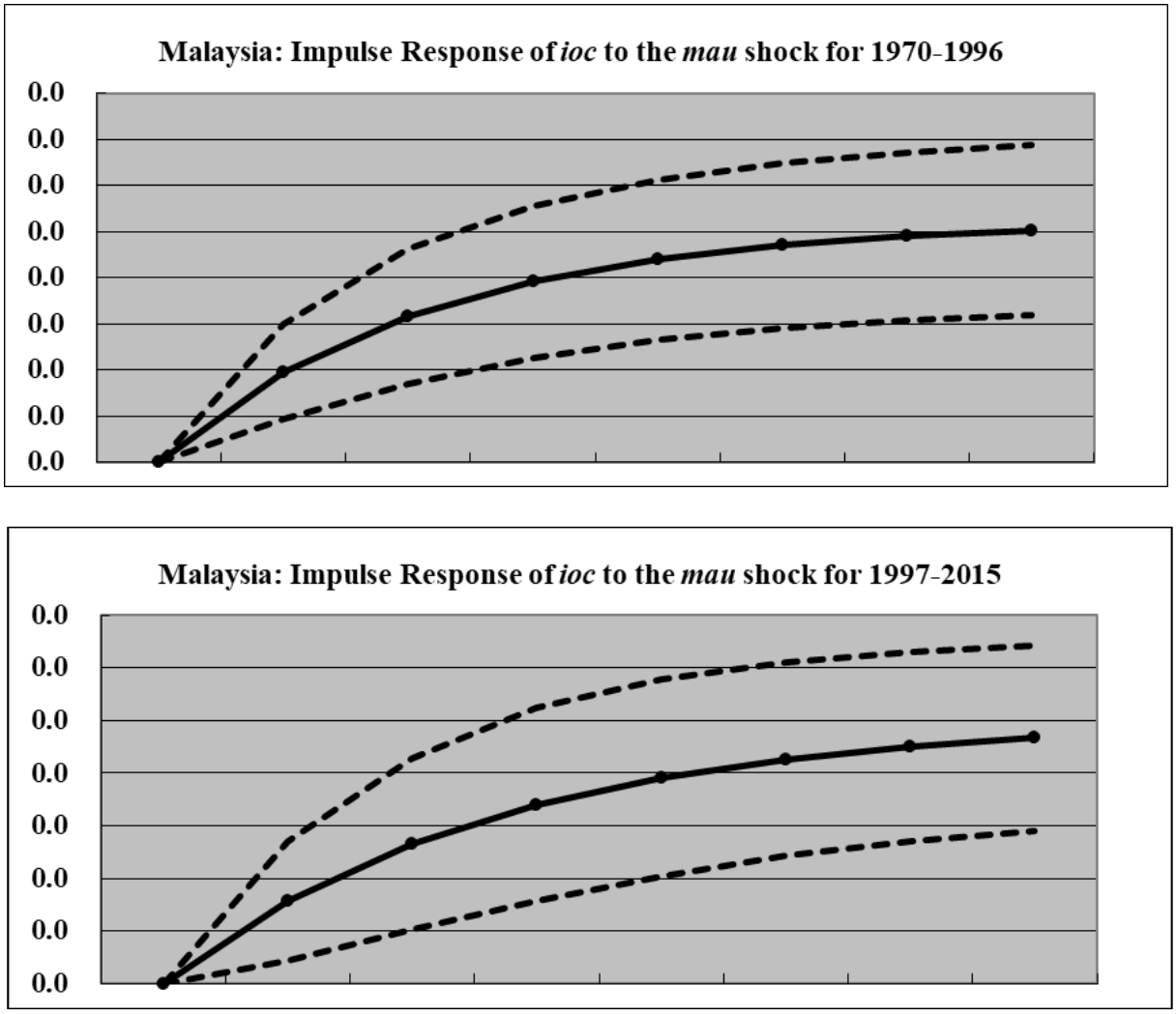
	Null Hypothesis	Lags	Chi-sq
For Capital Accumulation analysis	*mau* does not Granger Cause *ioc*	1	19.133***

Malaysia 1997-2015			
	Null Hypothesis	Lags	Chi-sq
For Dutch Disease analysis	*mau* does not Granger Cause *moy*	1	0.000
	mau does not Granger Cause *cpi*	1	1.423

	Null Hypothesis	Lags	Chi-sq
For Capital Accumulation analysis	*mau* does not Granger Cause *ioc*	1	9.495***

Note: ***, **, * denotes rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively.

Figure 3-4 Impulse Responses for Malaysia



Note: The dotted lines represent a 95 percent error band over 8-year horizons.

Table 3-5 Estimation for Myanmar

Table 3-5-1 Estimated VAR Model for Myanmar

Myanmar 1986-2015			
For Dutch Disease	*mau*	*cpi*	*moy*
mau-1	0.733*** [3.780]	0.152 [1.119]	-0.207** [-2.602]
cpi-1	0.080 [1.113]	0.904*** [17.779]	0.106*** [3.569]
moy-1	-0.362 [-1.301]	-0.088 [-0.452]	0.558*** [4.884]
ypc	0.349 [1.520]	0.005 [0.032]	0.309*** [3.280]
adj. R^2	0.978	0.996	0.981

Myanmar 1986-2015		
For capital accumulation analysis	*mau*	*ioc*
mau-1	0.924*** [26.781]	0.040 [0.996]
ioc-1	0.147** [3.036]	0.960*** [16.946]
fdi	0.014 [1.130]	0.017 [1.184]
adj. R^2	0.977	0.901

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively. The Figure in [ ] are t-value.

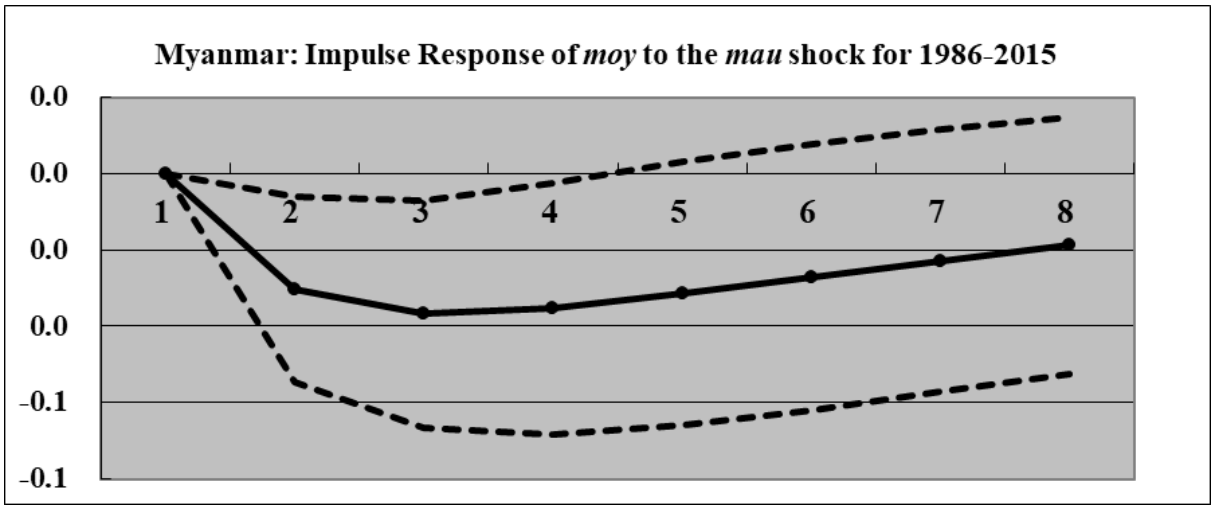
Table 3-5-2 Granger Causality Test for Myanmar

Myanmar 1986-2015			
	Null Hypothesis	Lags	Chi-sq
For Dutch Disease analysis	*mau* does not Granger Cause *moy*	1	6.774***
	mau does not Granger Cause *cpi*	1	1.254

	Null Hypothesis	Lags	Chi-sq
For Capital Accumulation analysis	*mau* does not Granger Cause *ioc*	1	0.992

Note: ***, **, * denotes rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively.

Figure 3-5 Impulse Responses for Myanmar



Note: The dotted lines represent a 95 percent error band over 8-year horizons.

Table 3-7 Summary of Estimation Outcomes for Indonesia, Lao PDR, Malaysia and Myanmar

Dutch Disease Effect: de-industrialization effect		
Indonesia	1970-2015	No
	1970-1996	Yes
	1997-2015	No
Lao PDR	1980-2015	Yes
Malaysia	1970-2015	No
	1970-1996	No
	1997-2015	No
Myanmar	1986-2015	Yes
Capital Accumulation Effect		
Indonesia	1970-2015	Yes
	1970-1996	Yes
	1997-2015	Yes
Lao PDR	1980-2015	Yes
Malaysia	1970-2015	No
	1970-1996	Yes
	1997-2015	Yes
Myanmar	1986-2015	No

Table 3-8 Resource Governance Index 2017 (Rankings among 89 countries)

	Indonesia	Malaysia	Lao PDR	Myanmar
Composite Index	11 (mining) 12 (oil & gas)	27 (oil & gas)	64 (mining)	77 (oil & gas) 83 (mining)
Value Realization	14 (mining) 15 (oil & gas)	51 (oil & gas)	65 (mining)	60 (oil & gas) 76 (mining)
Revenue Management	6 (mining) 6 (oil & gas)	46 (oil & gas)	65 (mining)	65 (oil & gas) 65 (mining)
Enabling Environment	27 (mining) 27 (oil & gas)	10 (oil & gas)	57 (mining)	76 (oil & gas) 76 (mining)

Source: Natural Resource Governance Institute: http://resourcegovernanceindex.org/

Table 3-9 Doing Business 2017 (Rankings among 190 countries)

	Indonesia	Malaysia	Lao PDR	Myanmar
Total Rank	91	23	139	170
Starting a Business	151	112	160	146
Dealing with Construction Permits	116	13	47	66
Getting Electricity	49	8	155	149
Registering Property	118	40	65	143
Getting Credit	62	20	75	175
Protecting Minority Investors	70	3	165	179
Paying Taxes	104	61	146	119
Trading across Borders	108	60	120	159
Enforcing Contracts	166	42	88	188
Resolving Insolvency	76	46	169	164

Source: The World Bank: http://www.doingbusiness.org/rankings

Table 3-10 Worldwide Governance Indicators in 2015

	Indonesia	Malaysia	Lao PDR	Myanmar
Control of Corruption	-0.45	0.28	-0.84	-0.89
Government Effectiveness	-0.22	0.96	-0.50	-1.24
Political Stability	-0.60	0.19	0.48	-1.17
Regulatory Quality	-0.21	0.77	-0.80	-1.26
Rule of Law	-0.41	0.57	-0.75	-1.22
Voice and Accountability	0.14	-0.35	-1.67	-1.30
Average	-0.29	0.41	-0.68	-1.18
Average in 1996	-0.52	0.49	-0.68	-1.53

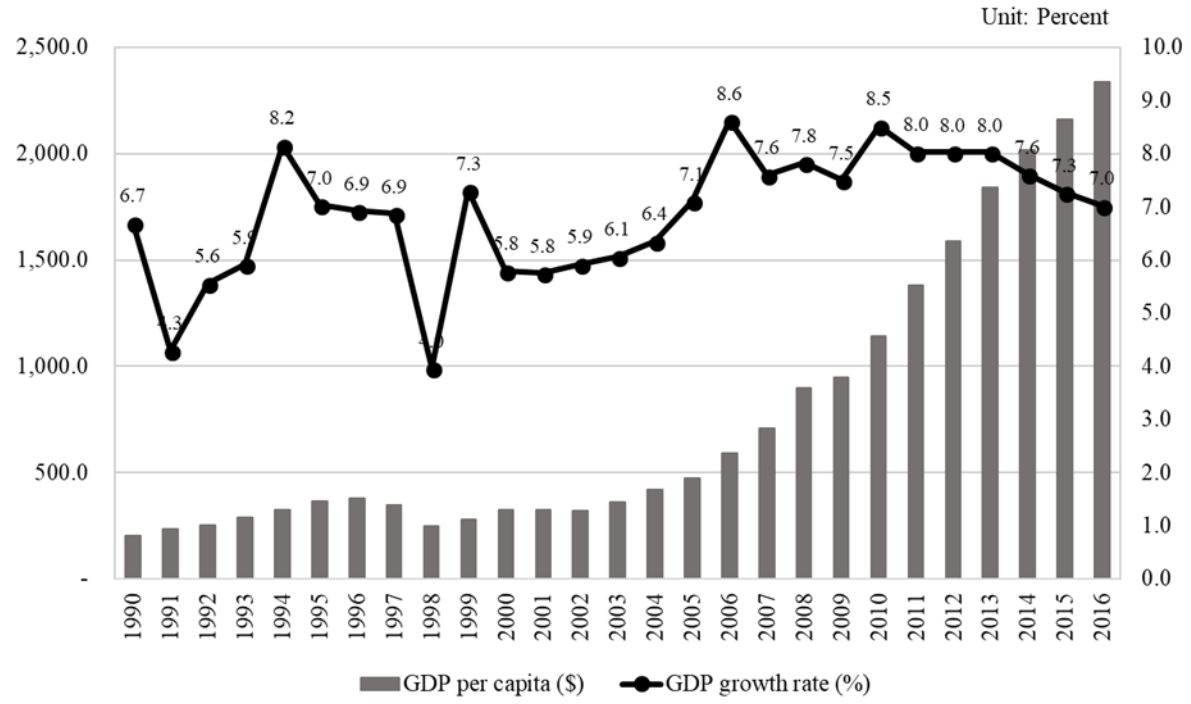
Source: The World Bank: http://data.worldbank.org/

Table 4-1 Lao Economy in 2016

Population *million*	6.8
GDP *billion US dollar*	15.8
GDP Per Capita *US dollar*	2,338.7
Labor Force *thousand people*	3,079.9*
Employed	3,021.2*
Unemployed	58.6*
Unemployment rate *percent*	1.9*
Economic Structure *percent of GDP*	
Total value added	100.0
Agriculture, hunting, forestry, fishing	19.5
Industry	32.5
Mining, utilities	17.4
Manufacturing	8.8
Construction	6.3
Services	48.0
Wholesale, retail trade, restaurants and hotels	16.1
Transport, storage and communications	3.4
Other activities	28.5
Government Finance *percent of GDP*	
Total revenue	15.5**
Taxes	13.4**
Total expenditure	23.5**
Overall budgetary surplus/deficit	-3.4**
Balance of Payments *percent of GDP*	
Exports	21.1
Imports	-29.8
Balance on goods	-8.7
Current account balance	-7.8
Overall balance	-1.1

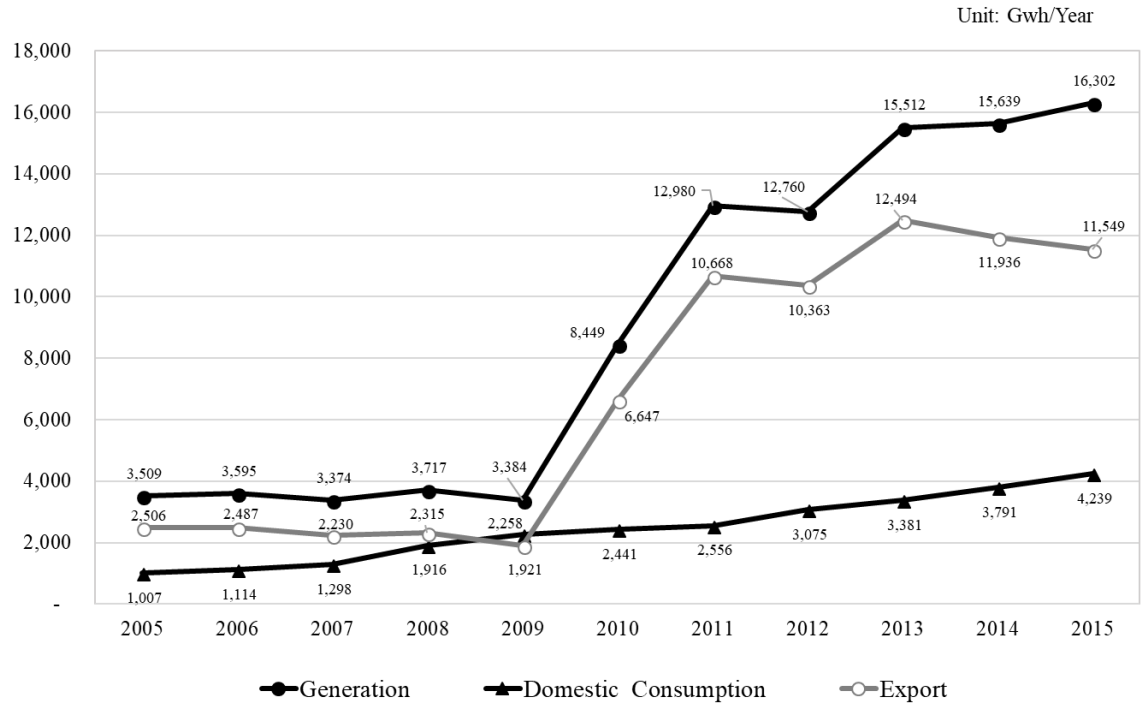
Source: Population, GDP and GDP per Capita are retrieved from World Development Indicators by the World Bank.
Labor Force, Government Finance, Balance of Payments are retrieved from Key Indicators for Asia and the Pacific 2017 by Asian Development Bank.
Economic Structure are retrieved from UNCTAD STAT.
Note: * , ** denotes 2010 and 2015 data respectively which are retrieved Key Indicators for Asia and the Pacific 2017 by Asian Development Bank.

Figure 4-1 GDP Growth rate and GDP per capita of Lao PDR during 1990-2016



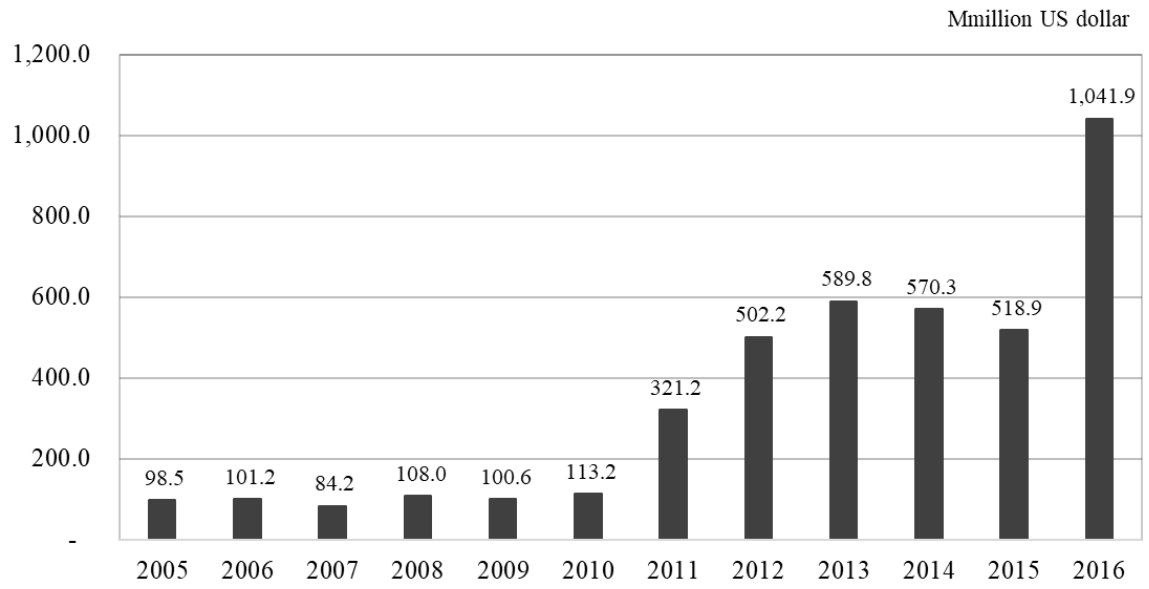
Source: World Development Indicators by the World Bank.

Figure 4-2 Electricity generation, domestic consumption and exports during 2005-2015



Source: Ministry of Energy and Mines, Government of Lao PDR.

Figure 4-3 Value of Electricity exports during 2005-2016



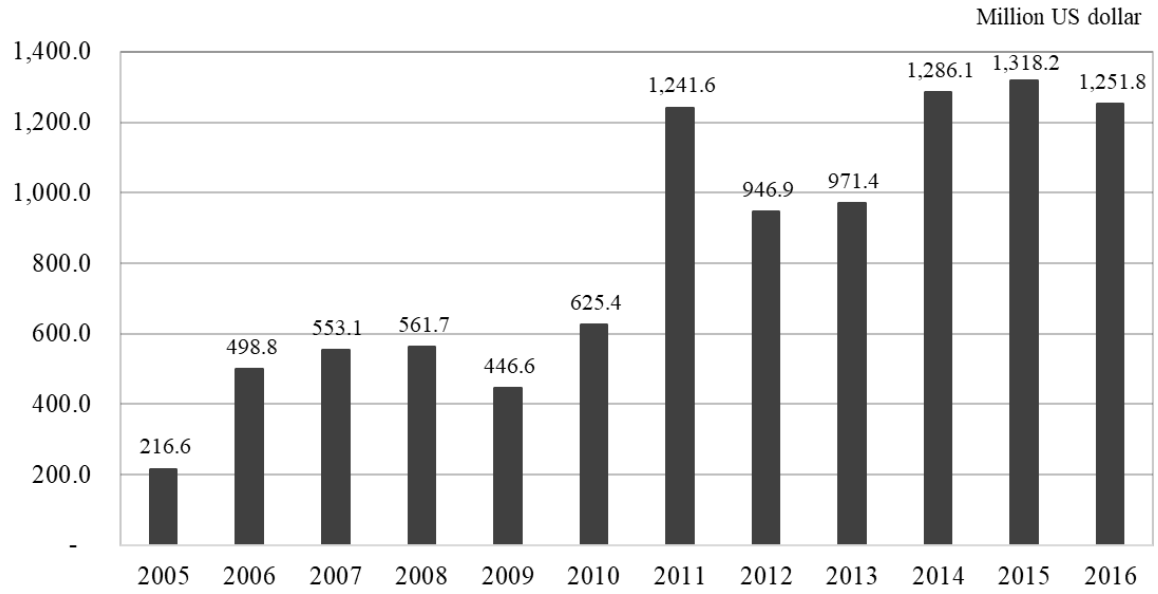
Source: Bank of Lao PDR.

Table 4-2 Minerals Production in Lao PDR during 2001-2015

Name of Minerals	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Antracite	Ton	50,500.0	62,000.0	80,000.0	24,900.0	101,400.0	211,700.0	166,600.0	129,927.0	104,260.0	105,564.0	106,028.0	138,809.0
Lignite	Ton	320,000.0	319,200.0	681,700.0	391,600.0	466,100.0	501,600.0	511,700.0	575,387.0	403,925.0	26,320.0	4,464,068.0	13,097,121.0
Gold	Kg	10,134.0	11,915.0	8,207.0	5,810.0	5,463.4	5,105.8	3,402.7	10,271.0	27,251.0	47,628.0	46,478.0	38,147.0
Copper	Ton	31,000.0	60,758.0	62,621.0	102,695.3	324,037.5	366,845.0	362,110.0	378,807.0	412,098.0	431,917.0	466,851.0	463,823.0
Lead	Ton	787.0	809.0	109.0	260.0	489.7	925.0	524.0	4,360.0	1,000.0	-	-	2,028.0
Limeston	Ton	420,000.0	430,000.0	450,000.0	911,654.0	737,203.0	1,194,894.0	815,200.0	789,071.0	1,454,298.0	1,261,423.0	1,184,093.0	1,348,096.0

Source: Ministry of Energy and Mines, Government of Lao PDR.

Figure 4-4 Value of Mining exports during 2005-2016



Source: Bank of Lao PDR.

Table 4-3 Fiscal Characteristics of Lao PDR

Unit: 1 Billion Kip

	2010/11	2011/12	2012/13	2013/14	2014/15
Revenue and Grants	13,890.0	16,992.0	19,589.0	22,356.0	23,858.0
Revenue	10,181.0	12,428.0	14,676.0	17,187.0	18,534.0
Tax revenue	9,109.0	10,915.0	12,659.0	14,548.0	15,819.0
Non-tax revenue	1,073.0	1,513.0	2,022.0	2,889.0	2,716.0
Grants	3,709.0	4,565.0	4,913.0	5,170.0	5,323.0
Expenditure	15,087.0	18,021.0	24,665.0	26,472.0	29,091.0
Current expenditure	7,890.0	9,365.0	15,888.0	16,869.0	17,685.0
Capital expenditure	7,197.0	8,656.0	8,777.0	9,602.0	11,405.0
Overall Cash Balance	-1,213.0	-1,029.0	-5,078.0	-4,116.0	-5,233.0
Excluding grants	-4,922.0	-5,593.0	-9,991.0	-9,285.0	-10,556.0
Financing	1,213.0	1,029.0	5,078.0	4,116.0	5,233.0
Domestic financing	-200.0	-155.0	3,905.0	1,675.0	374.0
Foreign financing	1,413.0	1,184.0	1,173.0	2,441.0	4,859.0

Unit: Percent

	2010/11	2011/12	2012/13	2013/14	2014/15
Revenue and Grants	22.4	24.2	24.4	24.6	23.7
Revenue	16.4	17.7	18.3	18.9	18.4
Tax revenue	14.7	15.5	15.8	15.7	15.7
Non-tax revenue	1.7	2.2	2.5	3.2	2.7
Grants	6.0	6.5	6.1	5.7	5.3
Expenditure	24.4	25.6	30.8	29.1	28.9
Current expenditure	12.7	13.4	19.8	18.6	17.6
Capital expenditure	11.6	12.2	10.9	10.6	11.3
Overall Cash Balance	-1.9	-1.5	-6.3	-4.5	-5.2
Excluding grants	-7.9	-7.9	-12.5	-10.2	-10.5
Financing	1.9	1.5	6.3	4.5	5.2
Domestic financing	-0.3	-0.2	4.9	1.8	0.4
Foreign financing	2.3	1.6	1.5	2.7	4.8

Source: Ministry of Finance, Government of Lao PDR.

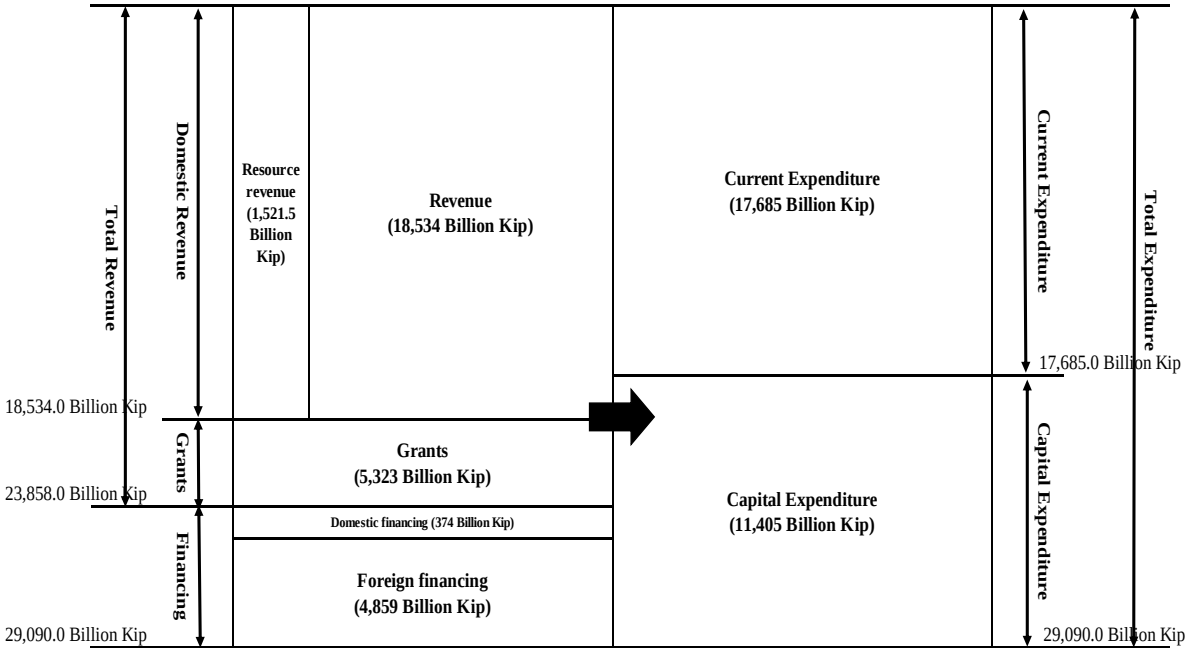
Table 4-4 Resource revenue in Lao PDR

Unit: 1 Billion Kip and Percent

		2010/11		2011/12		2012/13		2013/14		2014/15	
Tax revenue		**9,109.0**	**100%**	**10,915.0**	**100%**	**12,659.0**	**100%**	**14,548.0**	**100%**	**15,819.0**	**100%**
	Profit tax	1,592.0	17%	2,196.0	**20%**	2,188.0	**17%**	1,785.0	**12%**	2,129.0	**13%**
	Profit tax from Non Resource sector	686.0	8%	791.0	7%	1,119.0	9%	1,216.0	8%	1,549.0	10%
Resource revenue	Profit tax from Resource sector	906.0	10%	1,405.0	13%	1,069.0	8%	569.0	4%	579.6	4%
	Natural Resource Tax	526.8	6%	705.7	6%	699.5	6%	949.3	7%	587.0	4%
	Hydropower Royalties	195.3	2%	178.4	2%	212.0	2%	370.7	3%	354.9	2%
Resource revenue		**1,628.1**	**18%**	**2,289.1**	**21%**	**1,980.5**	**16%**	**1,889.0**	**13%**	**1,521.5**	**10%**
Other Tax		5,202.9	57%	5,638.9	52%	7,371.5	58%	9,658.0	66%	10,619.5	67%

Source: Ministry of Finance, Government of Lao PDR.

Figure 4-5 National Budget Balance in Lao PDR FY 2014



Source: Prepared by the author based on data from the Ministry of Finance, Government of Lao PDR.

Table 4-5 Names and Objectives of Natural Resource Funds of Selected Countries

Countries	Fund Name	Year of Foundation	Total Assets $ billion USD (statical year)	Source of Fund
Stabilization Fund: *fiscal stabilization*				
Chile	The Economic and Social Stabilization Fund	2007	13.7 (2016)	Copper
Kazakhstan	National Fund of the Republic of Kazakhstan	2000	76.6 (2014)	Oil
Russia	The Reserve Fund	2008	87.3 (2014)	Oil
Investment and Development Fund: *investing in domestic infrastructure projects*				
Angola	The Sovereign Fund of Angola	2012	4.9 (2016)	Oil
Ghana	Ghana Infrastructure Investment Fund	2014	0.13 (2016)	Oil & Minerals
Nigeria	The Nigeria Infrastructure Fund	2012	0.47 (2016)	Oil
Saving Fund: *saving for future generations*				
Canada	Alberta Heritage Savings Trust Fund	1976	12.9 (2017)	Oil
Kuwait	Kuwait's Future Generations Fund	1976	290.0 (2012)	Oil
Norway	Government Pension Fund Global	2006	1,032.0 (2017)	Oil & Gas

Source: Angola, Chile and Nigeria are retrieved from Funding Annual Report 2016.
Canada, Ghana and Norway are retrieved from Funding Annual Report 2017.
Kazakhstan, Kuwait and Russia are retrieved from Natural Resource Governance Institute Website https://resourcegovernance.org/natural-resource-funds.

Table 4-6 Guiding Matrix for Macro-fiscal Frameworks

Country-specific Decision Matrix		Resource Revenue (mining and petroleum)			
		Long-lasting (>30 years)		Short-term (<30 years)	
		Objectives	**Examples**	**Objectives**	**Examples**
Capital Scarcity (Infrastructure gaps; development needs)	**High**	Macroeconomic stability Managing volatility Development	Nigeria Iraq Peru Mongolia	Macroeconomic stability Sustainability/exhaustibility Development	Bolivia Ghana
		Rule: Flexible structural balance perhaps with front-loaded investment		*Rule: Flexible PIH-based non-resource primary balance with front-loaded investment*	
	Low	Macroeconomic stability Managing volatility	Saudi Arabia Kuwait Qatar Chile	Macroeconomic stability Sustainability/exhaustibility	UK Netherlands Norway
		Rule: Structural balance perhaps with expenditure growth cap		*Rule: PIH-based non-resource primary balance*	

Source: Presentation material by IMF/FAD in 2016: http://www.greenfiscalpolicy.org/wp-content/uploads/2016/11/Session-2-Oana-Luca-Macro-fiscal-policy-frameworks.pdf

Table 4-7 Education and Health expenditure (% of GDP)

Education expenditure

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Brunei	3.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.0	3.3	2.9	N/A	3.4	N/A
Cambodia	1.7	1.7	1.7	N/A	1.7	N/A	N/A	1.6	N/A	1.7	1.5	1.5	1.6	2.0	1.9	N/A
Indonesia	N/A	2.3	2.5	3.0	2.6	2.7	N/A	2.9	2.7	3.3	2.8	3.2	3.4	3.4	3.3	3.6
Lao PDR	1.5	2.0	2.8	N/A	2.4	2.4	3.0	3.1	2.3	1.7	1.7	1.8	1.8	3.2	2.9	N/A
Malaysia	6.0	7.5	7.7	7.5	5.9	N/A	4.5	4.4	4.0	6.0	5.0	5.8	5.7	5.5	5.2	5.0
Myanmar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.8	N/A	N/A	N/A	N/A
Philippines	3.3	3.0	3.0	3.0	2.6	2.4	2.5	2.6	2.7	2.7	N/A	N/A	N/A	N/A	N/A	N/A
Singapore	3.3	3.6	3.9	4.0	3.7	3.2	2.9	3.0	2.8	3.0	3.1	3.1	3.1	2.9	N/A	N/A
Thailand	5.3	4.8	3.9	3.7	4.0	3.9	4.1	3.6	3.5	3.9	3.5	4.8	4.5	4.1	N/A	N/A
Vietnam	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.9	4.8	5.1	4.8	5.5	5.7	N/A	N/A

Health expenditure

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Brunei	2.5	2.5	2.5	2.6	2.5	2.2	1.9	1.9	1.9	2.4	2.3	1.9	1.9	2.1	2.2	2.6
Cambodia	6.4	6.6	6.7	7.7	7.8	7.1	5.9	4.9	6.6	7.6	6.9	7.5	7.3	6.9	6.2	6.0
Indonesia	2.0	2.2	2.1	2.4	2.3	2.8	2.9	3.1	2.8	2.8	3.5	3.3	3.4	3.4	3.4	3.3
Lao PDR	4.7	4.8	4.2	5.0	4.9	4.8	4.1	3.5	3.0	4.0	3.2	2.2	2.3	2.7	2.6	2.8
Malaysia	2.4	2.7	2.7	3.0	3.0	2.9	3.3	3.3	3.1	3.4	3.3	3.5	3.6	3.7	3.9	4.0
Myanmar	1.8	1.8	2.1	2.0	1.9	1.8	1.7	1.6	1.8	2.0	1.9	1.7	1.9	2.0	4.9	4.9
Philippines	3.2	2.9	2.7	3.2	3.2	3.9	3.9	3.9	4.0	4.4	4.3	4.2	4.4	4.5	4.2	4.4
Singapore	3.4	3.2	3.4	3.6	3.2	3.0	3.0	2.9	3.2	3.4	3.2	3.2	3.4	3.7	3.9	4.3
Thailand	3.2	3.2	3.5	3.5	3.4	3.4	3.3	3.4	3.7	3.9	3.6	3.8	3.5	3.5	3.7	3.8
Vietnam	4.4	5.2	4.1	4.2	4.7	5.0	5.3	5.3	5.0	5.2	5.9	5.8	6.5	6.4	5.8	5.7

Note: N/A denotes data are not available.
Source: World Development Indicators by the World Bank.

Table 4-8 Comparison of Industrial Structure

Countries	Indicators	2016	1980
Lao PDR	Mining & Utility, % of GDP	17.4	5.8
	Manufacturing, % of GDP	8.8	3.9
	Product Concentration Indices (Exports)	0.20	-
Indonesia	Mining & Utility, % of GDP	8.7	23.0
	Manufacturing, % of GDP	21.3	12.4
	Product Concentration Indices (Exports)	0.13	-
Malaysia	Mining & Utility, % of GDP	12.5	15.2
	Manufacturing, % of GDP	23.1	21.9
	Product Concentration Indices (Exports)	0.17	-
Developing Economies	Mining & Utility, % of GDP	7.6	19.8
	Manufacturing, % of GDP	20.8	14.7
	Product Concentration Indices (Exports)	0.09	-

Note: The Product Concentration Indices (Exports) are measured by a Herfindahl-Hirschmann Index, which are defined in UNCTAD Handbook of Statistics 2016.
Source: UNCTAD STAT.

Appendix

Appendix 1-1 Sample Countries as Resource-rich Economies in This Study

This study samples the four countries as middle-income and resource-rich economies: Indonesia, Lao PDR, Malaysia and Myanmar.

As an indicator of resource abundance, the study focuses the production side of resources. The resource richness has ever been defined in various ways by international organizations and in academic articles. International Monetary Fund (2012), for instance, refers to "resource-rich developing countries" as low- and lower-middle-income countries whose exhaustible natural resources (e.g., oil, gas and mineral) comprised at least 20 percent of *total exports* or 20 percent of *natural resource revenues*, based on a 2006-10 average. This study, on the other hand, picks up the middle-income countries whose *resource production* on value added base accounts for around 10 to 20 percent out of total GDP in 2015. The reason for focusing on the production side is that the purpose of this study is to examine the applicability of the Dutch Disease theory proposed by Corden and Neary (1982), in which a resource boom was described as the "Hicks-neutral technological progress" in the energy sector's "production" function (see Section 2-3). Based on this concept, the study at the first stage selected the following five countries whose production of mining and utility as a percentage of GDP in the UNCTAD STAT database is around 10 to 20 percent in 2015: Vietnam (15.7%), Lao PDR (15.5%), Malaysia (11.8%), Indonesia (9.1%) and Myanmar (7.5%).[13]

The study next examined the contents of resource indicators, in particular, whether the "utility" should be included in the resource production. The "utility" in the UNCTAD STAT database is defined as "electricity, gas and water supply" in the Handbook of Statistics UNCTAD 2017 (pp. 99). For Lao PDR where the electricity generated by hydroelectric power is exported just like mining products, the "utility" could be included as the resource production[14], in the sense that their production activity might crowd out manufacturing in the

[13] Among the five countries above, the countries who fulfill the criteria of IMF (2012) as "resource-rich developing countries" are Vietnam, Lao PDR and Indonesia. Myanmar is not included in the sample of Resource-Rich Developing Countries (RRDCs) as the artificially low official exchange rate that was in place in the period before April 2012 hampers analysis.

[14] The value added share of hydroelectric production out of the utility (electricity, gas and water supply) is estimated to be 98% in 2015, based on the data of ADB Key Indicators and Lao Statistics Bureau. About half of produced hydroelectric power is estimated to be exported in 2015, based on the data of Lao Statistics Bureau and Bank of Lao PDR.

Dutch Disease context. In fact, the Lao PDR Development Report 2010 published by the World Bank has dealt with "hydropower and mining" as natural resources. For the other four countries, the "utility" appears to promote and support manufacturing activities rather than crowding them out, thereby the inclusion of the "utility" as resource production being questionable for them. Even if the study would like to focus only on the "mining" production, however, its time series data on the real GDP base for a long time from 1970 are not available in any other database of international organizations. The alternative way is to examine the share of the "utility" and "mining" as the composition of the mining and utility production in the UNCTAD STAT database by using another data base. The "ADB Key Indicators for Asia and the Pacific 2017" provides the data for "Mining and quarrying" and "Electricity, gas and water" in GDP base. Then the share of "Mining and quarrying" out of the sum of "Mining and quarrying" and "Electricity, gas and water supply" in nominal GDP base in 2016 can be calculated as follows: Indonesia 85.5%; Malaysia 76.0%; Myanmar 75.9%; and Vietnam 63.2%. From this result, the study decided to exclude Vietnam as a sample economy, since the mining and utility production containing the utility by around 40 percent might bring about a serious bias in examining its Ditch Disease effect. For the remaining three countries, the study finally checked the correlation coefficients in the limited time series of "Mining and quarrying" and the sum of "Mining and quarrying" and "Electricity, gas and water supply" on the nominal GDP base by ADB Key Indicators as follows: Indonesia 0.999 (1983-2016); Malaysia 0.994 (1987-2016); and Myanmar 0.996 (1986-2016). Thus the usage of mining and utility production that is highly correlated with mining production does not seem to cause a serious bias in examining the Ditch Disease effect for three sample countries: Indonesia, Malaysia and Myanmar.

In conclusion, the study samples the four countries of Indonesia, Lao PDR, Malaysia and Myanmar as middle-income and resource-rich economies, and uses the mining and utility production as an indicator of resource abundance, which is retrieved from the UNCTAD Stat database.

Appendix 1-2: Growth rate of ASEAN, Asia and the World during 1990-2016

Year	ASEAN	ASIA	WORLD
1990	8.3	6.3	3.1
1991	7.1	4.5	1.3
1992	7.0	5.2	1.9
1993	7.7	3.2	1.5
1994	7.9	3.4	3.1
1995	7.9	4.9	3.0
1996	7.4	5.2	3.3
1997	4.1	3.5	3.6
1998	-7.3	0.4	2.6
1999	3.7	2.6	3.3
2000	6.1	5.1	4.3
2001	2.7	2.2	1.9
2002	5.1	3.3	2.1
2003	5.6	4.5	2.8
2004	6.5	5.7	4.1
2005	5.7	5.4	3.6
2006	6.0	5.8	4.0
2007	6.7	6.3	3.9
2008	4.2	3.2	1.4
2009	1.7	1.0	-2.1
2010	8.0	7.2	4.1
2011	4.8	4.8	2.9
2012	5.8	4.2	2.2
2013	5.0	4.6	2.3
2014	4.4	4.0	2.5
2015	4.4	4.0	2.6
2016	4.5	3.9	2.2
Average	5.2	4.2	2.7

Source: UNCTAD STAT.

Appendix 3-1: Key variables: mining & utility production (*mau*) as mil. US dollar at 2005 constant price

Year	Indonesia	Laos	Malaysia	Myanmar
1970	10,688.0	14.8	4,583.4	-1.3
1971	11,277.9	15.5	5,200.5	-0.7
1972	13,784.0	16.0	5,555.4	-0.7
1973	16,996.3	17.4	5,319.7	-0.5
1974	17,575.7	18.0	4,982.9	-0.3
1975	16,937.1	19.3	4,974.3	-0.5
1976	19,478.8	19.9	5,971.3	0.1
1977	21,878.9	19.5	6,054.1	1.2
1978	21,442.9	19.5	6,611.3	1.6
1979	21,417.2	18.9	7,739.2	3.0
1980	21,140.1	21.5	7,587.9	3.0
1981	21,848.4	25.1	7,279.2	4.1
1982	19,269.9	25.9	7,827.8	5.8
1983	22,146.1	26.0	9,058.9	6.4
1984	23,444.9	27.5	10,291.5	8.3
1985	21,137.2	36.0	10,203.6	9.0
1986	22,293.9	35.4	10,855.0	10.3
1987	22,358.9	25.2	10,932.3	10.4
1988	21,656.1	23.7	11,570.9	10.1
1989	23,134.5	31.4	12,545.0	12.9
1990	24,837.7	37.0	12,515.9	13.7
1991	27,945.6	38.5	12,979.6	16.5
1992	28,352.0	36.8	13,698.1	23.2
1993	29,270.6	43.4	13,372.3	29.6
1994	30,872.0	53.6	14,235.0	31.7
1995	32,982.0	52.1	17,567.6	35.1
1996	35,051.3	61.0	18,014.3	40.6
1997	35,879.9	62.4	18,044.4	50.8
1998	35,198.9	90.7	18,589.1	50.7
1999	34,842.3	107.9	19,746.6	63.8
2000	36,781.5	141.7	19,918.5	76.3
2001	36,937.4	142.9	19,805.8	67.2
2002	37,373.2	149.3	20,743.3	83.5
2003	36,749.0	211.8	21,889.2	88.6
2004	35,062.5	197.7	22,749.7	88.9
2005	36,227.9	253.6	22,758.1	113.7
2006	36,874.0	420.6	22,503.1	114.9
2007	37,756.1	299.0	23,048.5	103.9
2008	38,270.6	340.4	22,647.2	109.8
2009	40,414.9	424.3	21,620.8	118.6
2010	41,866.0	527.8	21,600.6	134.3
2011	43,651.2	599.2	20,669.2	135.9
2012	45,178.0	634.1	21,081.5	121.0
2013	46,377.5	705.3	21,433.7	171.0
2014	46,809.2	737.0	22,107.4	283.5
2015	44,402.1	839.4	23,073.6	307.7

Source: UNCTAD STAT.

Appendix 3-2: Key variables: inflation rate (*cpi*) as average consumer prices, 2010=100 and GDP deflator 2010=100

Year	Indonesia cpi	Laos def	Malaysia cpi	Myanmar cpi
1970	1.2		23.3	0.2
1971	1.2		23.7	0.2
1972	1.3		24.5	0.2
1973	1.7		27.1	0.3
1974	2.4		31.8	0.4
1975	2.8		33.2	0.5
1976	3.4		34.1	0.6
1977	3.7		35.7	0.6
1978	4.0		37.4	0.5
1979	4.7		38.8	0.6
1980	5.6	0.2	41.4	0.6
1981	6.2	0.2	45.4	0.6
1982	6.8	0.3	48.0	0.6
1983	7.6	0.6	49.8	0.6
1984	8.4	0.8	51.8	0.7
1985	8.8	1.2	51.9	0.7
1986	9.3	1.7	52.3	0.8
1987	10.2	2.2	52.5	1.0
1988	11.0	3.3	53.8	1.1
1989	11.7	5.4	55.3	1.4
1990	12.7	7.3	56.8	1.7
1991	13.8	8.3	59.2	2.2
1992	14.9	9.1	62.1	2.7
1993	16.3	9.7	64.3	3.6
1994	17.7	10.4	66.7	4.4
1995	19.4	12.4	69.0	5.5
1996	20.9	14.2	71.4	6.5
1997	22.2	16.9	73.3	8.4
1998	35.2	30.0	77.1	12.7
1999	42.4	67.0	79.2	15.0
2000	44.0	81.7	80.5	15.0
2001	49.1	89.8	81.6	18.2
2002	54.9	100.0	83.1	28.5
2003	58.5	113.3	83.9	39.0
2004	62.2	125.1	85.2	40.7
2005	68.7	134.9	87.7	44.5
2006	77.7	154.3	90.9	53.4
2007	82.7	161.0	92.7	72.2
2008	90.7	170.5	97.7	91.5
2009	95.1	163.3	98.3	92.8
2010	100.0	179.4	100.0	100.0
2011	105.4	190.2	103.2	105.0
2012	109.9	204.9	104.9	106.6
2013	116.9	213.3	107.1	112.5
2014	124.4	222.9	110.5	118.6
2015	132.3	222.9	112.8	129.9

Source: International Financial Statistics of IMF.

Appendix 3-3: Key variables: manufacturing (*moy*) as percentage of GDP

Year	Indonesia	Laos	Malaysia	Myanmar
1970	9.6	3.8	15.3	10.2
1971	8.8	3.8	14.9	10.0
1972	10.3	3.8	14.7	9.2
1973	10.2	3.8	17.6	8.5
1974	8.8	3.8	18.7	8.1
1975	9.4	3.8	18.7	9.0
1976	10.0	3.8	19.7	9.7
1977	10.2	3.8	20.4	10.4
1978	11.3	3.8	19.5	10.0
1979	11.0	3.7	20.6	9.5
1980	12.4	3.8	21.9	9.5
1981	12.8	3.9	21.3	9.3
1982	12.5	3.8	19.4	9.3
1983	13.3	3.6	19.5	9.6
1984	15.1	3.6	19.7	9.9
1985	16.4	3.8	19.7	9.9
1986	17.1	4.4	19.7	9.2
1987	17.3	3.6	19.6	7.8
1988	20.0	2.8	21.7	7.5
1989	20.0	3.5	23.3	8.6
1990	20.8	4.0	23.8	7.8
1991	21.3	5.0	25.2	7.0
1992	21.9	5.2	25.5	6.9
1993	22.3	5.3	25.5	6.8
1994	23.2	5.4	26.2	6.2
1995	24.0	5.9	25.8	6.9
1996	25.5	6.6	27.0	7.1
1997	26.5	6.8	27.3	7.1
1998	25.0	7.7	27.1	7.0
1999	26.1	7.8	29.4	6.5
2000	25.1	7.8	29.9	7.2
2001	26.3	8.2	28.4	7.8
2002	25.8	8.9	28.5	9.2
2003	25.5	8.6	29.2	9.8
2004	25.3	8.8	29.7	11.6
2005	24.7	8.5	27.9	12.8
2006	24.9	8.4	27.8	14.0
2007	24.5	8.9	26.4	14.9
2008	25.3	9.1	24.8	16.8
2009	24.1	10.5	24.0	18.1
2010	22.6	10.1	23.7	19.9
2011	22.2	9.9	23.5	19.7
2012	21.9	8.4	23.4	20.1
2013	21.6	8.1	23.1	19.9
2014	21.5	8.1	23.1	19.9
2015	21.5	8.5	23.1	20.7

Source: UNCTAD STAT.

Appendix 3-4: Key variables: real GPD per capita as US Dollars at 2005 constant prices

Year	Indonesia	Laos	Malaysia	Myanmar
1970	349.4	158.5	1,201.1	71.2
1971	364.1	162.0	1,440.4	71.7
1972	388.0	163.0	1,537.4	70.3
1973	420.8	172.5	1,676.1	69.6
1974	441.6	174.5	1,772.7	70.0
1975	452.1	182.4	1,745.4	71.2
1976	471.4	185.0	1,902.7	73.3
1977	500.5	179.1	2,003.8	75.4
1978	527.1	179.1	2,088.5	78.2
1979	547.0	173.4	2,230.9	80.0
1980	587.1	187.8	2,339.9	84.3
1981	619.1	212.3	2,441.2	87.6
1982	618.5	222.2	2,522.4	90.2
1983	657.7	226.7	2,610.4	92.1
1984	688.2	236.4	2,738.5	94.6
1985	690.4	241.6	2,635.0	95.3
1986	716.2	246.4	2,588.9	92.4
1987	736.9	236.0	2,649.8	87.1
1988	764.9	224.7	2,799.4	75.9
1989	819.3	249.3	2,969.2	77.4
1990	877.2	258.4	3,147.1	78.4
1991	939.0	261.9	3,355.6	76.8
1992	989.9	268.7	3,559.6	83.2
1993	1,044.3	276.9	3,813.3	87.2
1994	1,105.2	291.9	4,060.5	92.6
1995	1,177.7	305.0	4,347.9	97.8
1996	1,251.0	319.0	4,662.3	102.8
1997	1,291.0	334.1	4,878.1	107.2
1998	1,105.9	340.8	4,408.0	111.0
1999	1,101.4	359.4	4,568.1	121.6
2000	1,140.0	374.1	4,861.9	136.7
2001	1,165.5	389.6	4,784.9	150.5
2002	1,201.3	406.9	4,943.4	166.9
2003	1,244.6	426.2	5,131.3	188.2
2004	1,289.8	449.7	5,379.3	211.9
2005	1,345.3	472.9	5,564.2	238.7
2006	1,400.6	461.1	5,770.5	267.9
2007	1,470.1	535.9	6,026.7	298.0
2008	1,538.2	567.5	6,209.4	326.4
2009	1,588.4	599.4	6,012.9	358.5
2010	1,665.3	637.0	6,354.1	392.1
2011	1,745.0	676.8	6,584.3	410.9
2012	1,826.1	718.2	6,837.2	437.6
2013	1,902.8	762.9	7,050.4	470.5
2014	1,973.4	807.2	7,365.2	503.8
2015	2,043.0	853.8	7,621.7	535.9

Source: UNCTAD STAT.

Appendix 3-5: Key variables: investment-consumption ratio (*ioc*) as percentage of GDP

Year	Indonesia	Laos	Malaysia	Myanmar
1970	15.1	7.7	22.4	12.1
1971	17.3	7.7	26.8	11.9
1972	21.9	7.7	28.3	11.5
1973	20.9	7.7	31.9	9.8
1974	20.9	7.7	35.6	8.7
1975	24.6	7.7	32.9	7.9
1976	25.1	7.7	32.6	9.4
1977	25.1	7.7	33.6	14.4
1978	25.0	7.9	36.5	19.6
1979	27.5	7.6	42.4	25.4
1980	28.1	7.6	46.4	22.7
1981	34.8	7.5	50.6	24.5
1982	33.5	8.0	50.9	25.3
1983	33.7	8.8	53.1	21.2
1984	30.4	6.3	49.5	17.9
1985	31.3	7.1	44.4	17.5
1986	31.7	7.1	38.8	16.2
1987	35.3	10.4	35.0	13.7
1988	35.7	12.9	38.8	10.8
1989	39.2	17.5	45.4	10.4
1990	39.9	17.5	50.4	16.6
1991	38.6	17.5	55.2	17.2
1992	36.9	17.4	57.9	14.3
1993	37.1	17.6	63.8	11.7
1994	38.8	17.4	66.6	13.1
1995	39.0	17.2	72.3	15.8
1996	40.3	18.1	74.4	16.9
1997	39.3	17.0	76.8	15.4
1998	32.9	16.5	52.3	14.6
1999	23.6	20.9	41.6	13.4
2000	28.2	13.9	46.9	13.5
2001	27.2	14.8	43.2	13.2
2002	25.2	35.6	40.5	10.9
2003	24.9	34.8	39.0	12.4
2004	29.1	41.2	37.0	13.4
2005	31.8	43.9	40.1	14.6
2006	33.0	39.9	39.6	16.0
2007	33.8	41.7	39.5	17.1
2008	39.1	41.8	36.6	19.1
2009	44.4	48.0	35.5	22.5
2010	47.5	39.3	37.0	34.0
2011	48.6	41.9	36.2	46.3
2012	49.8	50.2	39.9	47.2
2013	48.2	44.9	40.4	47.6
2014	48.9	46.8	39.5	47.1
2015	49.7	52.7	38.9	50.9

Source: UNCTAD STAT.

Appendix 3-6: Key variables: Foreign direct investment (*fdi*) as percentage of GDP

Year	Indonesia	Laos	Malaysia	Myanmar
1970	1.4	0.1	2.4	
1971	2.7		2.4	0.0
1972	2.0		2.3	0.0
1973	3.1	0.6	2.2	0.0
1974	0.6	0.2	6.0	0.0
1975	3.6	0.1	3.8	0.1
1976	1.7		3.5	
1977	0.4	0.3	3.1	0.0
1978	0.7		3.1	
1979	0.4		2.7	
1980	0.2		3.8	0.0
1981	0.1		5.1	
1982	0.2		5.2	
1983	0.3		4.2	
1984	0.2		2.3	0.0
1985	0.3		2.2	
1986	0.3		1.8	0.0
1987	0.4		1.3	
1988	0.6	0.3	2.0	
1989	0.6	0.5	4.3	1.2
1990	0.8	0.7	5.9	4.3
1991	1.0	0.7	8.2	4.4
1992	1.1	0.7	8.7	2.5
1993	1.1	2.3	8.6	1.4
1994	1.1	4.0	6.2	1.9
1995	1.9	5.6	6.5	4.1
1996	2.3	8.9	7.2	6.9
1997	1.9	5.1	6.3	9.7
1998		3.7	3.8	11.5
1999		3.7	4.9	4.6
2000		2.0	4.0	1.3
2001		1.4	0.6	0.2
2002	0.1	0.3	3.2	0.2
2003		1.0	2.2	18.7
2004	0.7	0.7	3.7	7.1
2005	2.7	1.0	2.8	0.9
2006	1.3	5.6	3.7	5.2
2007	1.5	7.7	4.4	0.0
2008	1.7	4.3	3.1	2.3
2009	0.8	3.4	0.7	0.1
2010	1.8	4.1	3.6	16.1
2011	2.2	3.7	4.1	1.9
2012	2.1	3.1	2.9	0.8
2013	2.1	4.0	3.7	0.9
2014	2.4	6.1	3.2	1.4
2015	1.9	8.9	3.8	4.5

Source: UNCTAD STAT.

Appendix 4-1: GDP Growth rate and GDP per capita of Lao PDR during 1990-2016

	GDP per capita ($)	GDP growth rate (%)
1990	203.3	6.7
1991	234.7	4.3
1992	250.5	5.6
1993	287.2	5.9
1994	325.6	8.2
1995	363.5	7.0
1996	378.0	6.9
1997	345.5	6.9
1998	248.5	4.0
1999	277.5	7.3
2000	324.8	5.8
2001	326.6	5.8
2002	319.8	5.9
2003	362.6	6.1
2004	417.8	6.4
2005	475.4	7.1
2006	590.3	8.6
2007	709.8	7.6
2008	899.5	7.8
2009	948.1	7.5
2010	1,141.1	8.5
2011	1,381.4	8.0
2012	1,588.6	8.0
2013	1,838.8	8.0
2014	2,017.6	7.6
2015	2,159.4	7.3
2016	2,338.7	7.0

Source: World Development Indicators by the World Bank.

Appendix 4-2: Electricity Products in Lao PDR during 1991-2015

Year	Generation	Domestic Consumption	Export
2005	3,509	1,007	2,506
2006	3,595	1,114	2,487
2007	3,374	1,298	2,230
2008	3,717	1,916	2,315
2009	3,384	2,258	1,921
2010	8,449	2,441	6,647
2011	12,980	2,556	10,668
2012	12,760	3,075	10,363
2013	15,512	3,381	12,494
2014	15,639	3,791	11,936
2015	16,302	4,239	11,549

Source: Ministry of Energy and Mines, Government of Lao PDR.

Appendix 4-3: Value of Electrcity and Mining Exportation (Million US$) during 2005-2016

	Electricity	**Mining**
2005	98.5	216.6
2006	101.2	498.8
2007	84.2	553.1
2008	108.0	561.7
2009	100.6	446.6
2010	113.2	625.4
2011	321.2	1,241.6
2012	502.2	946.9
2013	589.8	971.4
2014	570.3	1,286.1
2015	518.9	1,318.2
2016	1,041.9	1,251.8

Source: Bank of Lao PDR.