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The Resource Curse Hypothesis Revisited: Evidence from Asian Economies

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Abstract

This article examines the applicability of resource curse hypothesis focusing on Asian economies for two different phases for 1980-1995 and for 1995-2014. Its analytical contribution is to trace two kinds of crowding-out logics behind the resource curse: the Dutch Disease logic for resource abundance to crowd out manufacturing activities, and the non-Hartwick-rule logic to crowd out savings and investment, by conducting the statistical tests of Granger causality and impulse responses under vector auto-regression estimation. The empirical outcomes identified the existence of the Dutch Disease in 1980-1995, but not in 1995-2014, and also represented some approach toward the Hartwick-rule in 1995-2014, but not in 1980-1995. Thus, the resource curse hypothesis does not fit with the recent Asian economies. One of the interpretations on the transformation of the resource effects from a curse to a blessing could come from the improvement of institutional quality and the progress in policy efforts in the recent Asian economies.

JEL classification numbers: F43; O11
Keywords: resource curse, Asian economies, crowding-out, Dutch Disease, Hartwick rule and institutional quality.

1 Introduction

The "Resource Curse Thesis", initially proposed by Auty (1993), refers to the puzzling phenomenon that countries with great natural resource wealth tend to grow more slowly than resource-poor countries. It has been typically observed in the contrast that many African economies rich in oil, diamonds or other minerals have stayed at the least developed stage, whereas East Asian economies have achieved higher growth performances in the world without exportable natural resources, during the post-world-war II period.
The resource curse hypothesis has been analyzed empirically in a number of recent studies, and the majority of these studies has provided evidence to support the hypothesis

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(e.g., Sachs and Warner, 1995; Gelb, 1988; Gylfason et al., 1999; Sala-I-Martin and Subramanian, 2003; Manzano and Rigobon, 2008). 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 World Bank (2011) also presented the stylized fact that the share of natural capital in total wealth tend to be much higher in low-income countries. The experience of resource rich economies have, however, been still heterogeneous and not deterministic as typically seen in Chile and Botswana who have harnessed their resources to boost their economic performances. There have 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.

The next question then arises on what would be the mechanism and channels behind the solid fact of the resource curse. It has been argued that the curse is caused by several factors, some related to macroeconomic management, and others to political economy and governance. Most current explanations for the curse, as Sachs and Warner (2001) argued, have a crowding-out logic: 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 stories as follows. One is, natural resources crowd-out manufacturing activities from sectoral perspective. The other is, natural resources crowd-out savings and investment from an intertemporal perspective.

The first logic 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 by the Netherlands in the late 1950s. The theoretical framework for the hypothesis was shown by the Salter-Swan-Corden-Dornbusch model. Corden and Neary (1982) originally described this model as follows: positive wealth shocks from natural resource sector, through raising higher disposal income and aggregate demand, trigger higher relative prices of non-tradable goods (spending effect) that correspond to a real exchange rate appreciation; this causes further movement of resources toward non-tradable sector away from tradable sector (resource movement effect). 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 (2010) 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.

The second logic on whether natural resources crowd-out savings and investment or not 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 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.

This paper aims to examine the applicability of the resource curse hypothesis focusing on Asian economies. The reason why we look at the case of Asian economies is that the resource curse might not fit with Asian economies since Asian emerging-market economies have recorded high economic growth in the recent decades regardless of their abundance of natural resources. We thus verify the resource curse hypothesis for two different phases: one for 1980-1995 and the other for 1995-2014, and compare the applicability of the hypothesis between both phases. Our contribution in analyzing the resource curse is to keep track of the crowding-out logics as well as simple observation on the relationship between resource abundance and economic growth. In examining the crowding-out stories, we estimate the Granger causality and impulse response in a vector auto-regression (VAR) estimation from resource abundance to manufacturing activities in the aforementioned first logic, and from resource abundance to savings and investment in the second logic. The causality issue would, in particular, be critical, since manufacturing activities might also affect the share of natural resources in an economy. 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 natural resources. Similarly, the lack of manufacturing activities in an economy might make the economy stay at a resource-rich status. The crowding-out logics, therefore, require causality checks on whether resource abundance really crowd out growth-boosting activities.

The rest of the paper is structured as follows. The next section represents empirics on the applicability of the resource curse hypothesis in Asian economies: data for key variables, methodology for a VAR estimation, and estimation outcomes with their interpretation. The last section summarizes and concludes.

2 Empirics

This section represents empirics on the applicability of the resource curse hypothesis in Asian economies: data for key variables, methodology for a VAR estimation, and the estimation outcomes with their interpretation.

2.1 Data and Overview

For the subsequent analysis, we sample 37 economies in Asia for 1980-2014. Regarding

the scope of Asia, we follow the definition of UNCTADstat.[3] As we stated in the introduction, we divide sample period into 1980-1995 and 1995-2014 for comparing the applicability of the resource curse hypothesis between the two different phases. For a VAR model estimation in the next section, we will construct a panel data with 37 Asian economies for 1980-1995 and for 1995-2014.

We herein identify the following four variables for the resource curse analysis. The first variable is "natural resources rents (nrr)" to represent natural resource abundance in an economy. The data is retrieved from the World Development Indicators (WDI) of the World Bank as the series of "Total natural resources rents (% of GDP)".[4] In this database, the total natural resources rents are defined as the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. The second variable is "real GDP per capita (ypc)" as a partner variable for simply observing the correlation with resource abundance. The resource curse hypothesis would be implied if the inverse correlation between natural resources rents and the growth rate of real GDP per capita was verified. The data for real GDP per capita is retrieved from the UNCTADstat as the series of "GDP by US Dollars at constant prices (2005) and constant exchange rates (2005) per capita". The third variable is "manufacturing-services ratio in GDP base (mos)". This variable is introduced to examine the aforementioned first crowding-out logic in the resource curse mechanism, i.e., the Dutch Disease hypothesis in which resource abundance crowds out manufacturing activities. The manufacturing-services ratio is derived by dividing "manufacturing in value-added term" by "services in value-added one", both of which are retrieved from the UNCTADstat. The fourth variable is "investment-consumption ratio in GDP base (ioc)". This variable is for investigating the second crowding-out logic (namely, non-Hartwick-rule scenario) in which the resource abundance crowds out savings and investment. The ratio is produced by dividing "gross fixed capital formation" by "final consumption expenditure", both of which are also retrieved from the UNCTADstat.

We herein take an overview on the resource curse applicability in Asian economies by simply observing the relationship between natural resources rents and the growth rates of real GDP per capita. Figure 1 illustrates a scatter diagram between these two variables for the different phases: 1980-1995 and 1995-2014. It shows the negative correlation between natural resources rents and the growth rate of real GDP per capita for both phases, but their weaker correlation for 1995-2014 than that for 1980-1995. It might come from the following alternation of some economies' position from 1980-1995 to 1995-2014. First, although those economies with less resources rents such as Korea, Thailand and Singapore recorded higher growth of real GDP per capita for 1980-1995, they revealed the slowdown of their growth for 1995-2014, probably due to the convergence mechanics. Second, those emerging economies with middle-sized resources rents such as Laos, Vietnam and Myanmar improved their growth rates of real GDP per capita from 1980-1995 to 1995-2014.

We then investigate the mechanism and channels behind some change in the resource

[3] See the website: http://unctadstat.unctad.org/EN/. The 37 Asian economies are Afghanistan, Bahrain, Bangladesh, Bhutan, Brunei, Cambodia, China, Hong Kong, Macao, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Korea, Kuwait, Laos, Lebanon, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Syria, Thailand, Turkey, UAE, and Viet Nam. The countries that belong to central Asia are excluded due to their lack of data before 1991.

[4] See the website: http://data.worldbank.org/indicator/NY.GDP.TOTL.RT.ZS?view=chart.

curse applicability in Asian economies from 1980-1995 to 1995-2014, by examining two kinds of crowding-out logics through a VAR estimation with the panel data in the next section.

2.2 Methodology for a VAR Model Estimation

In this section, through a VAR estimation with panel data, we examine the Granger causalities and the impulse responses from natural resources rents (nrr) to manufacturing-services ratio (mos) based on the crowding-out logic of the Dutch Disease, and those from natural resources rents (nrr) to investment-consumption ratio (ioc) following another crowding-out logic of the non-Hartwick-rule scenario. The reason why we adopt a VAR model for our analyses is that the model allows for potential and highly-likely endogeneity between the variables of interest, and also for tracing out the dynamic responses of variables to exogenous shocks overtime.

We now specify a VAR model with panel data for estimation in the following way.[5]

$$y_{it} = \mu + V_1 y_{it-1} + \varepsilon_{it} \quad (1)$$

where y_{it} is a (2×1) column vector of the endogenous variables with country *i* and year *t*, i.e., $y_{it} = (nrr_{it}\ mos_{it})'$ for the Dutch Disease logic and $y_{it} = (nrr_{it}\ ioc_{it})'$ for the non-Hartwick-rule logic, μ is a (2×1) constant vector, V_1 is a (2 ×2) coefficient matrix, y_{it-1} is a (2 ×1) vector of the lagged endogenous variables, and ε_{it} it is a (2 ×1) vector of the random error terms in the system. In the Dutch Disease model, we insert a (2×1) vector of the control variable of real GDP per capita (ypc), since manufacturing-services ratio might be also affected by development stages of an economy according to the Petty-Clark's Law (Clark. 1940). The lag length (-1) is selected by the minimum Akaike Information Criterion (AIC) with maximum lag equal to (-2) under the limited number of observations.

Based on the VAR model (1), we examine the Granger causalities between natural resources rents (nrr) and manufacturing-services ratio (mos), and between natural resources rents (nrr) and investment-consumption ratio (ioc), and also investigate the impulse responses of mos and ioc to the Cholesky one-standard-deviation nrr shock, so that we can trace the 8-year dynamic effects.

2.3 Estimation Outcomes and Interpretation

Table 1, Table 2 and Figure 2 respectively report estimation outcomes of the estimated VAR model, the Granger causalities and the impulse responses.

Regarding the Granger causalities shown in Table 2, as far as the causality between natural resources rents (*nrr*) and manufacturing-services ratio (*mos*) is concerned, it was only in 1980-1995 when the causality from nrr to mos was identified at 99 percent level of significance. Considering the estimated VAR model in Table 1, this causality was supposed to be a "negative" one. As for the causality from natural resources rents (*nrr*) and investment-consumption ratio (*ioc*), on the other hand, it was in 1995-2014 when the positive causality was verified at the significant level. The impulse response analysis shown in Figure 2 was focused on the two cases where the Granger causalities were identified above. The manufacturing-services ratio negatively responded to the shock of natural resources rents (*nrr*) within a 95 percent error band after four-year lags during

[5] We specify the VAR model with panel data, i.e., PVAR, as in Papadamou, et al. (2015).

1980-1995, and the investment-consumption ratio (*ioc*) positively responded to the shock from the beginning during 1995-2014.

The implications of the estimation outcomes above are summarized as follows. Regarding the applicability of the Dutch Disease hypothesis, we could argue that Asian economies in 1980-1995 really suffered from the disease in which their resource abundance crowded-out manufacturing activities, from the aforementioned evidence of the Granger causality and impulse response from natural resources rents and manufacturing-services ratio. On the other hand, the disease could not be identified in Asian economies during the second phase of 1995-2014. As for the applicability of Hartwick-rule, the evidence of the Granger causality and impulse response from natural resources rents to investment-consumption ratio implied that the 1995-2014 Asian economies approached the rule, whereas the 1980-1995 economies did not follow the rule. In sum, the resource curse hypothesis does not seem to fit with the recent Asian economies from the perspectives of two kinds of crowding-out logics.

The next question is what has made the difference in the applicability of resource curse hypothesis from the first phase to the second phase in Asian economies. Van der Ploeg (2011) argued that with good institutions the resource curse could be turned into a blessing by showing several evidence (e.g., Mehlum et. al., 2006 and Boschini et. al., 2007). If we follow this argument, we could speculate that Asian economies with better growth performances have improved their institutional quality and transformed the effect of resource abundance on their growth from a curse to a blessing toward the recent times. Figure 3 exhibits the change in institutional quality from 1996 to 2014 in selected resource-rich Asian economies with better economic performance, the natural resources rents of which are more than 6 percent on average and the annual growth rate of real GDP per capita of which is over 2 percent during 1995-2014. The institutional quality is shown as an average of the indexes for “Government Effectiveness”, “Regulatory Quality” and “Rule of Law” in the Worldwide Governance Indicators by the World Bank. The index takes the value of -2.5 in the worst quality and of 2.5 in the best one. We could observe that the improvements in institutional quality from 1996 to 2015 are recorded in the oil producing economies such as Iraq, Saudi Arabia and Qatar and also in emerging-market economies with middle-sized resource abundance such as Lao PDR, Vietnam and Myanmar. In fact, the three emerging-market economies that belong to Mekong region has made policy efforts for intensively promoting their industrialization under the framework of the Greater Mekong Sub-region supported by the Asian development Bank since 1992.[6] The transformation of the resource effects in the recent Asian economies might come from the improvement of institutional quality and the progress in policy efforts in their economies.

3 Concluding Remarks

This article examined the applicability of the resource curse hypothesis focusing on Asian economies for two different phases for 1980-1995 and for 1995-2014. Its analytical contribution was to trace two kinds of crowding-out logics behind the resource curse: the Dutch Disease logic for resource abundance to crowd out manufacturing activities, and the non-Hartwick-rule logic to crowd out savings and investment, by conducting the

[6] See the website: http://www.adb.org/countries/gms/main.

statistical tests of Granger causality and impulse responses under a VAR estimation.
The empirical outcomes on the causalities and impulse responses from resources rents to manufacturing-services ratio and to investment-consumption ratio, identified the existence of the Dutch Disease in 1980-1995, but not in 1995-2014, and also represented some approach toward the Hartwick-rule in 1995-2014, but not in 1980-1995. Thus, the resource curse hypothesis does not fit with the recent Asian economies. One of the interpretations on the transformation of the resource effects from a curse to a blessing could come from the improvement of institutional quality and the progress in policy efforts in the recent Asian economies.

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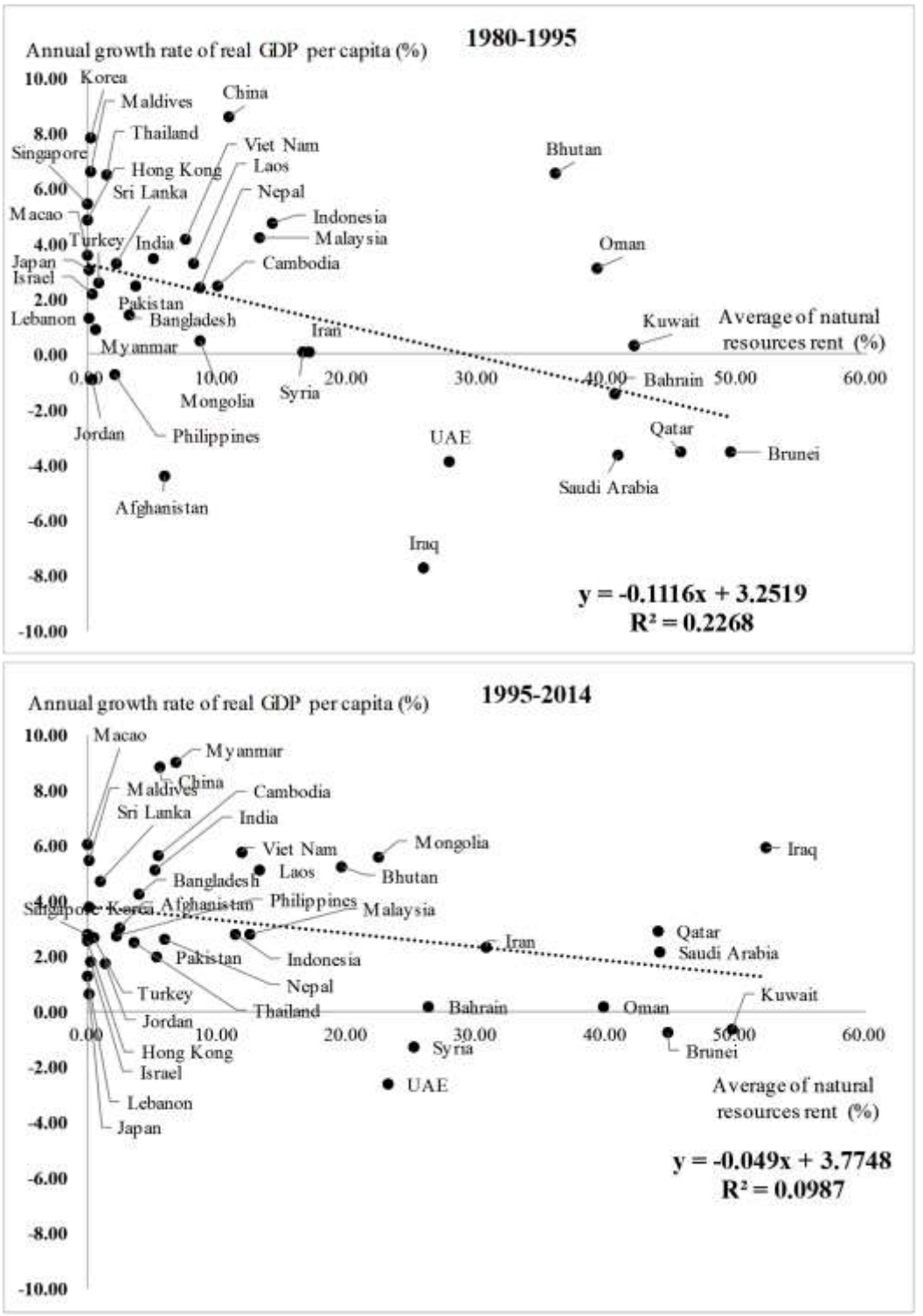

Figure 1: Natural Resources Rents and Growth Rate of Real GDP Per Capita in Asia
Sources: World Development Indicators (World Bank) and UNCTADstat

Table 1: Estimated VAR Model

nrr vs. *mos* : 1980-1995	*nrr*	*mos*
nrr -1	0.855***	-0.058***
	[73.859]	[-5.427]
mos -1	-0.003	0.870***
	[-0.315]	[95.501]
C	-0.415	4.991***
	[-0.434]	[5.605]
ypc	0.204*	-0.067
	[1.702]	[-0.598]
adj. R^2	0.929	0.949

nrr vs. *mos* : 1995-2014	*nrr*	*mos*
nrr -1	0.960***	0.007
	[96.652]	[0.935]
mos -1	-0.014	0.962***
	[-1.429]	[122.582]
C	0.317	1.230*
	[0.342]	[1.702]
ypc	0.078	-0.045
	[0.767]	[-0.574]
adj. R^2	0.935	0.956

nrr vs. *ioc* : 1980-1995	*nrr*	*ioc*
nrr -1	0.870***	-0.006
	[81.558]	[-0.441]
ioc -1	-0.034***	0.914***
	[-3.004]	[57.828]
C	2.152***	3.292***
	[4.717]	[5.267]
adj. R^2	0.929	0.869

nrr vs. *ioc* : 1995-2014	*nrr*	*ioc*
nrr -1	0.968***	0.060***
	[97.668]	[3.692]
ioc -1	-0.011	0.929***
	[-1.4027]	[70.960]
C	0.868**	2.141***
	[2.569]	[3.859]
adj. R^2	0.936	0.889

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively.
Sources: World Development Indicators (World Bank) and UNCTADstat

Table 2: Granger Causality Tests

nrr vs. mos	Lags	Null Hypothesis	Chi-sq
1980-1995	1	*mos* does not Granger Cause *nrr*	0.099
		nrr does not Granger Cause *mos*	29.456***
1995-2014	1	*mos* does not Granger Cause *nrr*	2.044
		nrr does not Granger Cause *mos*	0.875

nrr vs. ioc	Lags	Null Hypothesis	Chi-sq
1980-1995	1	*ioc* does not Granger Cause *nrr*	9.029***
		nrr does not Granger Cause *ioc*	0.195
1995-2014	1	*ioc* does not Granger Cause *nrr*	2.038
		nrr does not Granger Cause *ioc*	13.631***

Note: ***, **, * denote rejection of null hypothesis at the 99%, 95% and 90% level of significance, respectively.
Sources: World Development Indicators (World Bank) and UNCTADstat

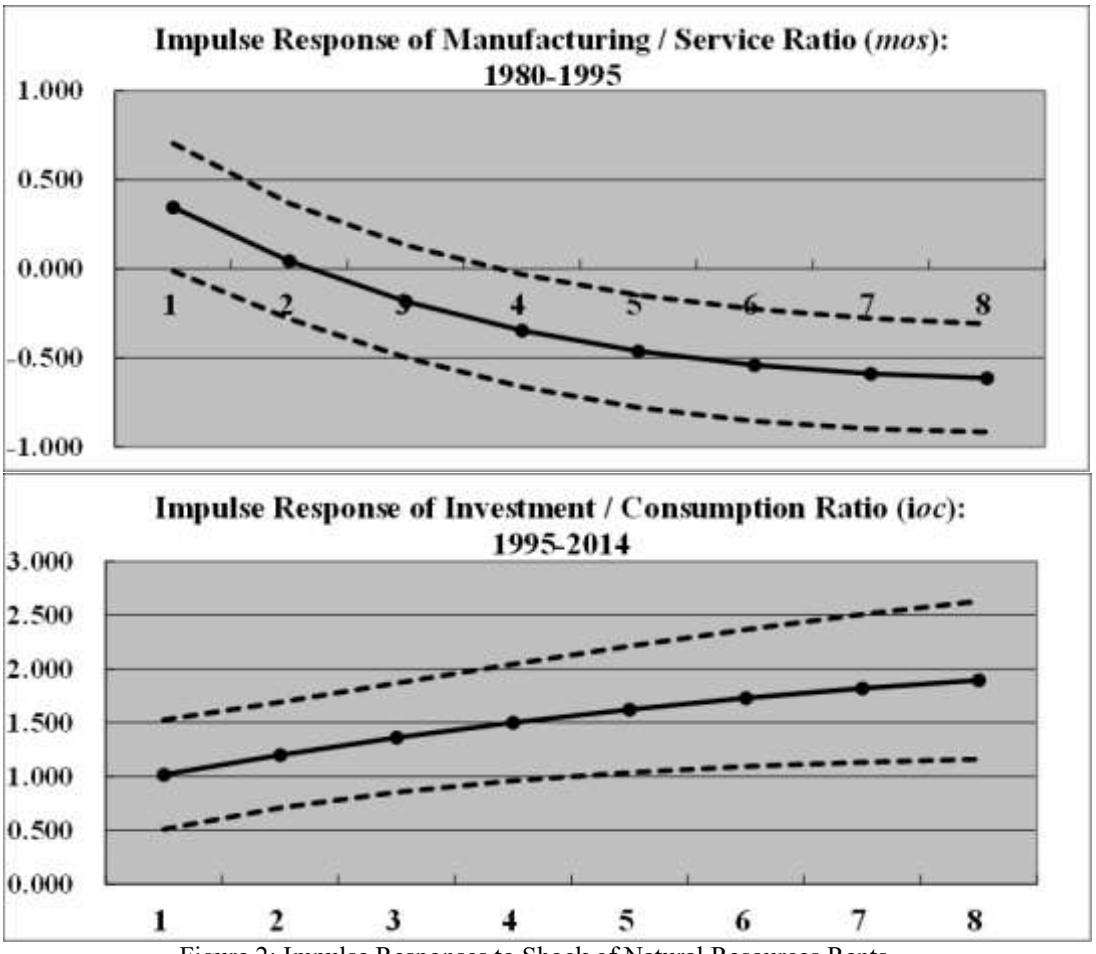

Figure 2: Impulse Responses to Shock of Natural Resources Rents
Note: The dotted lines denote a 95 percent error band over 8-year horizons.
Sources: World Development Indicators (World Bank) and UNCTADstat

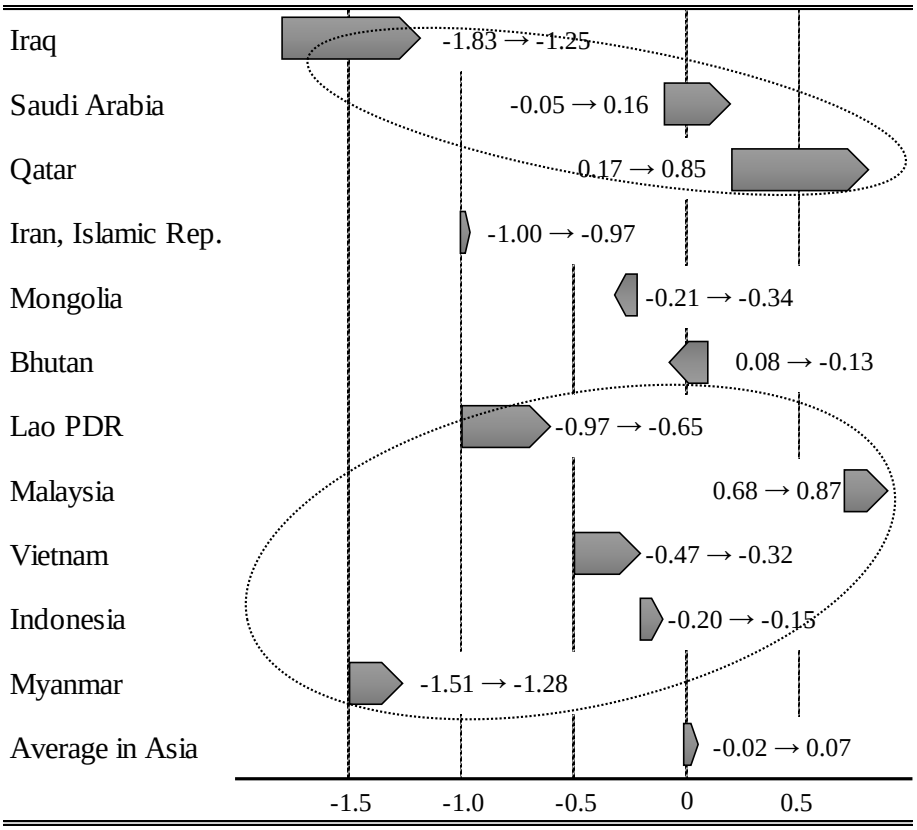

Figure 3: Change in Institutional Quality from 1996 to 2014

Note:
1) The figures on right and left sides are the ones in 1996 and in 2014 respectively.
2) Institutional quality is an average of the indexes for "Government Effectiveness", "Regulatory Quality" and "Rule of Law" in the Worldwide Governance Indicators by the World Bank.
Sources: Worldwide Governance Indicators (World Bank)