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Abstract

This paper aims to diagnose Mongolian economy on whether the economy has suffered from the Dutch Disease by applying a vector auto-regression model for the period from 1993 to 2016 under the current market-based regime including resource-booming times. From the outcomes of a VAR model estimation, it was found that there is a great possibility that Mongolian economy has been suffering from the Dutch Disease through the resource movement effect and the spending effect such that the boom in the mining sector has crowded out manufacturing activities; and that the boom in the mining sector has not contributed to, or even deteriorated the capital accumulation effect that alleviates the Dutch Disease. The strategic policy implications for the current Mongolian public financial management are that the part of the existing resource fund should be used for public investment to facilitate capital accumulation, specifically, for the projects on education, health and economic infrastructure to promote industrial diversification.

Key words: Dutch Disease; Public Financial Management; Mongolian economy; Vector auto-regression; Public investment

JEL Classification: F43, L60, O53

1. Introduction

The Mongolian economic system shifted from a centrally planned economy to a market-based economy in early 1990s, and a great number of political and economic reforms have been undertaken since then. Under the market-based regime, Mongolian economy has achieved 6.0 percent economic growth on the average in terms of real GDP for the period from 1993 to 2016.[1] During the growth process, Mongolia has graded up its economic status from "low income" to "middle income" since 2007, according to the World Bank Analytical Classifications.[2] One of the driving forces of rapid Mongolian economic growth has been said to be her natural resource development in such mining sectors as gold, copper and coal. In fact, as her growth rate has been accelerated, the contribution of mining and utility sectors as a percentage of GDP has expanded from 10-percent level before the early 2000s to more than 20 percent level after that, according to Figure 1. Baunsgaard et al. (2012) in the IMF report defined resource-rich countries as those whose fiscal revenue dependency could be in the range of 20 to 25 percent of total revenue, and whose resource reserve lifetime horizon could be set at 30 to 35 years. In this report, Mongolia was classified into one of resource-rich countries with the following indicators on the average for 2006-2010: the resource fiscal revenue accounted for 29 percent of total revenue and the resource exports did for 81 percent of total exports.

Mongolian economy, as a middle incomer, is expected to sustain economic growth to avoid the "middle income trap" argued by Gill and Kharas (2007). The high dependence on natural resources in Mongolian economy, on the other hand, reminds us of the "resource curse" problem initially proposed by Auty (1993): the economies with rich natural resource wealth tend to grow more slowly than resource-poor economies. The resource curse hypothesis could be explained by a crowding-out logic, according to Sachs and Warner (2001): natural resources crowd-out activity x; activity x drives growth; therefore natural resources harm growth. This crowding-out logic could be applied typically to the "Dutch Disease" hypothesis by arguing that natural resources crowd-out manufacturing activities through real exchange rate appreciation. The Dutch Disease was originally named by *the Economist* magazine on November 26, 1977 by being inspired by repercussions of natural gas discoveries by the Netherlands in the late 1950s. The theoretical framework for the Dutch Disease hypothesis was described by Corden and Neary (1982) as a model of resource reallocation from tradable sector to non-tradable sector caused by positive shocks from natural resource sector.

A critical question then arises on how Mongolia should manage her economy not in resource-curse way but in resource-blessing way to sustain economic growth, in other words, whether Mongolian economy should continue to depend on natural resources as a source of her economic growth or transform her economic structure in a more sustainable way. This paper aims to diagnose Mongolian economy on whether the economy has suffered from the Dutch Disease by applying a vector auto-regression (VAR) model for the period from 1993 to 2016 under the current market-based regime. At the same time, the paper extracts some policy implications for transforming the public financial management from resource-curse form to resource-blessing one.

The structure of this paper is as follows. Section 2 represents literature review and clarifies the contribution of this study; Section 3 clarifies the theoretical framework for the empirical study; Section 4 conducts empirics with a VAR model estimation; Section 5 presents the policy implications for public financing management; and the last section summarizes and concludes.

2. Literature Review and Contribution

This section reviews the literature with a focus on the Dutch Disease hypothesis, and demonstrates this study's contributions. From the theoretical perspective, as we stated in the introduction, Corden and Neary (1982) originally described the mechanism of the Dutch Disease 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 an appreciation of real exchange rate (defined by the relative price of services to traded manufacturing goods), and thus requires further adjustments towards reducing manufacturing employment. 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 manufacturing sector and squeeze a major source of technological progress in the economy with adverse consequences for long-term growth. There is, on the other hand, a counter-argument to emphasize a capital accumulation effect as a factor to offset the Dutch Disease effect within the theoretical framework of the Dutch Disease. 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. The mechanism of the Dutch Disease effect together with the capital accumulation effect will be illustrated in more details in the subsequent section.

From the empirical perspective, the Dutch Disease hypothesis has been intensively examined in a variety of aspects containing the effect of resource booms on a real currency appreciation. Regarding the world-wide evidence, for instance, 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. As more recent macroeconomic studies 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.

As for the Dutch Disease studies with a focus on Asian economies, Taguchi and Ni Lar (2016) examined the joint effects of the Dutch Disease and the capital accumulation, targeting Asian 37 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. There are also several studies of the Dutch Disease effects focusing on individual resource-rich economies in Asia such as Indonesia, Malaysia, Lao PDR and Mongolia. In these studies, some supported the Dutch Disease effects and the other did not. For Indonesia, Usui (1996 and 1997) argued that on the repercussions of the oil bonanza during the late 1970s, 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. For the case of Lao PDR with resource sectors still growing, Kyophilavong and Toyoda (2009) and Kyophilavong et al. (2013) identified a negative impact of capital inflows in resource sectors on Lao macro-economy in the long run, i.e., the Dutch Disease effect through appreciation of real exchange rate. Insisienmay et al. (2015) also found some symptoms of the Dutch Disease through the linkage from natural resource exports to real exchange rate, and proposed policy options such as the investments of resource revenues for infrastructure and education for Lao economy.

Regarding Mongolian economy, the target of this study, very few studies have investigated the Dutch Disease effect due to its rather short history of the mining boom. Khan and Gottschalk (2017), by using a computable general equilibrium model, investigated how the development of major mining projects leads to the Dutch disease in Mongolian economy. They found that the mining sector demand for domestic factor inputs explains two-thirds of the appreciation of the real exchange rate as the most potent channel for transmitting the Dutch disease, and suggested such policies as minimizing the usage of domestic inputs by the mining sector and as channeling mining revenues toward public investment to expand the economy's long-run supply potential.

This paper contributes to the literature reviewed above by enriching the evidence on the applicability of the Ditch Disease hypothesis to Mongolian economy under very limited previous studies on this issue. For an analytical methodology, this study applies a VAR model since the VAR model allows for potential endogeneity between the variables of concerns, and also for tracing out the dynamic responses of variables to exogenous shocks. This study also extracts some policy implications to avoid the Dutch Disease risk i.e., the policy suggestions for transforming the public financial management from resource-curse form to resource-blessing one for the future course of Mongolian economy.

3. Theoretical Framework for Dutch Disease Analysis

This section clarifies the theoretical framework for the Ditch Disease analysis to justify the subsequent empirical study. The framework includes the description of the "resource movement effect" and the "spending effect" as the Ditch Disease effect based on Corden and Neary (1982), and also the "capital accumulation effect" as the effect to alleviate the Dutch Disease effect based on Sachs (2007).

The assumptions underlying the theoretical framework are, for the first place, represented 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 good (services), the price of which moves flexibly to equalize domestic supply and supply. 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. 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.

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_SO_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 axis. 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*.

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 to the energy sector. 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.

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*, 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.

3.4 Intertemporal Effect: Capital Accumulation Effect

The Dutch Disease description above based on Corden and Neary (1982) belongs to the sectoral argument from the short-term perspective. Sachs (2007), on the other hand, added the longer term intertemporal perspective, namely the "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).

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.

4. Empirics

This section turns to the empirical analysis of the Dutch Disease effect in Mongolian economy by using a VAR model. The analysis, based on the theoretical framework presented in the previous section, examines the resource movement effect, the spending effect and the capital accumulation effect from the energy sector shock, comprehensively. This section represents data for key variables, methodology of the estimation and estimation outcomes with their interpretation.

4.1 Data for Key Variables

The model estimation covers the annual sample period from 1993 to 2016. The reason why the study picks up the year of 1993 as the starting sample is that in that year Mongolian economy actually started as a market-based economy under normal conditions after the transition period from a centrally planned economy. Based on the theoretical framework presented in the previous section, the study identifies the following five key variables for a VAR model estimation to examine the resource movement effect, the spending effect and the capital accumulation effect: mining and utility production (*mup*), manufacturing-GDP ratio (*moy*), consumer prices (*cpi*), investment-GDP ratio (*ioy*), and real GDP per capita (*ypc*). The reason why we focus only on these limited number of variables is to maximize the degree of freedom in the estimation within the short-range of annual data.

The first variable of mining and utility production (*mup*) represents the production activity in energy sector in the aforementioned theoretical framework. The data is retrieved from UNCTAD STAT. The 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 (2010) in millions. The mining and utility production is calculated by subtracting “Manufacturing” from “Mining, manufacturing, utilities” in this series.

The second variable of manufacturing-GDP ratio (*moy*) is a key variable to examine the Dutch Disease effect. This variable is expressed as “Manufacturing” as a percentage of GDP in the UNCTAD STAT database. The combination between *mup* and *moy* is used for estimating the “resource movement effect” that brings about “direct de-industrialization”.

The third variable of consumer prices (*cpi*) is a proxy of real exchange rate as a key variable for the Ditch Disease analysis. The usage of consumer prices as a proxy of real exchange rate is justified since the exchange rate in Mongolia has been highly controlled. According to Ilzetzki et al. (2011), the authority of Mongolia has adopted the "De facto crawling band and peg to US dollar" as the currency regime since 1997. In the selection of proxy variables of real exchange rate, Frankel (2010) argued in the context of the Dutch Disease that the real appreciation in the currency takes the form of money inflows and inflation if the country has a fixed exchange rate, whereas taking the form of nominal currency appreciation if the country has a floating exchange rate. The data of consumer prices come from the "Consumer Price Index, All items, 2010=100" in the International Financial Statistics of the International Monetary Fund. For the estimation, the two combinations between *mup* and *cpi* and between *cpi* and *moy* are used for examining the "spending effect" that leads to "indirect de-industrialization": the effect of mining and utility production on consumer prices and the effect of consumer prices on manufacturing-GDP ratio, respectively.

The fourth variable of investment-GDP ratio (*ioy*) is for examining the "capital accumulation effect". The ratio is expressed as "Gross fixed capital formation" as a percentage of GDP, retrieved from UNCTAD STAT in the category of GDP by type of expenditure. The combination between *mup* and *ioy* is used for estimating the effect that alleviates the Dutch Disease effect.

The last variable of real GDP per capita (*ypc*) is included as a control variable in a VAR model estimation, since manufacturing-GDP ratio and investment-GDP ratio might also be affected by development stage of an economy, for instance, according to the Petty-Clark's Law (Clark, 1940). The data for real GDP per capita is retrieved from UNCTAD STAT as the series of "GDP per capita, US Dollars at constant prices (2010)".

Figure 3 simply displays the five key variables above. It appears that manufacturing-GDP ratio has a sluggish movement around at ten percent whereas mining and utility production shows a rapid increasing trend together with the hike of consumer prices, thereby exhibiting the Dutch Disease phenomenon. The dynamic correlations of variables should, however, be put to a statistical test in a more sophisticated way, since the variables are interacting each other. There comes the necessity to conduct a VAR model estimation in the subsequent section.

4.2 Methodology for a VAR Model Estimation

This section clarifies the methodology for a VAR model estimation. The reason why the study adopts a VAR model for the Dutch Disease analysis is that the VAR model allows for potential and highly-likely endogeneity among the aforementioned five key variables, and also for tracing out the dynamic responses of variables to the structural shock of energy sector's production. The endogeneity can be described, for instance, in the interaction between energy sector's production and manufacturing activity: whereas a boom in energy sector may crowd out manufacturing activity as the Dutch Disease effect, the manufacturing activity itself may also affect an economy's dependence on energy sector. In that case, a single-equation regression usually causes an estimation bias. A VAR model, instead, allows for potential endogeneity and lets the data determine the "impulse responses" of variables to the structural shock of energy sector's production. The VAR model estimation thus makes it possible to explore the Dutch Disease effect (the resource movement effect and the spending effect) and the capital accumulation effect from the energy sector shock, comprehensively.

4.2.1 Data Property

Before specifying a VAR model, the study investigates the stationary property of each endogenous 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 unit root test tells us that each variable' data are not stationary in the level, but stationary in the first-difference, a set of variables' data correspond 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, the study adopts the augmented Dickey-Fuller (ADF) test (see Said & Dickey, 1984), and for a co-integration test, the study employs the Johansen test (see Johansen, 1995). The both tests are conducted by including "trend and intercept" in the test equation. The data of all the endogenous variables are converted into natural logarithm form for the estimation to avoid the heteroskedastic in the error terms.

Table 1 reports the result of both unit root and co-integration tests. For the data of all four endogenous variables except real GDP per capita as a control variable, the unit root test identified a unit root in their levels, but rejected it in their first differences at the conventional level of significance, thereby the variables following the case of $I(1)$. The co-integration test was, thus, conducted further on the combination of variables for examining the Dutch Disease effect (the resource movement effect and the spending effect) and the capital accumulation effect, 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.

4.2.2 Model Specification

We now specify a VAR model 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., $y_t = (mup_t\ moy_t)'$ for examining the resource movement effect, $y_t = (mup_t\ cpi_t)'$ and $y_t = (cpi_t\ moy_t)'$ for the spending effect, and $y_t = (mup_t\ ioy_t)'$ for the capital movement effect; μ is a constant vector[3]; V_1 and V_2 is a coefficient matrix; y_{t-1} is a vector of the lagged endogenous variables; z_t is a vector of the control variable of real GDP per capita (*ypc*); and ε_{it} 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 (-3) under the limited number of observations.

Based on the reduced-form VAR model estimation (1), the study examines the impulse responses of variables to exogenous shocks: the response of *moy* to the *mup* shock for examining the resource movement effect, the response of *cpi* to the *mup* shock and of *moy* to the *cpi* shock for the spending effect, and the response of *ioy* to the *mup* shock for the capital accumulation effect. In examining the impulse response under the assumption of the contemporaneous interaction between the pair of variables, the structural shock should be identified by imposing some restrictions in the VAR model specification. In general, to identify structural shocks, there are several approaches to impose the restrictions: short-run restrictions and long-run restrictions. This study, based on the theoretical framework presented in Section 3, employs the Cholesky restriction as one of the short-run restrictions with the following recursive orders: from *mup* to *moy* for the resource movement effect, from *mup* to *cpi* to and from *cpi* to *moy* for the spending effect, and from *mup* to *ioy* for the capital accumulation effect. By imposing the Cholesky restriction, the error term of reduced-form equation (1) could be linked with the structural shock in the model. In the estimated results, the negative response of *moy* to the *mup* shock would imply the existence of the resource movement effect; the positive response of *cpi* to the *mup* shock accompanied with the negative response of *moy* to the *cpi* shock would suggest the existence of the spending effect; and the positive response of *ioy* to the *mup* shock would indicate the existence of the capital accumulation effect.

4.3 Estimation Outcomes and Interpretation

Table 2, Table 3 and Figure 4 respectively report the estimated outcomes of the estimated VAR model and the impulse responses.

Regarding the Dutch Disease effect, manufacturing-GDP ratio (*moy*) responds negatively to the shock of mining and utility production (*mup*) at 95 percent significant level in the 2^{nd} to 4^{th} year after the shock, thereby implying the existence of the resource movement effect. Consumer prices (*cpi*) responds positively to the shock of mining and utility production (*mup*) with one-year lag, and at the same time manufacturing-GDP ratio (*moy*) responds negatively to the shock of consumer prices (*cpi*) with one-year lag, which suggests the existence of the spending effect. As for the capital accumulation effect, there is no positive response, even negative response of investment-GDP ratio (*ioy*) to the shock of mining and utility production (*mup*).

Thus the estimation outcomes here implies that there is a great possibility that Mongolian economy has been suffering from the Dutch Disease through the resource movement effect and the spending effect such that the boom in the mining sector has crowded out manufacturing activities, and that the boom in the mining sector has not contributed to, or even deteriorated the capital accumulation effect that alleviates the Dutch Disease.

The result of the empirical study could also be illustrated by the following actual stories in Mongolian economy.[4] For the period from 2010 to 2013, Mongolian economy entered the booming stage in the mining sector, and accepted a sore of inward foreign direct investment in that sector. Under this situation, a number of workers were shifted to the mining sector (the resource movement effect), and the inflows of foreign currencies fueled inflation to double-digit (the spending effect). At the same time, the Government launched the cash handout to the public from the “Human Development Fund” financed by the mining sector’s revenues, which accelerated the inflation through the consumption expansion (the loss of the capital accumulation effect).

5. Policy Implications for Public Financial Management

The empirical study in the previous section suggested that Mongolian economy, although expected to sustain economic growth as a middle incomer, might fall into the resource curse in terms of the Dutch Disease. To offset the Dutch Disease effect, Sachs (2007) argued that the resource earnings should be used for public investment to facilitate capital accumulation. The issue in this section is how to materialize the Sachs (2007) argument in public financial management in Mongolia, in other words, how the current public financial management in Mongolia should be transformed from resource-curse form to resource-blessing one.

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. Second, fiscal spending would be influenced by short-term political interests and rent-seeking activities, which would lead to the over-spending for wasteful consumptions and low-return investments (and finally reach the Dutch Disease). Hence comes the necessity to insulate fiscal spending from these volatilities and political pressures, 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.

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[5] (e.g., pension funds); and the funds for development to allocate resources to propriety socioeconomic projects (investments). Regarding the funds for stabilization, this section will not discuss it further, since this section concerns mainly the issue on resource allocation. As for the second and third categories, there is a controversy on whether the funds should be saved or invested. This depends on the development stage of a country, and in the case of developing countries including Mongolia, 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 also consistent with the argument of Sachs (2007) with an emphasis on the role of public investment.

Focusing on the funds for investment, then, what kinds of investments should be promoted would be another critical question. 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) to diversify the economy so as to insulate it from specific shocks in the resource-rich sector in the medium and long term.

Turning to the current status of Mongolian public financial management, Mongolia has operated two kinds of resource funds.[6] One is the Fiscal Stabilization Fund, which was established in 2010 as a fund to insulate the budget from volatile resource revenues.

The other is the Future Heritage Fund (FHF), which was just set up in 2017 as a fund for savings to future generations. The FHF replaced the Human Development Fund (2009-2017), which has further replaced the Mongolian Development Fund (2007-2008). As was mentioned before, the previous funds, particularly, the Human Development Fund, had been utilized for the cash handout to the public for the social welfare purpose, which raised consumption demands but not investments, resulting in two-digit inflation.

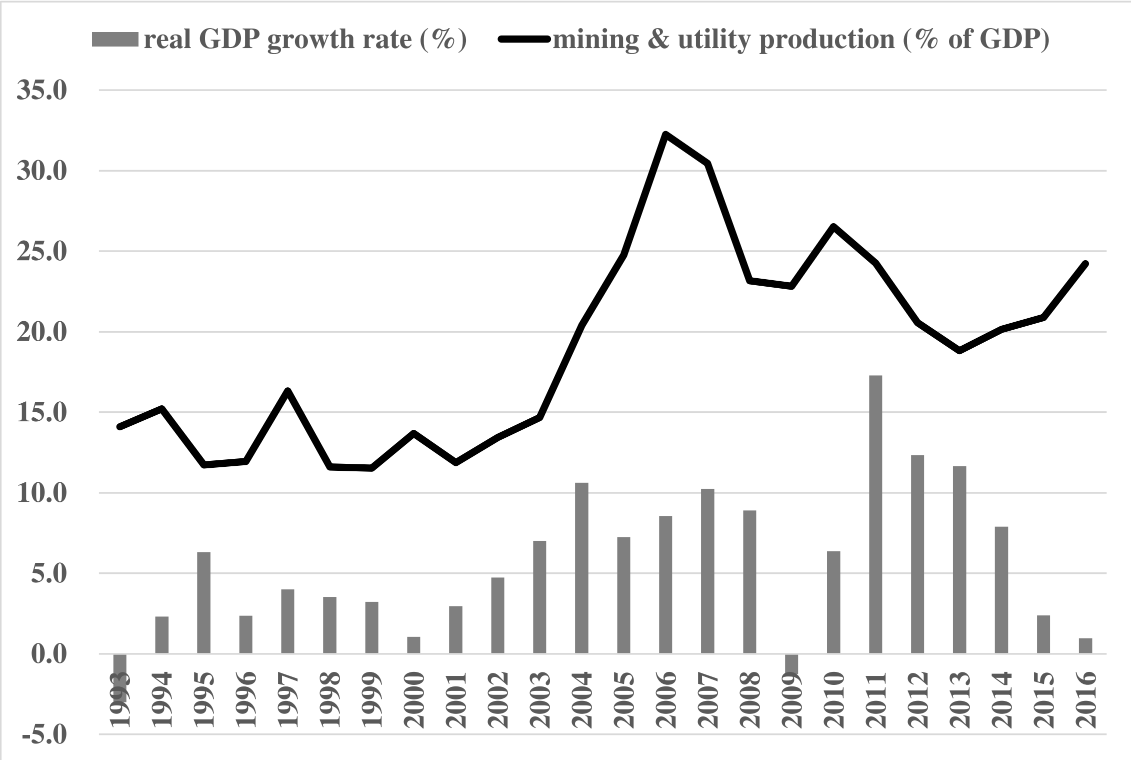
This section finally provides policy suggestions on the current Mongolian public financial management as follows. In managing the FHF, the part of the fund should be used for public investment as Sachs (2007) suggested, and specifically for the projects on education, health and economic infrastructure to facilitate industrial diversification as Coutinho (2011) suggested. In particular, the industrial diversification is the vital requirement for Mongolian economy to sustain its growth by enhancing the resilience against resource sector's volatilities. Table 4 compares industrial structure among Mongolia, Indonesia, Malaysia and the average of developing economies. The mining and utility production as a percentage of GDP in 2016 in Mongolia is 24.2 %, 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 of exports[7] in 2016 in Mongolia is 0.40, whereas those of Indonesia, Malaysia and the average of developing economies are 0.13, 0.17 and 0.09, respectively. These indicators show that Mongolian 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 increased the share of the manufacturing from 12.4% to 21.3%. Indonesia could thus be an example of transforming industrial structure from oil-driven one to manufacturing-oriented one through diversification.

Another suggestion is that the investment allocation for the FHF needs some framework independent from political pressure. Anty (2007) proposed the establishment an independent unit that would evaluate the rate of return of each public investment project. Coutinho (2011) picked up the stories on the roles of the "technocrats" in Indonesia and "Chicago boys" in Chile in the resource revenue allocation and economic management.

6. Concluding Remarks

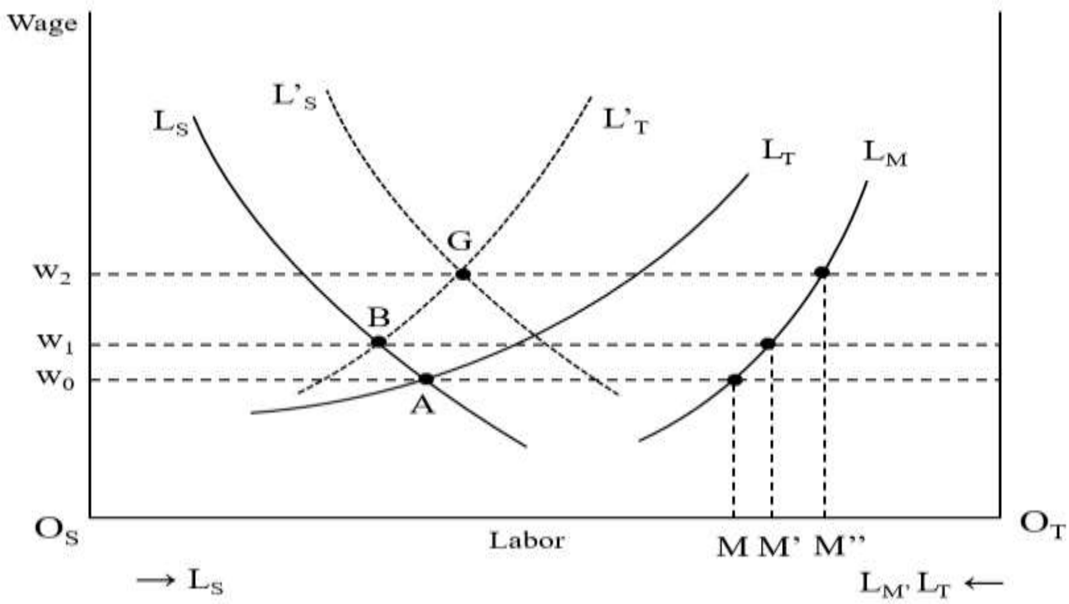
This paper diagnosed Mongolian economy on whether the economy has suffered from the Dutch Disease by applying a VAR model for the period from 1993 to 2016 under the current market-based regime including resource-booming times. The paper also extracted some policy implications for transforming the public financial management from resource-curse form to resource-blessing one. From the outcomes of a VAR model estimation, it was found that there is a great possibility that Mongolian economy has been suffering from the Dutch Disease through the resource movement effect and the spending effect such that the boom in the mining sector has crowded out manufacturing activities; and that the boom in the mining sector has not contributed to, or even deteriorated the capital accumulation effect that alleviates the Dutch Disease. The strategic policy implications for the current Mongolian public financial management are that the part of the existing resource fund should be used for public investment to facilitate capital accumulation, specifically, for the projects on education, health and economic infrastructure to promote industrial diversification. In particular, the industrial diversification is the vital requirement for Mongolian economy to sustain its growth by enhancing the resilience against resource sector's volatilities. Another suggestion is that the investment allocation for the existing resource fund needs some framework independent from political pressure.

Figure 1 Economic Growth Rate and Contribution of Mining & Utility Sectors



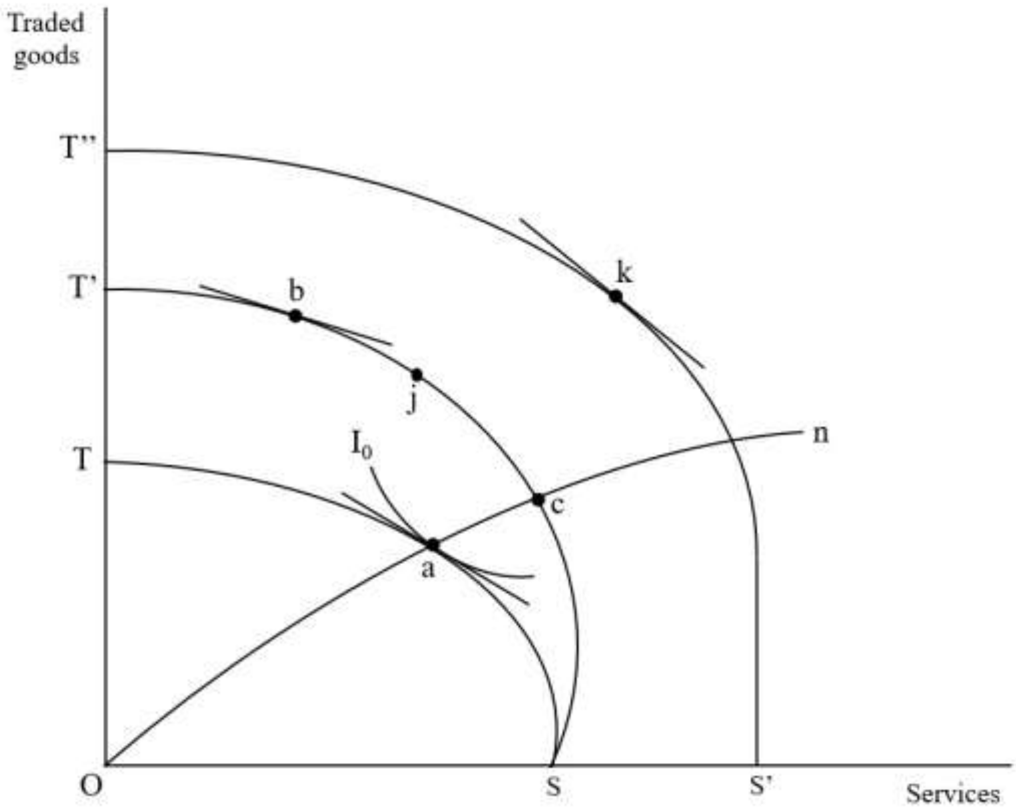
Source: UNCTAD Stat

Figure 2-1 Labor Market



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

Figure 2-2 Commodity Market



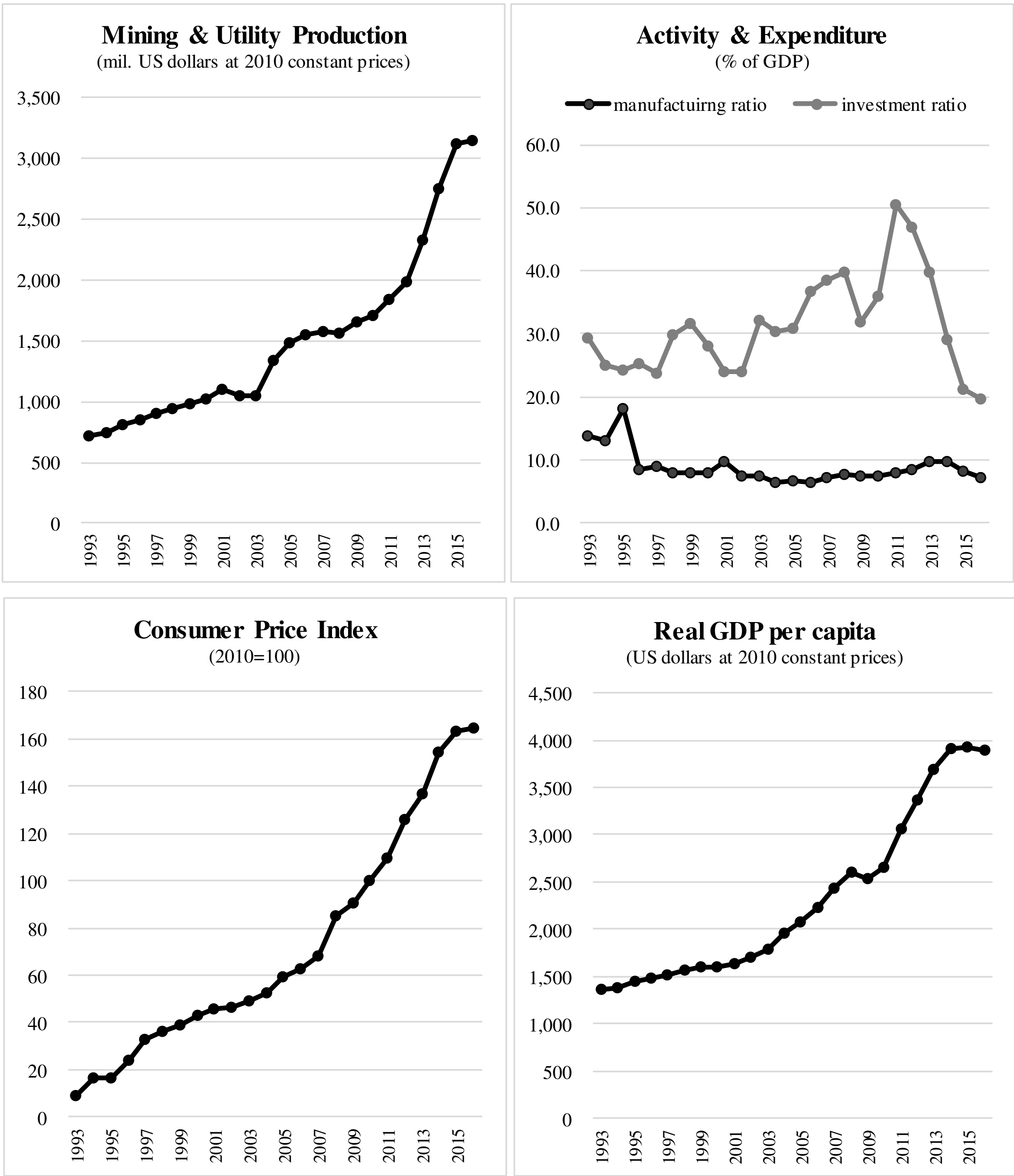
Source: This diagram is based on Corden and Neary (1982) and Sachs (2007).

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

	Unit Root Test (ADF Test)			
	Level		First Difference	
	t-Statistics	Provability	t-Statistics	Provability
mup	-2.494	0.327	-3.856	0.033
cpi	-2.615	0.277	-7.469	0.000
moy	-1.971	0.583	-4.385	0.011
ioy	-1.899	0.620	-3.690	0.045
	Cointegration Test (Johansen Test)			
	Trace		Max-eigen	
	Statistic	Provability	Statistic	Provability
mup & moy	16.626	0.009	12.884	0.025
mup & cpi	18.035	0.005	14.289	0.014
cpi & moy	22.390	0.000	19.918	0.001
mup & ioy	21.382	0.018	18.399	0.032

Source: Author's estimation

Figure 3 Overview of Key Variables



Source: UNCTAD STAT and International Financial Statistics of International Monetary Fund (for Consumer Price Index)

Table 2 Estimated VAR Model

Resource Movement Effect	*mup*	*moy*
mup_{-1}	0.770 ***	-0.846 **
	[5.711]	[-2.231]
moy_{-1}	-0.061	0.491 ***
	[-1.172]	[3.335]
pcy	0.234 *	0.929 **
	[1.782]	[2.455]
adj. R^2	0.979	0.434
Spending Effect: mup & cpi	*mup*	*cpi*
mup_{-1}	0.951 ***	0.469 ***
	[9.450]	[3.126]
cpi_{-1}	0.043	0.647 ***
	[0.792]	[7.902]
C	0.241	-1.841 **
	[0.463]	[-2.365]
adj. R^2	0.977	0.980
Spending Effect: cpi & moy	*cpi*	*moy*
cpi_{-1}	0.851 ***	-0.213 **
	[12.981]	[-2.000]
moy_{-1}	0.0441	0.333
	[0.323]	[1.581]
pcy	0.081	0.293 **
	[1.226]	[2.702]
adj. R^2	0.974	0.411
Capital Accumulation Effect	*mup*	*ioy*
mup_{-1}	0.885 ***	-0.483
	[5.987]	[-1.190]
ioy_{-1}	0.027	0.749 ***
	[0.309]	[3.095]
pcy	0.103	0.560
	[0.627]	[1.235]
adj. R^2	0.978	0.499

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

Table 3 Estimated Impulse Responses

moy Response to *mup* Shock							
1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year
-0.017	-0.060 **	-0.071 **	-0.069 **	-0.065	-0.059	-0.053	-0.048
(0.036)	(0.030)	(0.031)	(0.033)	(0.035)	(0.037)	(0.038)	(0.039)

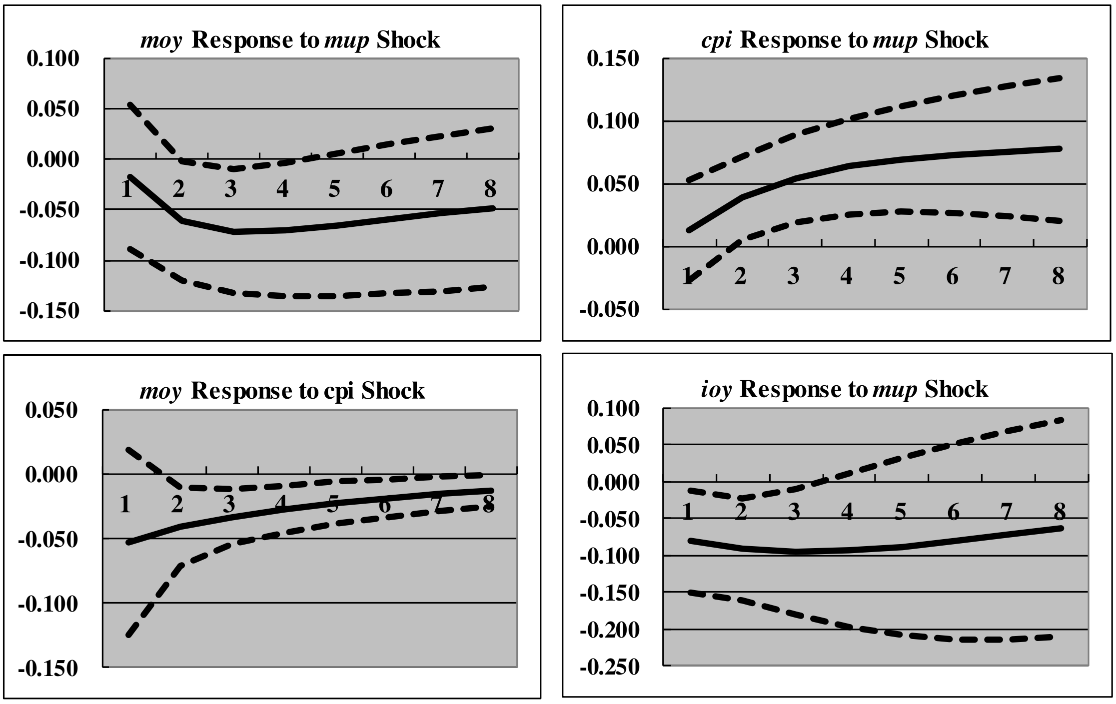
cpi Response to *mup* Shock							
1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year
0.013	0.038 **	0.054 **	0.063 **	0.069 **	0.073 **	0.075 **	0.077 **
(0.020)	(0.017)	(0.017)	(0.019)	(0.021)	(0.024)	(0.026)	(0.029)

moy Response to *cpi* Shock							
1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year
-0.053	-0.040 **	-0.032 **	-0.027 **	-0.022 **	-0.018 **	-0.015 **	-0.012 **
(0.020)	(0.017)	(0.017)	(0.019)	(0.021)	(0.024)	(0.026)	(0.029)

ioy Response to *mup* Shock							
1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year
-0.080 **	-0.091 **	-0.094 **	-0.093	-0.088	-0.081	-0.072	-0.064
(0.034)	(0.035)	(0.043)	(0.052)	(0.060)	(0.066)	(0.071)	(0.074)

Note: ** denotes rejection of null hypothesis at the 95% level of significance. The figures in ( ) are standard errors.

Figure 4 Estimated Impulse Responses



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

Table 4 Comparison of Industrial Structure

Countries	Indicators	2016	1980
Mongolia	Mining & Utility, % of GDP	24.2	11.9
	Manufacturing, % of GDP	7.3	12.0
	Product Concentration Indices (Exports)	0.40	-
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

Notes

1. The data of real GDP is 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. In case that the coefficient of the constant term is insignificant, the term is omitted to maximize the degree of freedom in the estimation.
4. The description of actual stories here is based on the annual reports of the Bank of Mongolia in each year.
5. The idea for the funds for savings is often referred to as the well-known "permanent income hypothesis".
6. The description of this paragraph is based on "PFM Handbook" published by Japan International Cooperation Agency (JICA) in 2016.
7. 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.

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