

# Impact of the Mining Sector on the Economy and Budget Revenue Management

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## **Abstract**

This research looks into Mongolia's budget revenue management in order to study the economic effects of implementing the Fiscal Stability Law. When analyzing the current state of revenue management in Mongolia, the research team used historical data from the Ministry of Finance, the Bank of Mongolia, and other organizations to ensure that the study is comprised of comprehensive information. In order to assess the impact of the FSL, the research team utilized an in-house Computable General Equilibrium Model (CGE).

## **Keywords:**

Mining sector, impact assessment, budget revenue management, CGE modeling, Mongolia

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**Draft Report**

**ULAANBAATAR, 2018**



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## **List of Abbreviations**

BoP	Balance of Payments
CGE	Computable General Equilibrium
EFF	Extended Fund Facility
ETT	Erdenes Tavan Tolgoi
FDI	Foreign Direct Investment
FSF	Fiscal Stability Fund
FSL	Fiscal Stability Law
GoM	Government of Mongolia
IMF	International Monetary Fund
IOT	Input Output Table
MMM	Mongolian Macro-Budget Model
NSO	National Statistics Office
OT	Oyu Tolgoi
PoM	Parliament of Mongolia
SUT	Supply and Use Tables
TT	Tavan Tolgoi

## INTRODUCTION

From 2011 to 2014, the Mongolian economy prospered as economic growth reached over 10 percent and the poverty declined considerably. For instance, the economic growth was over 17 percent in 2011, which was recorded as the second highest ranked growth in the world at the time.

However, due to a rapid decline in foreign direct investment (FDI) into Mongolia and declining commodity price trends in the world market, the economy has experienced difficulties since 2015. In the last few years, the Government of Mongolia (GoM) has implemented economic remedy policies and borrowed a considerable amount from abroad in the form of bonds. Yet, despite the policy reforms, the GoM was unable to prevent and avoid an economic crisis.

The GoM agreed with the International Monetary Fund's (IMF) Extended Fund Facility (EFF) program arrangement in order to break out of the boom-bust cycle caused by price fluctuations in the mining sector and help the economy recover. Besides granting a loan of around 5.5 billion USD in total, the program also assists in implementing policies and structural reforms. Some of these mandatory reforms are to enforce fiscal policy discipline, improve the central bank's independence and governance, strengthen the financial sector, foster economic diversification and inclusive growth, and protect the lower socio-economic classes.

Fiscal policy discipline is especially important for resource rich countries. Governments of nations with an abundance of natural resources need to implement laws and regulations to reduce the swings in the economy caused by price fluctuations on the global commodity markets, which tends to oscillate more frequently than other types of products.

When the Parliament of Mongolia (PoM) approved the 2018 budget, the GoM presented the fiscal framework statements for 2019 and 2020. Economic growth is expected to rebound next year, achieving a growth of 8.1 percent in 2019 (Parliament of Mongolia, 2017). Megaprojects in the mining sector, such as Oyu Tolgoi's underground mine development, Tavan Tolgoi, and the IMF's program will play a central role in reviving economic growth.

In 2010, the PoM adopted the Fiscal Stability Law (FSL), which took effect in 2013. The Fiscal Stability Fund (FSF) was established in 2011. The purpose of a stabilization fund is to prevent economic fluctuations related to changes in mineral commodity prices and encourage sustainable economic growth. Although the law had been imposed for two years, the PoM postponed its implementation in consideration of economic difficulties. As the FSF could not save enough money, there was an increase in public debt. Additionally, the budget has had a continued deficit in the last few years. For instance, by the end of 2016, public debt increased to around 80 percent of GDP and the GoM allocated over 20 percent of budget revenue to interest payments of public debt (Natural Resource Government Institute & Gerege Partners, 2017).

With an adequate budget revenue management in place, the Mongolia economy could avoid economic downturns. Therefore, this research will study whether the imposition of the FSL can reduce economic fluctuations caused by oscillations in the mineral commodity prices.

## LITERATURE REVIEW

There are two researches about fiscal stability based on Mongolian data, both of which utilize the computable general equilibrium (CGE) model and the Mongolian Macro-Budget Model (MMM).

- *Impact of Fiscal Stability Law (2014)* considered two scenarios with and without FSL. The research compared the two results to estimate the impact of FSL. The research simulated an environment where prices fluctuated so the impact of FSL could be observed. The average of the macro variables of both scenarios are similar, and when imposing the law, the variations in these variables are further reduced, which means the law promotes economic stability.
- *Fiscal Sustainability in Mongolia (2017)*: The research was conducted by Gerege Partners LLC and the Natural Research Government Institute (NRGI) and was based on the MMM. The model made an impact assessment until 2030 using an expanded model by the IMF's program utilizing forecasts of mineral commodity prices. The main findings were that the IMF's program does not have any impacts on the economy, which negatively affects fiscal sustainability, when commodity prices are decreased by 15 percent. However, even if commodity prices remain stable or increase, if the GoM increase their expenses outside of the budget or even overestimate the budget revenue by utilizing commodity price forecasts above the consensus, fiscal sustainability will be negatively affected.

In addition, when studying the economic impact of megaprojects, CGE models are widely used in countries with natural resource. Such as the following:

- *Impact Assessment of Erdenes Tavan Tolgoi (2014)*: Erdenes Tavan Tolgoi (ETT) is a significant project covering five of six sub areas in Tavan Tolgoi. The project has the potential to make up around 18 percent of total exports in the future, ranking second after the Oyu Tolgoi project. This research assessed the impacts of the ETT project on the economy until 2030. Within the ETT project, the GoM plans to build a 450 megawatts power station and a 267-km railway as part of the concession contract. These infrastructure projects would increase ETT's annual productions to 25 million tons in 2019, expanding the economy by 15 percent.
- *Impact Assessment of the Iron Ore sector (2014)*: This research estimated the impact of the planned projects in the iron ore sector on the economy between 2014 and 2030. The iron ore sector made up 15 percent of total exports and 2 percent of budget revenue in 2013. It is estimated that the direct and indirect impact on the economy from the iron ore sector projects will reach 31.3 trillion MNT by 2030. However, the iron ore sector as a share of GDP would just reach 5 percent, its peak point, under the estimation period. This is due to the fact that the sector is smaller and has higher production cost compared to other mining sectors.

Taking into consideration previous research studies done on the subject and the methodologies used, in this report, the research team will study the impacts of budget revenue management using a CGE model. The model will be explained in detail in the following section.

## METHODOLY

While mineral resources present countless development opportunities, they also impose challenges for Mongolia. The economy has undergone substantial structural changes due to the mineral resources boom and will continue to face more changes in upcoming years as other major mining projects are implemented. An in-depth analysis of such changes in the Mongolian economy require economic modelling tools capable of investigating the underlying factors of the changes, evaluating policy alternatives such as FSL to counteract negative effects, and producing forecasts of the likely path that the Mongolian economy will take in the future. Computable General Equilibrium (CGE) modelling is an extensively used and accepted tool for estimating the impacts of changes in economic conditions. CGE models belong to the economy-wide class of models that provide industry disaggregation in a quantitative description of the whole economy (Dixon & Rimmer, 2010). CGE models are based on a comprehensive economy-wide database and can serve as a laboratory for policy analysis. The CGE framework helps capture interrelationships between economic sectors and accounts for the repercussion effects of policy (Dixon & Rimmer, 2002). Even if only one sector is directly involved, there will be indirect effects on other sectors, making economy-wide modelling a necessary tool to analyze these effects. For these reasons, CGE analysis has become a mainstream contributor to policy dialogues (Anderson, Martin, & Mensbrugghe, 2012).

### Model

The ERI CGE model is an in-house model currently being further developed to analyze the impact of the FSL in the framework of the Budget Revenue Management project. The ERI CGE model embodies characteristics of the Mongolian economy via calibrations to 2012 and 2015 Mongolian input-output data. It identifies 32 industries and 32 commodities in its 2015 database. Three primary factors are identified (labor, capital and land). Labor is further distinguished by 9 occupational types as in the International Standard Classification of Occupations 2008 (ISCO-08), one digit major groups (International Labour Office, 2012). The model has a representative aggregate household and could be extended to multiple household types. Optimizing behavior governs decision-making by industries and households. Each industry minimizes its costs subject to given input prices and a constant-returns-to-scale (CRS) output function. Household demands are modelled via a representative utility-maximizing household within a linear expenditure system (LES). Units of new industry-specific capital are cost minimizing combinations of Mongolian and imported commodities. Imperfect substitutability between imported and domestic varieties of each commodity is modelled using the Armington constant elasticity of substitution (CES) assumption. The demand for any given Mongolian export commodity is inversely related to its foreign-currency price.

The model recognizes consumption of commodities by the government, and a variety of direct and indirect taxation instruments. It is assumed that all sectors are competitive and all markets clear. Purchasers' prices differ from producer prices by the unit value of indirect taxes and trade and transport margins. Furthermore, the ERI CGE has a top-down regional module

which allows for result reports of its applications at both the national level and at the provincial level. The ERI CGE model can be represented as a system of  $m$  equations in  $n$  variables as:

$$F(X, Y) = 0$$

where  $F$  is a vector of  $m$  functions,  $X$  is the vector of  $n-m$  variables chosen to be exogenous and  $Y$  is the vector of  $m$  variables chosen to be endogenous.

The ERI CGE model is a national model with annual periodicity. The matrix  $(X, Y)$  includes flow variables for year  $t$  at the national level representing quantities and values of demands and supplies. The vector also contains stock and level variables at an instance of time, i.e., at the end of year  $t$ . For example, these variables can be capital stocks and the value of exchange rates at the end of year 2017.  $(X, Y)$ , in addition, contains lagged variables such as the lagged consumer price index for year 2018 which is the consumer price index for year 2017. The  $m$  equations include links between flow variables in year  $t$  provided by market clearing conditions, zero pure-profit conditions, and demand and supply equations derived from optimizing decisions. The model incorporates four types of inter-temporal linkages: physical capital accumulation and rate-of-return-sensitive investment; foreign debt accumulation and the balance of payments; public debt accumulation and the public sector deficit; and dynamic adjustment of wage rates in response to gaps between the demand for and supply of labor.

## Data

The database for the model consists of three main parts:

- (a) Core data from the base year (2015), which provide the initial solutions to our model;
- (b) Behavioral parameters, elasticities and miscellaneous indexing coefficients; and
- (c) Ancillary base year data including industry capital stocks and interest rates, government budget accounts, balance of payments and the net foreign liability (accumulated debt) positions of the private and public sectors.

In the framework of the project, ERI obtained the 2015 supply and use table (SUT) prepared by the National Statistics Office (NSO) to be consistent with the model's database. In recent years, as the mining sector has significantly been expanding, the five main commodities are divided into sub sectors which are treated as individual sectors. The division of the mining sector into independent ones will allow for a more accurate estimate of the impacts of the megaprojects planned. Even though input output data provide the core data for CGE models, there are many other types of data and information concerning every aspect of the economy such as the government budget, balance of payment, public borrowings, and debt.

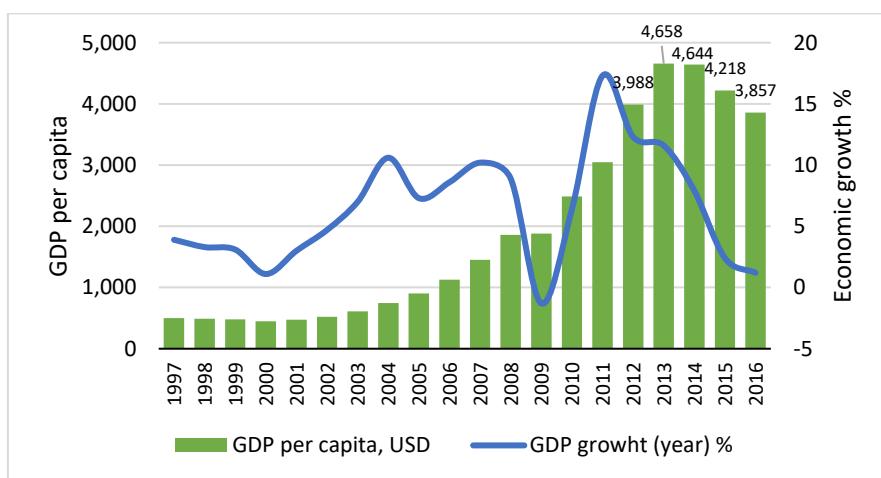
In the following section, we will explain the dynamics of economic indicators and the main factors and explanations emerging from the historical data in following section.

## DYNAMICS OF THE MONGOLIAN ECONOMY

### Background

Mongolia has been one of the fastest growing economies over the past decade. Figure 1 shows the changes in GDP per capita and economic growth. Real GDP growth averaged 8.5 percent over the period before 2009, and GDP per capita more than quadrupled. Mongolia moved from low-income status to lower middle-income in 2012 and to upper middle-income in 2015 (World Bank, 2015). However, in recent years, the growth declined dramatically, reaching 1.2 percent in 2016.

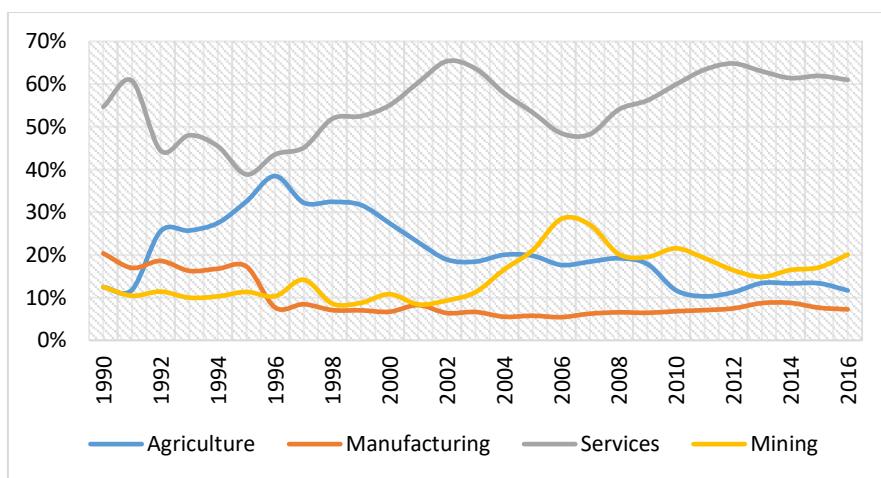
**Figure 1. GDP per capita (USD, current price) and real GDP growth (%)**



Source: National Statistical Office (NSO) and World Bank's database

Over the past two decades, as shown in Figure 2, the structure of the Mongolian economy has changed and shifted from sectors prominent in the socialist period towards services sectors with a growth in the importance of the mining industry. Geographically, economic activity has also shifted towards the resource-rich province of Umnugobi where the the Tavan Tolgoi and Oyu Tolgoi mines are located.

**Figure 2. Sectoral shares of GDP (%)**



Source: NSO

Changes in the structure of the economy have been driven by a range of factors, including rising demand for services, rapid economic growth in China, economic policy, and technological advancement.

Agriculture has a significant but declining importance in the Mongolian economy. The GDP share of agriculture has been decreasing since its peak of 38.5 percent in 1996 to just about 15 percent in 2014. The sudden drops in the GDP share of agriculture in Figure 2 around 2001-2002 and 2009-2010 indicate the impacts of 'dzud' disasters that occurred in those years. Dzuds occur when the harsh winter conditions (in particular, heavy snow cover) prevent livestock from accessing pasture or from receiving adequate hay and fodder.

From Table 1, we can observe that agriculture accounted for 46 percent, on average, of total persons employed annually between 1991 and 2004. It is the second largest employer after the services sector and one-third of the total workforce has been employed in agriculture, on average, in recent years. These trends have been relatively stable until 2016.

The share of output of manufacturing in the overall economy declined until 2013 before recovering in recent years. Over the last two decades, the mining industry's share of nominal output has fluctuated considerably that the average output share of the mining industry doubled from its average in 1991-2004 to its average in 2005-2012 as well as to its average in 2013-2016.

**Table 1. Sectoral shares in Output and Employment (total percent=100)**

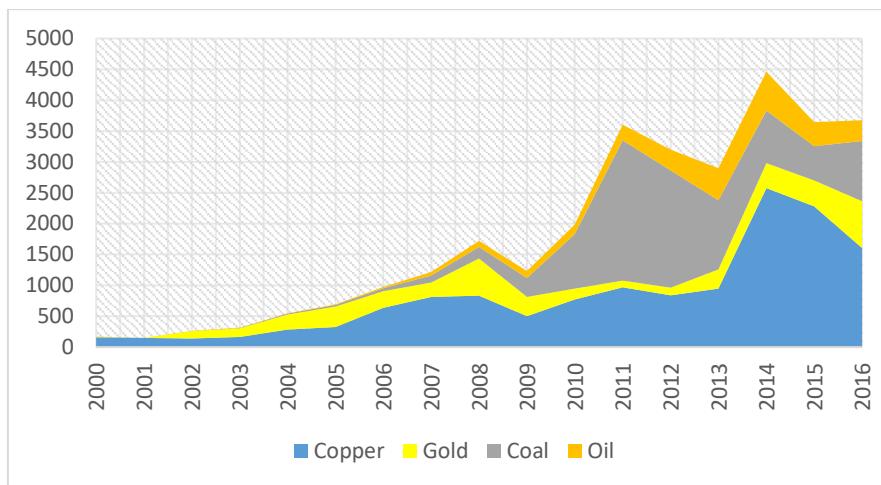
	Agriculture	Mining	Manufacturing	Services
<b>Output</b>				
1991-1997	28%	11%	15%	47%
1998-2004	25%	11%	7%	58%
2005-2012	16%	22%	6%	56%
2013-2016	11%	20%	12%	58%
<b>Employment</b>				
1991-1997	46%	2%	9%	43%
1998-2004	46%	3%	6%	45%
2005-2012	36%	4%	5%	54%
2013-2016	29%	4%	7%	60%

Source: NSO and World Bank's database

Service industries are generally more labor intensive (and less capital intensive) than manufacturing and agriculture in Mongolia, with the services sector employing around 60 percent of the workforce on average from 2013-2016.

As shown in Figure 3, the export income of the Mongolian mining sector increased sharply in recent years, owing to higher international prices and the partial utilization of OT and TT.

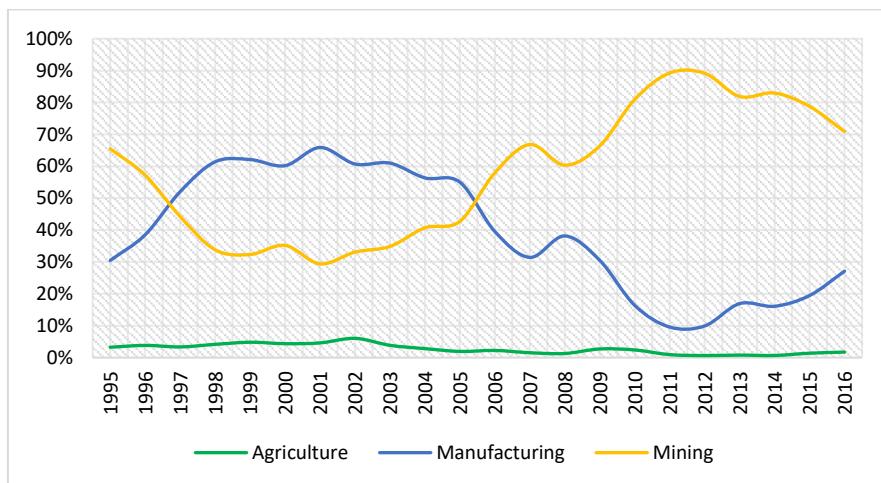
**Figure 3. Value of Mineral Exports (USD Million)**



Source: NSO and Mongolian Customs General Administration

The mining share of total exports has risen substantially since the early 2000s. In particular, the share has increased markedly from 2005, reaching to almost 90 percent in 2011 and 2012. On the contrary, the manufacturing share of total exports has fallen dramatically since 2005 as shown in Figure 4. Export composition

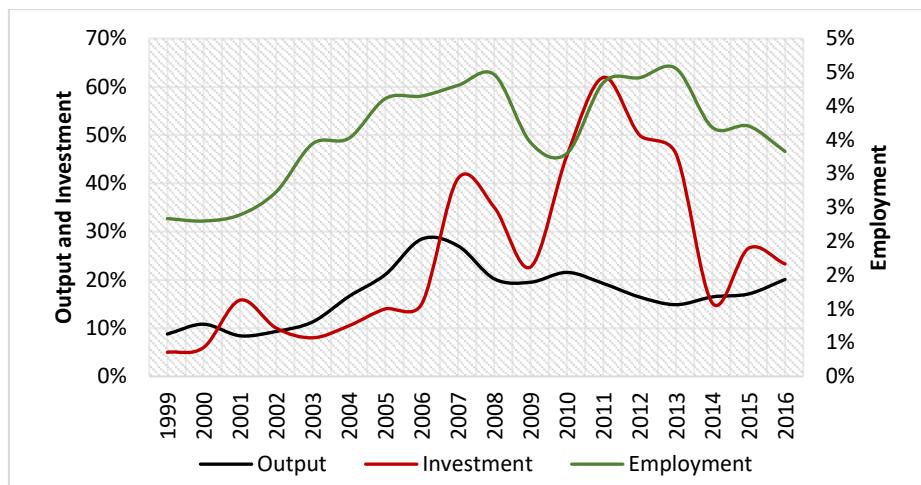
**Figure 4. Export composition**



Source: NSO and Mongolian Customs General Administration

Figure 5 compares the movements in the shares of output, investment, and employment in the mining sector during the recent mining boom. Investment in the mining sector has also risen from 5 percent of total investment in the early 2000s to 60 percent at its height in 2011. Since 2012, the investment share of the mining industry has fallen substantially due to the global economic environment and the government's harsh policies towards foreign investment (Batdelger, 2014).

**Figure 5. Mining activity**



Source: NSO and Mongolian Customs General Administration

The mining boom directly impacted the remarkable economic growth in the past decade. It fundamentally affected Mongolia's economic structure, social welfare, and environment. At the peak of the mining boom, the resources industry became so pervasive that the nickname 'Minegolia' was given to Mongolia (Langfitt, 2012).

### Impact of Mining sector on the economy in 2015

In this section, we will discuss how the main exported commodities impacted the economy in a particular period (2015) by distinguishing the macroeconomic impact and sectoral impact based on the data from the Input Output table (IOT) 2015. In order to assess these impacts, we distinguished between the main exporting commodities, treating each of the five commodities as a distinct mining subsector.

These subsectors made up 72 percent of total exports, 17 percent of GDP and 18 percent of domestic production in that year (IOT 2015). The copper ore sector, in particular, contributed significantly to GDP with 13.3 percent, while the shares of the other subsectors including coal, crude oil, iron ore and gold were relatively lower at roughly 4 percent.

The copper ore sector produced 13.5 percent of total production and around 4 percent of total production was derived from the other four subsectors. The coal, crude oil, iron ore and copper ore sectors export over 80 percent of their productions. As a result, the mining sector became a major source of Mongolian export revenue. Due to an increase in Oyu Tolgoi's production, the copper ore sector generated more than half of total exports followed by coal and crude oil with roughly 8 and 7 percent, respectively.

**Table 2. Export shares in productions by the mineral commodities**

	Export share in production	Share in total export
<b>Iron ore</b>	99.7%	3.2%
<b>Copper ore</b>	95.0%	53.0%
<b>Crude oil</b>	88.4%	7.4%
<b>Coal</b>	84.2%	8.1%

<b>Gold</b>	43.3%	0.2%
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Source: ERI's estimation

In addition, we analyzed the impact of the commodity sectors on the labor market and on tax revenue. In general, the overall Mongolian mining sector is highly capital intensive which means that the sector utilizes a relatively higher amount of fixed assets and lower amount of labor force in terms of production. Of the commodity sectors, the coal and gold sectors are considerably more labor intensive in comparison at over 30 percent, while the sectors overall are more capital intensive as shown in the table below.

**Table 3. Labor and capital shares in productions by the mineral commodities**

	<b>Capital</b>	<b>Labor</b>
<b>Crude oil</b>	96.7	3.3
<b>Iron ore</b>	93.2	6.8
<b>Copper ore</b>	81.6	18.4
<b>Coal</b>	67.4	32.6
<b>Gold</b>	58.8	41.2

Source: ERI's estimation

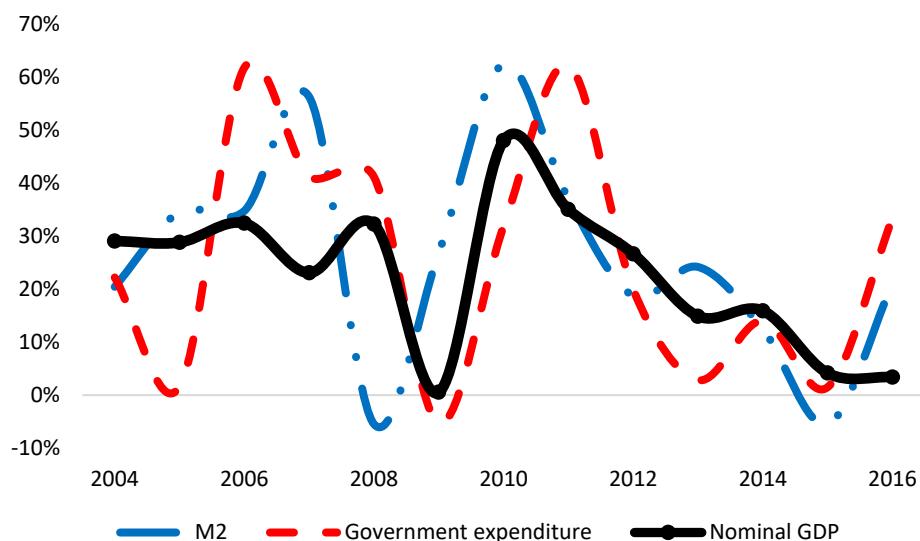
In terms of tax on commodity production, we can see the production net tax from the IO table. Despite the copper ore subsector contributing the most to GDP and exports in 2015, the coal subsector paid the most net production taxes at 60.8 percent with the copper ore sector paying the second highest percentage of taxes at 15.6 percent.

## BUDGET REVENUE MANAGEMENT AND MODELING

### Current state

In recent years, the Mongolian economy faced several booms and busts. While monetary and fiscal policies generally reduce economic fluctuations, in Mongolia, the oscillations are of a greater magnitude as observed in the following figure.

**Figure 6. GDP, budget expenditure and M2, nominal changes %**



Source: NSO

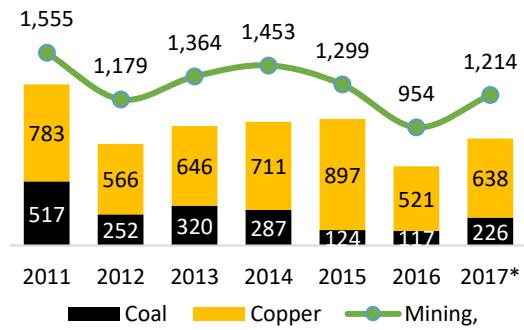
Monetary and fiscal policies encourage diversification in the Mongolian economy; however, it should also be noted that the economic structure plays a significant role in determining economic fluctuations. As the Mongolian economy is heavily dependent on the mining sector, considerable declines in mineral commodity prices in recent years, have led to economic difficulties such as revenue shortfalls, increasing budget deficit, and more public debt.

The direct impact of the mining sector on the budget fell from 35 percent in 2011. This is due to the fact that while the volume of mining sector contribution to budget has not decreased, total budget revenue has increased at a faster rate. In absolute terms, the contribution of the mining sector is estimated at around 1 trillion MNT per year. According to the budget plan for 2017 approved by the PoM, the direct impact of mining on budget is expected to be 17 percent, a 3 percent increase in comparison to the previous year. The bulk of the revenue generated by the mining sector consists of coal and copper concentrate sales.

**Figure 7. Budget revenue, by sectors**

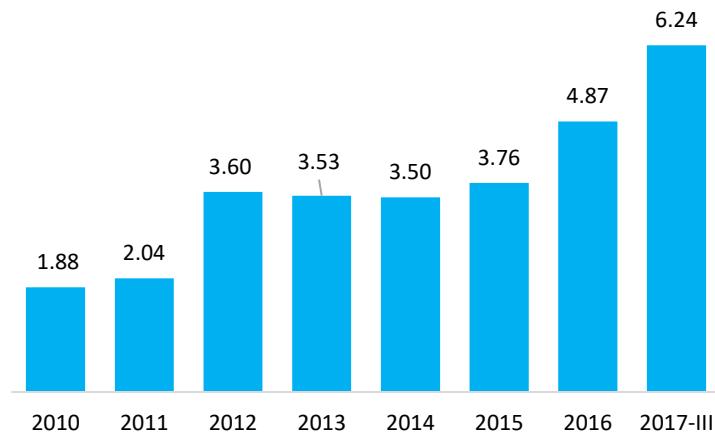


**Figure 8. Budget revenue of mining sector, by commodities, million MNT**



Economic growth was 17.5 percent in 2011, and has been consistently decreasing since then. For instance, economic growth was 2.5 and 1.0 percent in 2015 and 2016, respectively. Declining growth during this period has mainly been caused by significant declines in mineral commodity prices in the world market. For instance, in 2012, when the declines started, budget revenue shortfall reached 0.8 trillion MNT due to price decreases. Equilibrated budget deficits were 1.2 and 3.7 trillion MNT in 2015 and 2016, respectively. As a result, public debt grew by 22.8 percent (from 3.76 to 4.87 billion USD).

**Figure 9. Public debt, billion USD**

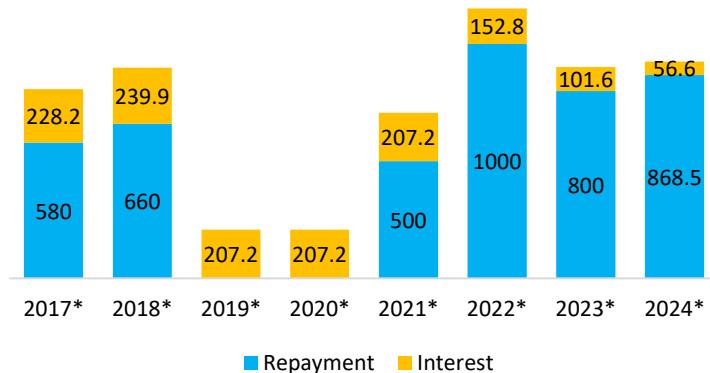


Source: Mongolbank

In 2018, the GoM needs an estimated 800 million USD to pay the repayments and interest payments of bonds such as the Chinggis and Dim Sum bonds. As a result, the financial account of the balance of payments (BoP) and government budget are expected to experience foreign debt pressures. In order to reduce the pressures on the BoP and government budget, the GoM issued the “Gerege” bond<sup>1</sup> in October 2017 to completely pay off the two bonds.

**Figure 10. The schedule of bond repayments, million USD**

<sup>1</sup> It is of 800 million USD and has an interest rate of 5.625 percent annually.



Source: The fiscal framework statements of 2019 and 2020

The GoM's future bond payments are shown in the figure above. In 2019 and 2020, the GoM will not have any bond repayments scheduled but there still remains interest payments of public foreign debt left to be paid that amount to around 200 million USD each year. In 2021, 500 million USD of the Mazaalai bond issued in 2016, are planned to be paid. Following this, the GoM will need to allocate over 800 million USD from the budget revenue each year for bond repayments until 2024.

### Modeling the FSL

In addition to price declines, another contributing factor to the budget deficit, public debt, and revenue shortfall is fiscal discipline. The PoM approved the FSL in order to improve fiscal discipline and to provide fiscal stability; however, the law was only implemented in 2013 and postponed in 2014(table A1 in Appendix). According to the law, the government budget has to follow the subsequent requirements:

- 6.1.1.** Total budget revenue must be calculated with using an equilibrated method<sup>2</sup>;
- 6.1.2.** The budget deficit derived from the equilibrated method must not exceed 2 percent of GDP in the same year or must become surplus;
- 6.1.3.** The growth rate of total expenditure must not exceed the maximum of the growth rate of non-mining GDP in the same year and the average growth rate of non-mining GDP in the previous 12 years;
- 6.1.4.** The present value of government debt must not exceed 60 percent of GDP of the budget year.

The FSL aims to reduce the negative impacts of the mining sector and established the FSF. Any budget surplus from when mineral commodity prices are higher than the equilibrated prices are deposited into the fund. The savings accumulated in the fund are then spent to stabilize the economy when prices are lower than the equilibrated price.

<sup>2</sup> The Government must first calculate the average price of last 20 years for each main mining product as well as the average price of subsequent 3 years (including current year) predicted by the government approved international agency. The equilibrated price is the average of these two average prices.

The FSF is generated from the following sources:

- Additional surcharge revenue generated from major commodities priced above the equilibrated price in budget plan,
- Net profit of equilibrated balance,
- Government Reserve Fund's unspent leftover,
- Risk Fund's unspent leftover,
- Net income of the FSF activity,
- Other income allocated by the Parliament to the FSF.

Funds from the FSF may be transferred to the state budget:

- If the budget deficit is 4 percent higher than GDP,
- In case of a budget revenue disruption due to a decrease in major mineral commodity prices,
- In case of a budget revenue disruption due to a 20 percent or more decrease in the volume of major mineral commodities,
- In case of recession, natural disaster or national emergency,
- If the fund fails to address the second case, the government may borrow. This shall be within the scope of article 6.1.4 of this Law (it will be implemented from 2024).

We utilized the budget neutrality idea in modelling the FSL in Mongolia. Budget neutrality reflects the idea that increases in any category of public expenditure and cuts in any types of tax is offset by either decreases in other categories of public expenditure (i.e., public sector investment) or increases in other types of taxes. We proposed the semi-neutralization method where we set the upper restricts in the budget deficit and public-sector debt as mandated by the law. We call this the “budget stabilization mechanism”. When simulation results are above the limits, certain variables are neutralized at the fixed levels, triggering “stabilization instruments” to come into effect. The variables being semi-neutralized in the model are public sector deficit, public sector debt, real national savings, and real national wealth. The instruments available to utilize in order to achieve budget stabilization are public investment expenditure, the rates of direct taxes on labor, capital and natural resources, rates of indirect taxes on trade, production and sales, rates of various social security payments, and public consumption of commodities.

The ERI CGE model is capable of generating forecasts of public sector outlays, revenue and deficit/surplus with the inclusion of detailed public-sector accounts. One of the main functions of the public-sector account is that it is a tool for policy simulations. Policy simulations, in general, require measurements of tax collections and government expenditures so that the user of the model can implement assumptions such as the aforementioned budget stabilization mechanism.

The public-sector deficit is defined as the difference between total outlays and total revenue. Outlays include public consumption, public investment, transfer payments, and other capital expenditure. Transfers consist of benefits to households, grants, and net interest payments on the public debt. Revenue is comprised of indirect taxes collected on sales to households,

intermediate use, investment, exports, public expenditure, production and imports, direct taxes collected on labor, capital and land, and other revenue, which includes income from public sector enterprises and/or privatization.

There are no commonly used theoretical models for grants, other capital expenditure, and other revenue components of the public-sector account. Therefore, their movements have been linked to that of GDP. For benefits and direct taxes, we use specific driving factors such as the changes in overall wage rates, total population, wage income, capital income, and land income. Public investment is not for seeking profit and there exists two rules of action for public investment: follow industry investment as a fixed share or differ from an industry investment. These are achieved by turning on and off the rules by endogenizing and exogenizing shifter variables.

Public sector debt contains accrued loans borrowed by the government from foreigners and domestic residents. Public sector debt at the end of year  $t$  in foreign currency  $FDATTGF\_F_t^{end}$  is defined as:

$$FDATTGF\_F_t^{end} = FDATTG\_F_t^{start} + PHI_t[-SAVINGS\_G_t + INVEST\_G_t - GOVASSETSALE_t - DDEBTISSUE_t]$$

where  $FDATTGF\_F_t^{end}$  and  $FDATTG\_F_t^{start}$  are public sector debt at the end and start of year  $t$ ;  $SAVINGS\_G_t$  and  $INVEST\_G_t$  are government savings and investment respectively;  $GOVASSETSALE_t$  is the privatization revenue or revenue generated from selling government assets;  $DDEBTISSUE_t$  is the government debt issue; and  $PHI_t$  is the level of real effective exchange rate.

## SIMULATIONS

The aim of running the simulations is to assess the FSL's impact/effect against the negative effects of the mining boom. Volatility in developing countries arises from external shocks, as in the case of Mongolia. Unfortunately, the fiscal policies of Mongolia had been pro-cyclical, expansionary rather than countercyclical during the recent mining boom. This type of economic policy often exacerbates volatility and creates larger cycles of fluctuations. As a result, in turn, economies become more exposed to external factors. In addition, government revenue in a mineral commodity reliant economy unavoidably fluctuates due to frequent volatility in commodity prices. As a result, budgeting and planning become more problematic and require frequent adjustments that may negatively impact private investment. In our proposed simulations, we carry out two simulations: one without the FSL and with the FSL in effect. However, the nature of these types of simulations are complex as they involve both base and policy forecasting in alternative scenarios.

The following two scenarios will be estimated and compared:

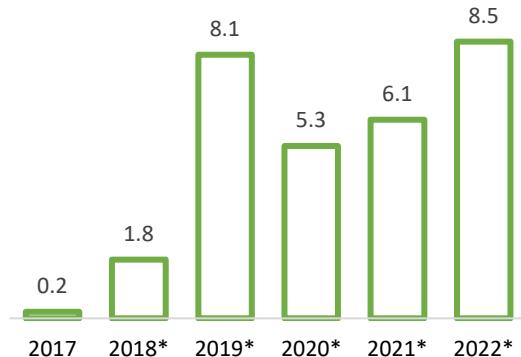
### Base scenario

In the base scenario, the implementation of the FSL is not included. This means that the base scenario will show how the Mongolian economy will be developed in the future within a scope of forecasted or exogenous factors. The Oyu Tolgoi and Erdenes Tavan Tolgoi projects will commence and operate according to the plans outlined;

- Population and the number of households will be consistent with NSO's forecast made in 2010;
- The real GDP growth will follow the IMF's forecast, which considered the repayments of public bonds;
- Main mineral commodity production levels will be consistent with the Medium Term Fiscal Framework Statement;
- Mineral commodity prices in the future will follow the IMF forecasts;
- The budget revenue will be adjusted by growth in tax revenue, calculated using the equilibrated method;
- Budget expenditure will follow the GNP (pro-cyclical);

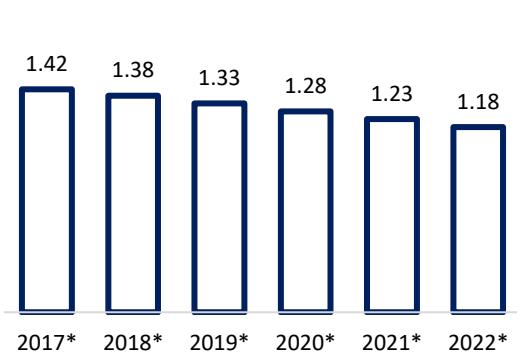
Using these exogenous variables, the research team will forecast the economy till 2025. For example, the following figures reveal how the Mongolian economy and population will develop in the future based on the assumptions.

**Figure 11. Economic growth, YoY %**



Source: IMF

**Figure 12. Population growth, YoY %**



Source: NSO

The production of mining sector is shown in the following table, based on forecasts made by the Ministry of Mining and Heavy Industry. The mining sector will produce 36.2 and 38.8 million tons of coal in 2018 and 2019, respectively. In 2020, coal production is expected to reach over 40 million tons, and be constant after. Another main exporting commodity is copper concentrate. Its production will decline to around 1.2 million tons in both 2018 and 2019. In 2020, the mining sector will produce 1.3 million tons of copper concentrate, a 0.8-million-ton growth compared to 2018 and 2019. The GoM and Bank of Mongolia have implemented the “Gold-2” program which aims to increase the production of gold to promote economic recovery.

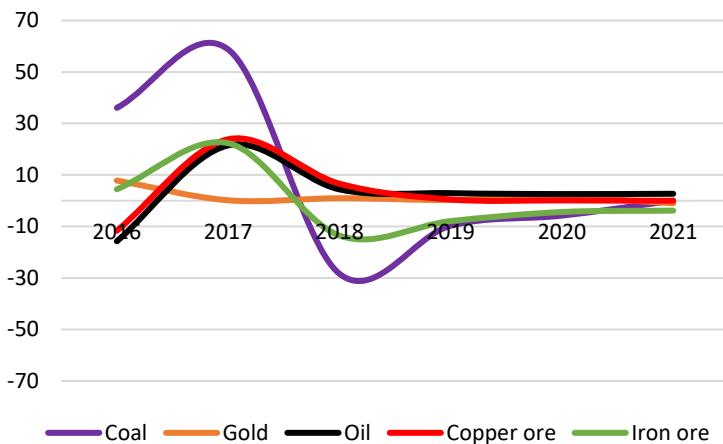
**Table 4. Mining sector's production, by commodities**

	2017*	2018**	2019**	2020**	2021**
Coal, mln tn	33.24	36.23	38.76	40.74	40.74
Copper concentrate, mln tn	1.37	1.24	1.22	1.30	1.30
Crude oil, mln barrel	8.10	8.10	8.10	8.10	8.10
Gold, tn	17.00	20.00	20.00	20.00	20.00
Iron Ore, mln tn	5.58	5.89	6.20	8.20	8.20

\* - preliminary performance, \*\*-forecast; Source: Ministry of Mining and Heavy Industry

In addition to changes in commodity production quantities, their prices are also expected to fluctuate in the future. There are many organizations which make mineral commodity price forecasts. The research team used the following price scenarios, which consists of an average of the forecasts made by various institutes.

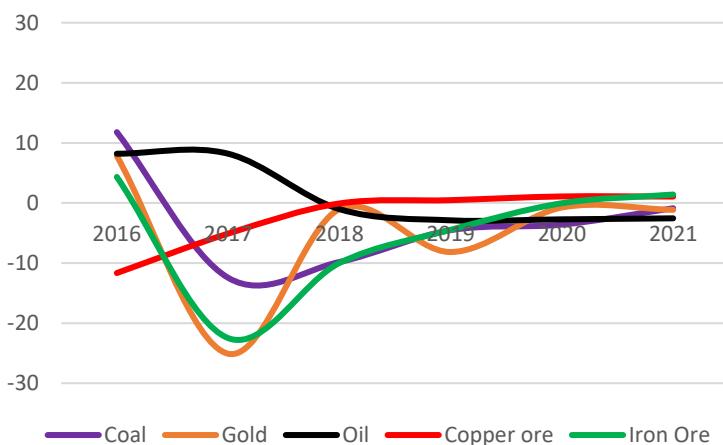
**Figure 13. Average of price scenarios on the top 5 commodities, YoY %**



Source: ERI's estimation, IMF, WB, and other international institutes

In the research, we assumed that the Mongolian mineral commodity prices will change at the same rate as shown in the figure above. On the model, the budget revenue must use the equilibrated prices, and the research team estimated how the equilibrated prices will be altered.

**Figure 14. The equilibrated prices of the top 5 commodities, YoY %**



Source: ERI's estimation, IMF, WB, and other international institutes

The base scenario without the FSL will simulate the economy within a scope of these exogenous variables and scenarios. In order to assess the impact of the FSL, we must re-estimate the policy scenario with the FSL. The following part will describe the main features of the policy scenario.

### Policy scenario

The policy scenario takes account the implementation of the FSL in accordance with the designated schedule by the GoM.

## RESULTS

This section introduces the main results from both scenarios, followed up by comparisons and contrasts using the averages and standard deviations of key macroeconomic variables to define whether the FSL has a stabilization impact.

### Base scenario

As mentioned earlier, this scenario is without the FSL. The following table shows how the macroeconomic variables would change under the base scenario.

**Table 5. Results without the FSL (macroeconomic variables)**

Macro variables %	2017*	2018*	2019*	2020*	2021*	2022*	2023*	2024*	2025*
Inflation	9.5	-0.7	-6.5	6.2	6.4	-8.5	-6.2	-4.7	-3.5
Real GDP	0.2	1.8	8.1	5.3	6.1	8.5	8.0	7.0	6.0
Real exports	2.5	4.0	9.7	11.5	13.7	7.5	6.2	6.0	5.7
Real imports	0.3	1.5	3.5	4.0	5.3	2.8	1.4	1.1	1.3
Mining sector output	2.5	2.7	10.0	9.2	16.9	18.5	17.2	14.5	13.2
Non-mining sector output	-1.4	1.2	7.2	3.7	1.3	3.9	4.0	6.8	7.3
Real wage	-10.8	1.4	8.9	-4.8	-5.3	7.6	8.1	5.2	4
Terms of Trade (ToT)	10.2	-1.3	-7.2	-0.6	-1.1	-1.8	1.3	-0.9	-0.8

\* -forecast; Source: ERI's estimation

In the future, the Mongolian mining sector will expand due to increases in commodity prices and production levels. In accordance with the price scenario, the mineral commodity prices will grow considerably in 2017, resulting in a positive effect for the ToT.

### Policy scenario

Under the policy scenario with the FSL, the selected variables would fluctuate as shown in the table below.

**Table 6. Results with the FSL (macroeconomic variables)**

Macro variables %	2017*	2018*	2019*	2020*	2021*	2022*	2023*	2024*	2025*
Inflation	9.0	-0.7	-6.8	6.3	5.3	-7.2	-5.9	-4.8	-3.6
Real GDP	0.2	1.8	8.1	5.3	6.1	8.5	8.0	7.0	6.0
Real exports	2.4	4.3	9.5	11.3	13.4	6.8	6.1	5.6	5.2
Real imports	0.3	1.3	3.0	5.7	3.4	3.2	2.1	1.5	1.6
Mining sector output	2.2	2.3	8.7	15.6	16.9	16.1	15.0	12.6	11.5
Non-mining sector output	-1.5	1.3	7.6	3.9	1.4	4.1	4.2	7.2	7.7
Real wage	-9.4	1.3	8.3	-5.0	-5.7	6.5	7.2	4.5	4.3
Terms of Trade (ToT)	8.9	-1.4	-7.6	-0.6	-1.0	-1.7	1.3	-0.8	-0.8

\* -forecast; Source: ERI's estimation

In comparison to those in base scenario, the magnitude of the volatility of the selected macroeconomic variables are smaller in the policy scenario. The subsequent subsection shows the means and standard deviations of those macroeconomic indicators.

### Comparing the scenarios

The comparison of the two scenarios will exhibit the impact of the FSL on the economy. Overall, although the mineral commodity prices fluctuate in both scenarios, the economy is more stable under the policy scenario.

As shown in the table below, when comparing the results, we use the average and standard deviations of the macroeconomic variables, shown in Table 5 and Table 6 above.

**Table 7. Comparing the simulation results (macroeconomic variables), %**

	Mean		Standard deviation	
	Base	Policy	without FSL	with FSL
Inflation	-0.9	-0.9	6.24	5.87
Real GDP	5.67	5.67	2.72	2.72
Real exports	7.42	7.18	3.39	3.33
Real imports	2.36	2.46	1.54	1.49
Mining sector output	11.63	11.21	5.66	5.36
Non-mining sector output	3.78	4.00	2.85	3.02
Real wage	1.59	1.34	6.60	6.08
Terms of Trade (ToT)	-0.24	-0.40	4.28	4.01

Source: ERI's estimation

It is worth noting that the growth of the non-mining sector is higher under the policy scenario, illustrating the lessening impact of the FSL on the negative consequences of mining development, also known as de-industrialization. Both the magnitudes of changes in mining sector output and non-mining sector output are smaller under the policy scenario. However, we can see that the variation in the mining sector output is relatively higher than in the non-mining sector output.

The FSL implementation does not have a significant impact on the means of the selected macroeconomic variables. However, with the help of the FSL, the magnitudes of the variations of the selected variables are significantly reduced. This suggests that if the GoM persistently follows the FSL, the Mongolian economy is likely to be more stable. For instance, the inflation rate is the same in both scenarios on average but is less volatile in the policy scenario. We can observe similar results for other macroeconomic variables.

## CONCLUSION

Over the last decade, the Mongolian economy inevitably faced numerous booms and busts. The economic indicators revealed that the booms and busts were caused by the changes in the mining sector with changes in mineral commodity prices and the investment being particularly salient. The mining boom brought with it economic fragility, notably vulnerability to commodity price slumps and an adverse shock to FDI. Mongolia started to experience economic slowdown following the boom in 2012, when the mineral prices fell significantly on the world market. The public foreign debt grew substantially in last few years as a result of budget expenditure increases and falling revenues. The issue was also related to the over-optimistic projections for the mineral prices when the PoM approved budgets in these years.

This research aimed to assess the impact of the FSL on the economy. The fiscal and monetary policies were pro-cyclical in Mongolia, which in turn exacerbated the fluctuations in the economy and in the government budget position. The FSL plays an important role in restraining fluctuations in the government budget and thereby reducing uncertainty.

The simulation results indicate that the FSL could counteract and lessen the de-industrialization effect of mining development. The results from the two scenarios may help in aiding the understanding of the reasons for and provide confidence in utilizing methods like the FSL to reduce the negative structural change effects of the mining development.

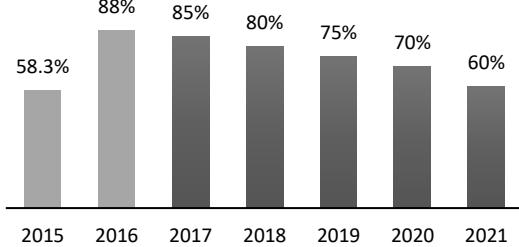
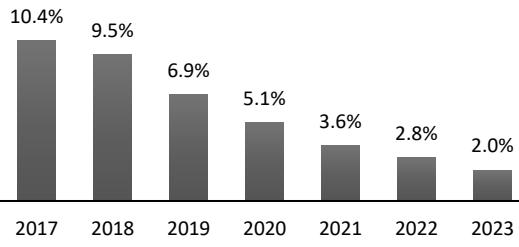
To guard against excessive spending and borrowing, the parliament approved the Fiscal Stability Law (FSL) in 2010 and it briefly came into effect in 2013. However, the caps on public debt and a structural budget deficit have been changed a few times undermining the impact of the law. The FSL's full implementation was postponed due to the economic difficulties and political unwillingness. The FSL contains four main requirements or caps related to the budget revenue, expenditure, deficit, and public debt. Currently, the FSL partially went into effect in 2017. The most important requirements concerning the budget deficit and public debt are still yet to be implemented.

There is also uncertainty regarding the discount rate and frequent cost overruns in the FSL, which may be needed to be analyzed. Productivity is often viewed as a key to raising living standard in the long run. The potential difference in productivity in two scenarios may also need to be explored as a future research avenue.

The research results show that fiscal discipline is paramount as the economy is expected to perform in a relatively similar fashion in both scenarios unless the GoM increases its spending and in turn, its debt, unnecessarily. When the GoM adheres to the FSL, on the other hand, its benefits materialize.

## Appendix

**Table A 1. Constraints and implementation period of the law**

The year of implementation	Law article	Constraints																
2017	6.1.3	Expenditure growth limited to the greater of non-mineral GDP growth or non-mineral GDP growth over a 12-year period  Net present value (NPV) of public debt cannot exceed 60 percent of GDP <sup>3</sup>																
2021	6.1.4	 <table border="1"> <thead> <tr> <th>Year</th> <th>NPV of public debt (% of GDP)</th> </tr> </thead> <tbody> <tr><td>2015</td><td>58.3%</td></tr> <tr><td>2016</td><td>88%</td></tr> <tr><td>2017</td><td>85%</td></tr> <tr><td>2018</td><td>80%</td></tr> <tr><td>2019</td><td>75%</td></tr> <tr><td>2020</td><td>70%</td></tr> <tr><td>2021</td><td>60%</td></tr> </tbody> </table>	Year	NPV of public debt (% of GDP)	2015	58.3%	2016	88%	2017	85%	2018	80%	2019	75%	2020	70%	2021	60%
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2023	6.1.2	 <table border="1"> <thead> <tr> <th>Year</th> <th>Fiscal deficit (% of GDP)</th> </tr> </thead> <tbody> <tr><td>2017</td><td>10.4%</td></tr> <tr><td>2018</td><td>9.5%</td></tr> <tr><td>2019</td><td>6.9%</td></tr> <tr><td>2020</td><td>5.1%</td></tr> <tr><td>2021</td><td>3.6%</td></tr> <tr><td>2022</td><td>2.8%</td></tr> <tr><td>2023</td><td>2.0%</td></tr> </tbody> </table>	Year	Fiscal deficit (% of GDP)	2017	10.4%	2018	9.5%	2019	6.9%	2020	5.1%	2021	3.6%	2022	2.8%	2023	2.0%
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2023	2.0%																	

Source: The FSL, Parliament of Mongolia

<sup>3</sup> Definition of NPV of public debt does not include government guarantees, Mongolbank foreign liabilities, or state-owned enterprise borrowing (e.g. Trade and Development Bank of Mongolia debt)

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