



A static CGE model of the Mongolian economy

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In 2012, with support of the UK Department for international Development (DfID or UK Aid) and the International Development Research Centre (IDRC) of Canada, PEP launched a new program to support and build capacities in “Policy Analyses on Growth and Employment” (PAGE) in developing countries.

This brief summarizes the main features and outcomes of one of the projects supported under the 2nd round of the PAGE initiative (2014-2015).

A boom in the Mongolian mining sector has meant significant growth for the country, but this concentrated success has also led to increased economic dependence on mining. The international price of metal ores is highly volatile and an economy dependent on mining is therefore vulnerable. A team of local researchers uses a static CGE model of the Mongolian Economy and data from various national surveys to assess the economy’s vulnerability. The researchers find that rapid expansion in the coal sector may have many positive effects including increased GDP, exports and employment. On the other hand, they also find that a drop in the world price of metal ore may have various negative effects in the short run, including reduced employment and a decrease in GDP. Based on these results, the team makes several recommendations for policy to protect against vulnerabilities.

Dependence on mining in Mongolia

The Mongolian mining sector is booming thanks to abundant natural resources and favourable government policies. This boom has triggered fast growth in the country. Between 2009 and 2014, real GDP increased at an average annual rate of more than 11%. However, this success means that the Mongolian economy is becoming increasingly dependent on the mining sector.

When a boom is concentrated in only one or a few sectors the economy risks seeing Dutch disease effects, including over-dependence on the booming sectors, currency appreciation, and reduced competitiveness in international trading.

The Mongolian economy felt the effects of the global financial crisis in 2009 due to copper losing about two-thirds of its value. But the quick recovery in the price of copper and the unexpected increase in the price of coal led Mongolia out of the recession within a year.

However, the current dependence on the mining sector (as of 2010, mining commodities accounted for about 60% of Mongolian export revenues) exposes the economy to potentially very violent price shocks from the international market where the price of metal ores is highly volatile.



Furthermore, the Mongolian government’s fiscal policy has been highly procyclical, i.e. increasing public spending during boom periods and reducing public spending during recession periods, which amplifies the effect of external shocks.

The Mongolian government is currently negotiating with investors regarding the operation of one of the biggest coal mines in the world: Tavan Tolgoi. This situation prompted a team of local researchers to assess the effect of changes in the external environment on the Mongolian economy.

Reflecting the government's recent policy to issue coal extraction and exportation licences that increased capital stock investment in the coal mining sector, the researchers investigate the effects of an increase in the stock of capital and land owned by the coal sector.

The researchers also consider what a decrease in the world price of metal ores would mean for the Mongolian economy in order to assess the economy's vulnerability to external shocks.

Data and methodology

The research team calibrated a PEP standard static single country Computable General Equilibrium (CGE) model to a 2010 social accounting matrix (SAM) to examine the short-run effects on the Mongolian economy of the developments occurring in the mining sector. As there was no existing SAM for the Mongolian economy, the researchers built one using data from a number of sources including the 2010 Input-Output table, the government account, the Household Socio-Economic Survey, the Labour Force Survey, and the balance of payments.

The researchers used the model as a laboratory to test two particular shocks:

- 1) a 30% increase in the stock of capital and land owned by the coal industry as of 2010, and
- 2) a 20% decrease in the world price of metal ore commodities.

In the short-run, in these scenarios, the capital and land stock are fixed for all sectors (except the coal sector in the first scenario) and nominal wages are constant - meaning there is slack in the labour market (i.e. elastic labour supply).

Key findings

Simulation 1: A 30% increase in capital and land stock owned by the coal sector

This simulation seeks to reflect recent government policies and to assess their effects.

The researchers found that growth in the coal sector has a number of positive effects including:

- A 2.3% increase in real GDP,
- A 3.1% increase in real investment,
- A 2.7% increase in skilled labour employment and a 3.4% increase in unskilled labour employment,
- An 11.9% increase in government savings, which reflects an increase in government revenues as government spending is fixed in the simulation,
- A 2% income increase for poor households and a 2.7% income increase for rich households.

There are also almost no Dutch disease effects on other sectors and only small negative effects on exports of other commodities due to domestic currency appreciation. However, the researchers advise that this may be due to the short-run assumption of slack in the labour market due to the fixed nominal wage in the model.

Simulation 2: A 20% decrease in the international price of metal ores

This simulation seeks to assess the vulnerability of the Mongolian economy to external changes given its current dependence on the mining sector.

The researchers found that a decrease in the world price of metal ores had a number of short-run effects including:

- A 1.2% decrease in real GDP (due to a 4.6% decrease in investment),
- A 1% and a 4.9% decrease in consumption amongst poor and rich households respectively,
- Employment decreases by 4.8% and 5.2% for skilled and unskilled labour, respectively,
- A 1.8% decrease in consumer prices indicated that domestic prices fall significantly as the import prices for everything except metal ores remains fixed.

Despite decreased domestic prices, there is not a sufficient drop in production costs to generate a competitive advantage in the international markets. The researchers again advise that these results may not hold under assumptions of a flexible nominal wage. See detailed simulation results on page 3.

Simulation 1:**Change in macroeconomic variables (%)**

Real GDP at basic price	2.3
Nominal GDP at market price	2.9
Consumer prices	0.9
GDP deflator	0.5
Public expenditure price index	0.3
Total investment	3.1
Overall exports	4.5
Overall imports	3.2
Exports prices	-0.7
Consumption/savings of poor households	2.0
Consumption/savings of rich households	2.7
Gross fixed capital formation	3.4
Employment of skilled labor	2.7
Employment of unskilled labor	3.4
Government savings	11.9
Firms' savings	1.0

Simulation 2:**Change in macroeconomic indicators (%)**

Real GDP at basic price	-1.2
Nominal GDP at market price	-6.9
Consumer prices	-1.8
GDP deflator	-6.1
Public expenditure price index	-0.6
Investment price index	-2.5
Total investment	-7.1
Overall exports	-7.6
Overall imports	-5.1
Exports prices	-8.5
Consumption/savings of poor households	-4.6
Consumption/savings of rich households	-6.4
Gross fixed capital formation	-8.6
Employment of skilled labor	-4.8
Employment of unskilled labor	-5.2
Government savings	-25.2
Firms' savings	-2.4

Conclusions and implications for policy

In Mongolia, government spending and transfers have been procyclical. The team suggests that if the government had borrowed from abroad and increased its spending and transfers to households as the coal sector expanded, the effects of the boom could have been amplified, including significant Dutch disease effects.

This simulation can be used as a rationale for the 2013 Fiscal Stability Law that permits the government to save any excess revenue (after spending) in a Fiscal Stability Fund (FSF) for use when revenue falls short of spending. However, the law has not been put into action as the fall in commodity prices since 2013 has meant the government has not been able to accumulate sufficient revenue in the FSF.

Based on the research and the current situation in Mongolia, the researchers recommend increased government support for the industries producing tradable goods, such as agriculture and manufacturing, as they can be both the engine of sustainable long-term growth and the buffer against short-run volatility caused by the price movement of mineral products.



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To find out more about the research methods and findings, read the [working paper 2016-03](#)