Developing a Dynamic CGE model of the Mongolian Economy

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- Background
  - What is CGE?
  - Core database and types of price in a model
- CGE simulations-historical, decomposition etc.,
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Computable General Equilibrium model

- Fundamental theories are
  - Walras Law (law-a complex economic system with the interaction of independent agents)
  - Edgeworth Box (general equilibrium analysis of exchange)
- CGE model of the Mongolian Economy
  - One country model
  - 5 agents-industries, investors, households, foreign sector, government

Core database & prices

Absorption matrix		Intermediate use	Final use				Future use
		1	2	3	4	5	6
		Industries	Investors	Household	Export	Government	Inventories
	Size	← I →	← I →	← 1 →	← 1 →	← 1 →	← 1 →
1	Basic Flows	↑ C×S ↓	V1BAS	V2BAS	V3BAS	V4BAS	V5BAS	V6BAS
2	Margins	↑ C×S×M ↓	V1MAR	V2MAR	V3MAR	V4MAR	V5MAR	n/a
3	Taxes	↑ C×S ↓	V1TAX	V2TAX	V3TAX	V4TAX	V5TAX	n/a
4	Labour	↑ OCC ↓	V1LAB					
5	Capital	↑ 1 ↓	V1CAP					
6	Land	↑ 1 ↓	V1LND					
7	Production Taxes	↑ 1 ↓	V1PTX					
8	Other Costs tickets	↑ 1 ↓	V1OCT					

C = Number of commodities (55 in 2005, 68 in 2012)
I = Number of industries (55)
S = Sources (domestic, imported) (Cockburn)
OCC = Number of occupation types (9)
M = Number of commodities used as margins (Cockburn)

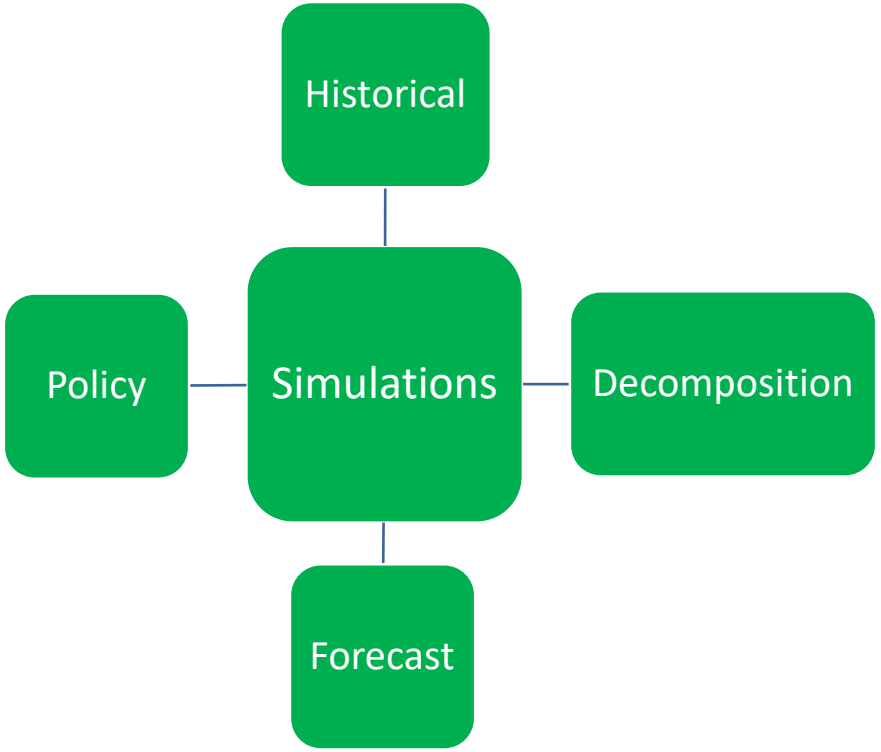
	Joint production matrix
Size	← I →
↑ C ↓	MAKE

	Tariffs
Size	← 1 →
↑ C ↓	V0TAR

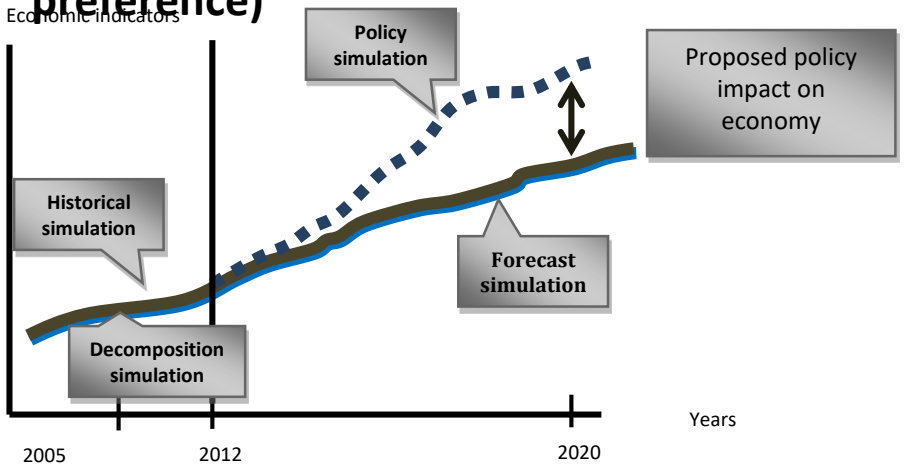
	Output at basic prices
plus	taxes on products (excl. VAT)
less	subsidies on products
equals	**Output at producer prices**
plus	trade and transport margins
plus	not-deductible VAT
equals	**Output at purchaser prices**

Source: Horridge, p.13

CGE's simulations



- IOT-2005 & 2012
  - Policy (estimate the deviations from forecast path)
  - Forecast (predict for industries, regions, occupations and households etc.,)
  - Decomposition (explanations of historical episodes)
  - **Historical (changes in technology and preference)**



Source: the research team's creation

Historical simulation (2005-2012)

Economic sectors	2005	2012	Growth
Agriculture	602,136.3	801,269.2	33.1
Mining	642,089.0	861,511.4	34.2
Manufacturing	175,155.9	295,225.0	68.5
Electricity and gas	75,928.2	111,667.2	47.1
Water supply, drainage	13,768.9	20,388.4	48.1
Construction	81,408.4	102,604.2	26.0
Trade	227,478.2	591,110.6	159.9
Transport, storage	256,726.4	605,013.9	135.7
Hotels & cafes	19,341.7	60,167.0	211.1
Communications	96,261.1	226,794.4	135.6
Financial intermediation & insurance	112,278.8	249,875.0	122.5
Real estate, renting & other business activities	160,522.7	217,574.6	35.5
Research & development	18,024.5	50,763.4	181.6
Other public supporting services	34,071.1	80,097.5	135.1
Public administration and defense	66,923.1	72,982.2	9.1
Education	86,528.6	102,230.4	18.1
Health and Social services	37,516.9	50,946.0	35.8
Cultural services	7,744.5	12,933.8	67.0
Other services	15,763.7	24,238.5	53.8

Source: NSO and MB

Indicators	2005	2012	Change (%)
Population, end-year (millions)	2.551	2.868	12.4
Number of households (thousands)	611.03	768.26	25.7
Real GDP, at constant 2005 prices			
(in billions of MNT)	3,041.4	5,529.3	81.8
(in millions of USD and in constant exchange rates)	2,523.6	4,587.9	81.8
GDP, at current purchaser prices (in billions of MNT)	3,041.4	16,688.4	448.7
GNI, at constant 2005 prices (in billions of MNT)	2,979.1	4,992.7	67.6
Export value index (2005 = 100%)	100.0	406.8	306.8
Export volume index (2005 = 100%)	100.0	198.2	98.2
Import value index (2005 = 100%)	100.0	569.5	469.5
Import volume index (2005 = 100%)	100.0	372.4	272.4
Real investment, at constant 2005 prices (billions of MNT)	849.7	3,310.9	356.9
Real household consumption, at	1,678.1	3,953.83	135.6
Real public consumption, at constant 2005 prices (billions of MNT)	369.19	628.27	70.2
Employment of labour (thousands of persons)	1,009.9	1,103.6	9.3
CPI, end-year	100	223.2	123.2
GDP deflator	100	303.5	203.5
Exchange rate (MNT/USD period average)	1,205.2	1,359.2	12.8

Results

- A large outward movement in the export demand
- A significant change in the average propensity to consume
- A massive change in the capital labour ratio
- A small primary-factor saving technical change growth
- A slight overall technical change resulting in a small GDP contribution

Results

- **Technical change by sectors**

	Average of technical change
Agriculture	1.94
Mining	-4.65
Manufacturing	0.54
Services	-0.18

* Mongolian had one of the worst "dzud" in the 2009-2010 (8.5 million head)
Source: NSO and estimation result

- **Household preference**
  - Imported 5,280 cars in 2005; 46,409 in 2012 (878.9%)-it can not be explained by household income, the number of household, and so forth (preference shift)

- **Capital/labour**
  - Mining sector growth-FDI and OT
  - Mongolia is net importer of machinery, vehicles and fuel (import increase as well)

- **Household preference-domestically produced commodities**
  - For instance, " leather products"

Destination	Sales composition (%) 2005	2012
Intermediate	2.1	28.5
Investment	0	0
Household consumption	0.8	40.4
Exports	95.4	25.2
Government consumption	0	0
Stocks (future consumption)	1.8	6
Total	**100**	**100**

Source: NSO and estimation result

Results

- **In 2005 VS 2012**
  - **For intermediate consumption, 50 percent of "LeatherPrd" was imports in 2005; 11.9 in 2012**
  - **Household's purchase of it increase from 5.7 percent to 55.6 percent domestically**

Main items in "LeatherPrd"

Main items in 'LeatherPrd'	2005	2012	Change (%)
Leather footwear (thousand pairs)	3.00	18.30	510.0
Leather coat (thousand pieces)	3.60	13.90	286.1
Leather jacket, shirt (thousand pieces)	4.20	8.30	97.6

Source: NSO and estimation result

"LeatherPrd" domestically produced is more favorable than import one

	Sales	Intermediate	Household
2005	Domestic	50	5.7
	Imported	50	94.3
2012	Domestic	88.1	55.6
	Imported	11.9	44.4

Source: NSO and estimation result

- **Perhaps due to a quality of improvement and a variety increase**
  - **Leather footwear- 510 percent**
  - **Leather coat- 286.1 percent**
  - **Leather jacket- 97.6 percent**

Conclusion

- The economy needs *efficiency* and *productivity* improvement (input saving technology)
- Mining industry encourages changes in capital/labor due to capital-intensive sector
- Foreign trade growth had been driven by the industrialization and urbanization of Mongolia's neighbor and trading partner, China
- Economic structure dramatically changed due to mining boom (too vulnerability to com price)
- Australia undertook a series of economic reforms through 1980s to avoid Dutch disease.