



Research article

The 2014 Mongolian Social Accounting Matrix

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Abstract: This paper describes the construction of the Mongolian Social Accounting Matrix (SAM) for 2014 in detail. The SAM has fifty-six sectors, seventy commodities, two types of production factors (capital and labor), three types of institutions (households, government and the rest of the world) along with capital accounts, three types of taxes (direct taxes, import duties and indirect taxes on commodities) and investment accounts (public investment, private investment and changes in inventories).

Key words: Social Accounting Matrix; CGE models; Mongolian economy; Supply and Use Tables

JEL Codes: C82, E01, E16

Abbreviations: SAM: Social Accounting Matrix; NSO: National Statistical Office; IMF: International Monetary Fund; BoP: Balance of Payments; SUTs: Supply and Use Tables; GDP: Gross Domestic Products; GFCF: Gross Fixed Capital Formation; VSTK: Variation of stocks; TD: Direct taxes; TM: Import duties; TI: Indirect taxes; ROW: Rest of the world; LFS: Labor Force Survey; CGE: Computable General Equilibrium; GAMS: General Algebraic Modeling System; TCM: Transaction cost model

1. Introduction

A Social Accounting Matrix (SAM) is a snapshot of an economy for a particular year and a main database for computable general equilibrium models. In addition to the information in a typical input output table, a SAM exhibits the interactions between economic agents (such as taxes and transfers), incorporates data from the balance of payments and defines the sources of investment expenditure. The seminal contributions are Pyatt and Round (1977) building SAMs for Iran, Sri-Lanka and Swaziland in the early 1970s and Greenfield (1978) building a 1974/75 SAM for Botswana.¹ Our paper contributes to a branch of this literature focusing on the construction of a SAM for various economies (e.g., Boughanmi et al. (2002) for Oman; Harun et al. (2012) for Malaysia; Ayadi and Salem (2014) for Tunisia).

This paper exhibits the construction steps of a Mongolian SAM for 2014. The primary data sources are Supply and Use Tables (SUTs), government budget data from the National Statistical Office (NSO)² and the Balance of Payments (BoP) data from the International Monetary Fund (IMF).³ The SAM is a square matrix with 210 columns and rows. Its accounts consist of fifty-six sectors and seventy commodities, two production factors (capital and labor), three types of institutions (households, government and rest of the world) along with their capital accounts, three types of taxes (direct taxes, import duties, and indirect taxes on commodities) and investment accounts (public investment, private investment and changes in inventories).⁵ Income and expenditure of all accounts of the SAM are equivalent (that is, the SAM is balanced).⁶ The main contributions of this paper are the following: 1) it shows how one can utilize micro data to implement corrections in sectoral data 2) it shows how one can consistently disaggregate data by utilizing an external model 3) it exhibits examples of how one can obtain necessary disaggregation of activities when data does not allow 4) it shows how to create a more detailed figure of capital flow between institutions. The closest reference to this paper is Cicowiez and Lofgren (2018) which provides a detailed technical description of the construction of a Mongolian SAM for 2015. There are similarities between the two SAMs in terms of methodology which are mentioned in Section 3.2. At the same time, there are some notable differences which are given in Appendix 2.

¹ See Round (2003) for a review on the progress of construction of SAMs. Also see Keuning and de Ruijter (1988) for a general guideline for the construction of a SAM.

² Statistics are drawn from various reports and tables published at <http://www.1212.mn>.

³ SUTs and general budget data are compiled by the NSO. BoP data is available at the IMF database website (<http://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52>).

⁴ Baatarzorig et al. (2018) construct a SAM using the 2010 data to conduct policy analysis in a CGE model without exhibiting the construction of the SAM.

⁵ The “households” account includes both firms and households. Therefore, some statements about households are also relevant to firms.

⁶ More information on the balance of the SAM can be found in Appendix 1.

2. Data and methodology

2.1. The “Proto” SAM and adjustments

2.1.1. The “Proto” SAM

The first version of the SAM without adjustments or augmentations is called the “proto” SAM. Table 1 shows the “proto” macro SAM as a share (22.2 trillion Mongolian Tugrug or MNT) of nominal Gross Domestic Product (GDP) in 2014. A macro SAM is a version of the SAM in which all industries and commodities are aggregated into one account while all other accounts remain disaggregated. Then, all values of the macro SAM are divided by the 2014 nominal GDP to expose the structure of the economy as a whole (Table 1). Accordingly, one can see that private consumption contributes 57%, current government spending is 13% and gross fixed-capital formation (GFCF) and inventory changes (VSTK) account jointly for 35% of GDP. The values of both export and import are more than half of the GDP (52% and 57% respectively). The economy is highly capital-intensive (i.e., about 70% of value added is payments to capital owners). The share of value added in the GDP is 90.1%, and the remaining 9.9% comes from indirect taxes on commodities (7.7%), import duties (1.6%) and net taxes on production (0.5%).

Table 1. The “Proto” Macro SAM 2014 (Percent of GDP).

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Labor								0.4	26.3				26.8
2 Capital								0.0	63.8				63.8
3 Households	25.4	57.6		10.4				2.4					95.7
4 Government			4.7		13.4	1.6	7.7	0.3	0.5	0.0			28.2
5 TD			13.4										13.4
6 TM										1.6			1.6
7 TI										7.7			7.7
8 ROW	1.4	6.3	1.5	0.8						57.1			67.0
9 Sectors										185.8			185.8
10 Commodities			56.6	13.0				52.2	95.1	20.1	28.6	6.6	272.4
11 GFCF			19.6	4.1				11.6					35.2
12 VSTK											6.6		6.6
13 TOTAL	26.8	63.8	95.7	28.2	13.4	1.6	7.7	67.0	185.8	272.4	35.2	6.6	

Note: TD = direct taxes, TM = import duties, TI = indirect taxes on commodities, ROW = rest of the world, GFCF = gross fixed capital formation and VSTK = variations of stocks.

2.1.2. Adjustments in the SAM

In the “proto” SAM, some sectors (e.g., trade and livestock) are reported as highly capital-intensive. In reality, however, they are likely to be labor-intensive, which is consistent with the structure of the Mongolian labor force. According to the Labor Force Survey (LFS) data for 2013, 2014, and 2015, roughly 27% and 15% of workers are in the livestock and trade sectors respectively.⁷ In that sense, the structure of value added in the “proto” SAM may be unrealistic.

In addition, to be a compatible database with Computable General Equilibrium (CGE) models, we need to distribute domestic production of each commodity into domestic and export categories and exports at purchaser price into (trade and transport) margins and exports at basic price.

To make the SAM more realistic and suitable for CGE models, we make a few adjustments, which are explained below. In doing so, we follow the approach of Cicowiez and Lofgren (2018).

Separating “mixed income” from gross operating surplus

In the 2014 SUTs, the value added in each sector is composed of employee compensation, the consumption of fixed capital and gross operating surplus. The former is considered as labor payments while the latter two are considered as capital payments. The structure of value added, meaning the factor intensity in all sectors, is given in Table 2 (Columns “labshr0” and “capshr0”). Capital intensity in some sectors may be overestimated because gross operating surplus includes “mixed income” which is likely to be a combination of the income of self-employed people, owners of small enterprises and employers. Although production activities use labor, individuals in these employment categories tend to consider their income to be profit from their activities and hence report it as overall operating surplus rather than labor income. A part of their income, however, which we call “mixed income” should be considered labor income.

To address this problem, we first calculate the number of salaried and non-salaried workers in each industry (shown in Table 2 under the columns “salaried” and “non-salaried”) using the LFS data from 2013, 2014, and 2015. In doing so, we merge the LFS data to create a larger database and calculate the aforementioned numbers as a three-year average. The survey participants report their sectors of activity which are consistent with the sectors in the SUTs and their employment status. We use the employment status of workers to define whether they are salaried or non-salaried.

There are six types of employment status in the LFS:

- paid employee;
- employer;
- self-employed;
- member of a producer cooperative;
- employed in animal husbandry;
- unpaid family worker.

⁷ The LFS is an annual survey organized by the NSO which is the main database for generating employment data at the country level.

Paid employees and unpaid family workers are considered “salaried” while employers, self-employed people, members of producer cooperatives and people employed in animal husbandry are considered “non-salaried.” Because we also know each worker’s sector of activity from the LFS data, we obtain the number of workers of each type in each sector. The average wage for each industry is then calculated using the original employee-compensation values in the SUTs and the number of salaried workers (computed from the LFS data). By multiplying the number of non-salaried workers by the average wage, we find “mixed income” values for each sector. Finally, these values are added to the original compensation of employees while being subtracted from the original capital payments. After this adjustment, labor and capital intensity in each sector are recalculated (see columns “labshr1” and “capshr1” in Table 2).⁸ As a result, capital intensity in some sectors decreases significantly and some sectors turn out to be more labor-intensive. Sectors relatively more affected by this adjustment are livestock, agriculture, apparel, leather, printing, repair and installation, trade, and land and water transport because all of these sectors have more of “non-salaried” workers. Generally, the magnitude of the change depends upon the average wage and the number of non-salaried workers.

Adjustments in re-exports

Exports of some commodities in the SUTs (crude oil, metal ores, other minerals; general-purpose machinery; special-purpose machinery; office, accounting and computing machinery; communication equipment; and transport equipment) are greater than domestic production. This is known as a re-export problem in CGE models and could exist in real life because stock accumulated in previous years could be exported even in the absence of new domestic production. CGE models do not take this feature into account. Therefore, we adjust exports exceeding domestic production to make the SAM consistent with CGE models.

To address this problem, we reduce the imports and exports of the those commodities simultaneously by the values exceed. This adjustment is not possible for some commodities (e.g., crude oil, metal ores, and other minerals), however, because imports are too small or zero. Note that exports are at purchaser price meaning that they include trade and transport margins while domestic production is at basic price. We need to calculate exports at basic price by excluding margins. To do so, we use a small model that distributed margins into domestic transactions and exports (see below). Once export margins are subtracted from purchaser-price of exports, the re-export problem is solved for two of the three commodities (crude oil and metal ores).⁹

⁸ The “mixed income” adjustment is made for sectors in which compensation of employees contributed less than half of value added. If an adjusted capital payment turn negative, the share of labor payment in the value added is assumed to be 2/3 for that particular sector.

⁹ There are no export taxes for re-exported commodities. Thus, subtracting only the export margins gives us exports at basic price.

Table 2. Structure of value added (before/after adjustment) and number of salaried/non-salaried workers by sector.

	non_salaried	salaried	labshr0	capshr0	labshr1	capshr1
crop	7,091	5,922	19%	81%	41%	59%
animal	278,445	21,038	6%	94%	88%	12%
for	1,436	1,617	53%	47%	53%	47%
fish	64	64	7%	93%	14%	86%
coal	801	15,924	36%	64%	38%	62%
oil	-	762	3%	97%	3%	97%
metore	3,071	17,304	21%	79%	25%	75%
othmin	888	2,748	64%	36%	64%	36%
minsup	479	4,088	37%	63%	42%	58%
food	3,370	12,845	10%	90%	13%	87%
bev	175	4,656	22%	78%	23%	77%
tob	-	228	2%	98%	2%	98%
textile	1,589	4,100	20%	80%	28%	72%
wear	9,493	5,400	25%	75%	69%	31%
leather	4,320	2,325	33%	67%	95%	5%
wood	5,194	2,216	76%	24%	76%	24%
paper	-	361	62%	38%	62%	38%
print	413	1,378	47%	53%	62%	38%
coke	-	264	5%	95%	5%	95%
chem	181	173	41%	59%	85%	15%
pharma	393	1,141	34%	66%	46%	54%
rubplast	166	430	30%	70%	41%	59%
nonmetmin	1,852	5,654	31%	69%	42%	58%
basmet	178	2,330	19%	81%	21%	79%
fabmet	1,112	772	46%	54%	67%	33%
com	54	304	73%	27%	73%	27%
mach	-	414	19%	81%	19%	81%
motveh	86	193	12%	88%	18%	82%
furn	2,201	2,524	25%	75%	46%	54%
othman	1,514	528	41%	59%	67%	33%
med	-	130	43%	57%	43%	57%
repins	2,115	1,184	36%	64%	100%	0%
elec	156	14,723	59%	41%	59%	41%
water	679	4,402	62%	38%	62%	38%
waste	423	1,550	61%	39%	61%	39%
cons	16,533	65,597	34%	66%	42%	58%
trade	100,834	65,046	27%	73%	68%	32%
lw-trans	40,022	21,079	37%	63%	67%	33%
a-trans	-	4,090	27%	73%	27%	73%
warehouse	514	1,557	31%	69%	41%	59%
post	363	1,079	64%	36%	64%	36%

Continued on next page

	non_salaried	salaried	labshr0	capshr0	labshr1	capshr1
accom	8,350	26,522	48%	52%	64%	36%
info	2,224	14,709	29%	71%	34%	66%
fin	1,188	18,751	27%	73%	28%	72%
insu	-	1,375	52%	48%	52%	48%
auxfin	219	921	22%	78%	27%	73%
real	242	789	3%	97%	3%	97%
pro	3,295	9,863	40%	60%	54%	46%
adm	2,041	12,133	48%	52%	57%	43%
pubad	398	65,538	80%	20%	80%	20%
edu	1,107	88,137	81%	19%	81%	19%
health	1,327	37,240	85%	15%	85%	15%
art	2,270	8,403	74%	26%	74%	26%
othser	11,934	7,647	41%	59%	67%	33%
othact	724	2,549	0%	100%	0%	100%

Note: Names of the sectors are abbreviated here. See Appendix 3 for their full names.

After the adjustment, exports at basic price still exceed domestic production at basic price for one commodity (other minerals). For this commodity, we reduce exports at purchaser price by the exceeded value and simultaneously increase inventory changes by the same value. Inventory changes for this commodity are initially negative and then that negative number shrank—in other words, we eliminate some changes in inventories because we assume that exports at purchaser price include the value of exports from accumulated stock. CGE models, conversely, specify exports and stock variations separately and do not take this feature into account—i.e., they assume that commodities are exported solely from current production and not from accumulated stock.

According to the SUTs, forestry products are not exported. A value for export tax is included, however, for that commodity. To eliminate this inconsistency, we include this value in the export tax of livestock products while transferring the same amount from indirect taxes on livestock products to indirect taxes on forestry products.

Distributing margins into domestic transactions and exports

In the SUTs, trade and transport margins appear by commodity. There is, however, no information on how the margins are distributed among different transactions (domestic sales, imports and exports). To distribute the margins among these transactions, we employ the transaction-cost model of Cicowiez and Lofgren (2018). In doing so, we first aggregate trade and transport margins to obtain the total margin for each commodity. The transaction-cost model then splits the total margin into different transactions.¹⁰ From the results, we separate trade and transport margins for each commodity using the original structures. Imports and domestic sales are considered jointly as domestic transactions.

¹⁰ For a detailed explanation of how the transaction-cost model works, see Appendix 4.

2.2. *New accounts in the SAM*

2.2.1. New sectors and commodities

Exported coal

We separate the existing coal sector/commodity in the SUTs into domestic coal (“coal”) and exported coal (“excoal”). The exported coal sector represents coking coal producers selling to China while the domestic-coal sector represents thermal coal producers supplying domestically-consumed coal.

The cost structure of these two sectors is assumed to be identical because we have no data that permits disaggregation. Output of the “excoal” sector is considered to be equal to the value of the original coal sector’s exports. On the other hand, output of “coal” sector is assumed to be equal to the original coal sector’s domestic output. Domestic demand for the original coal is then considered demand for the “coal” commodity.

Railway

We create a new sector/commodity for railway.¹¹ The railway sector is extracted from the original transport sector and assumed to have the same cost structure as the whole railway system in the economy.¹² Railway service is produced exclusively by the railway sector and represents that part of the service used only for coal export as a transport margin. Thus, we have three margin commodities: trade, railway, and other transport.

The original value of the transport margin associated with coal export is about 135 billion MNT. We assume that 10% of this value (13.5 billion MNT) could be allocated to the railway, implying that the total demand for the railway together with the total output of the railway sector is 13.5 billion MNT.

Separation of coke-oven products and refined petroleum products (fuel)

In the SUTs, coke-oven products and refined petroleum products are aggregated into one account. Coke-oven products include peat, coke, semicoke, and lignite which are domestically produced and exported. On the other hand, according to the Mineral Resource and Petroleum Authority of Mongolia, refined petroleum products are exclusively imported (i.e., there is no domestic production). Hence, we distinguish these commodities from one another by dividing the original commodity in the SUTs into two: “fuel” and “coke.” Refined petroleum products (“fuel”) contribute 92.3% of domestic demand for the original commodity while the remaining 7.7% is produced domestically. We use this structure to distribute indirect taxes on the commodity, domestic trade, and transport margins between the new commodities. The structure of sectors producing

¹¹ This refers to that part of the overall railway system that is used only for coal export.

¹² We knew the structure of the existing railway sector and used this structure to create the new “railway” sector while keeping other transportation sectors aggregated into one account.

“coke” are left unchanged and the original values of outputs are considered to derive exclusively from the output of “coke”.

2.2.2. Capital accounts

To construct a more realistic financing mechanism of public and private investment and include financial flows between institutions in the SAM, we add a capital account for each institution. This results in three new accounts: “cap-h”, “cap-gov” and “cap-row.” Here, we follow the approach of Cicowiez and Lofgren (2018). The significance of these accounts is that they allow us to include details on the sources of private investment, government borrowing and foreign direct investment. Such details are useful for policy analyses in CGE models.

Each institution’s savings (calculated as the difference between income and expenditures) go to the corresponding capital account (Table 3):

- Household/firm savings—*SH*;
- Government savings—*SG*;
- Net foreign savings—*SROW*.

In addition, the following financial flows are included in the SAM (Table 3):

- Net domestic borrowing of the government—*NDFG*;
- Net foreign borrowing of the government—*NFFG*;
- Net foreign borrowing of the private sector (households) —*NFFH*;
- Foreign direct investment—*FDI*.

Table 3. Capital accounts.

	H	GVT	ROW	cap-h	cap-gov	cap-row
cap-h	<i>SH</i>					<i>NFFH</i>
cap-gov		<i>SG</i>		<i>NDFG</i>		<i>NFFG</i>
cap-row			<i>SROW</i>			
<i>GFCF_PRI</i>				<i>N_FDI</i>		<i>FDI</i>
<i>GFCF_PUB</i>					<i>GFCF_PUB</i>	
<i>VSTK</i>				<i>VSTK</i>		

Note: *GFCF_PRI*, *GFCF_PUB* and *VSTK* are the names of both accounts and variables.

The SAM included accounts for private and public investment expenditures (gross fixed capital formation or GFCF) and changes in inventories:

- Private fixed capital investment expenditure—*GFCF_PRI*;
- Public fixed capital investment expenditure—*GFCF_PUB*;
- Changes in inventories—*VSTK*.

The first two are calculated in Equations 1, 2 and 3 below while *VSTK* is provided in the SUTs. Equation 1 implies that private fixed capital formation (*GFCF_PRI*) is financed by non-FDI (*N_FDI*) sources and foreign direct investment (*FDI*). Non-FDI sources are household savings (*SH*) and net foreign borrowing of households (*NFFH*) in excess of household’s net lending to the government (*NDFG*) and inventory changes (*VSTK*) as in Equation 2. Public fixed capital formation

(*GFCF_PUB*) is financed by government savings, net domestic and foreign borrowing of the government as in Equation 3.

$$GFCF_PRI = N_FDI + FDI \quad (1)$$

$$N_FDI = SH + NFFH - NDFG - VSTK \quad (2)$$

$$GFCF_PUB = SG + NFFG + NDFG \quad (3)$$

The value of *NFFG* is taken from IMF Article IV 2017 (1.6 trillion MNT). *FDI* is taken from the 2014 BoP (419 billion MNT). *NFFH* and *NDFG* are calculated as residuals to ensure the balance of Table 3. We take the value of *GFCF_PUB* from the IMF Article IV 2017 which is 3.3 trillion MNT including the off-budget spending of the Development Bank of Mongolia. *NDFG* is calculated as a residual and thus adjusted to satisfy Equation 3. Given the values of total *GFCF* in the SUTs and *GFCF_PUB*, we obtain the value of *GFCF_PRI*. The values of *FDI*, *VSTK*, *GFCF_PRI*, *SH* and *NDFG* in Equation 2 yields the value of *NFFH*.

2.3. Aggregation of the SAM

After the adjustments and augmentations, the SAM is referred to as “revised.” The revised SAM is then aggregated in terms of sectors and commodities for the purposes of facilitating interpretation. Specifically, seventy commodities and fifty-six sectors are aggregated into twenty-four commodities and twenty-four sectors. The mapping between original and aggregated sets of sectors/commodities used in this paper is similar to that of the NSO. Sectors/commodities more important for the economy, such as agricultural and mining sectors/commodities are largely left disaggregated while relatively small sectors/commodities, especially manufacturing, are aggregated. For instance, forestry and fishery are aggregated into “agriculture” while wood, paper, metal industries, machinery, equipment, and vehicles are aggregated as “other manufacturing sectors/commodities.” The new sectors/commodities (exported coal, fuel and railway) are not aggregated.¹³

The aggregated SAM is a square matrix with eighty-six columns and rows. Accounts in the aggregated SAM are shown in Table 4.

Table 5 shows the revised macro SAM as the share of nominal GDP in 2014. The shares of public and private investment expenditures in the GDP are similar—15% and 14% respectively. In comparison with the “proto” SAM, export and import shares are slightly decreased as the result of the adjustment of re-exports. Capital intensity decrease due to the “mixed income” adjustment. As a result, the economy is equally capital-intensive and in labor-intensive in the revised SAM.

¹³ For the mapping of sectors/commodities in the aggregated and the detailed SAM, see Appendices 5 and 6.

Table 4. Accounts in the SAM.

Sectors (24)		Commodities (24)	Institutions (3)
1	Agriculture	Agriculture	Households (H)
2	Livestock	Livestock	Government (GVT)
3	Domestic coal	Domestic coal	Rest of the world (ROW)
4	Exported coal	Exported coal	
5	Crude oil	Crude oil	Taxes (3)
6	Metal ores	Metal ores	Income taxes (TD)
7	Other mining	Other mining	Import duties (TM)
8	Food	Food	Taxes on commodities (TI)
9	Textiles	Textiles	
10	Coke and chemicals	Coke and chemicals	Factors (2)
11	Manufacturing	Manufacturing	Labor (Lab)
12	Electricity	Electricity	Capital (Cap)
13	Water	Fuel	
14	Construction	Construction	Savings-Investment (3)
15	Trade	Trade	Public investment (INV_PUB)
			Changes in inventories (VSTK)
16	Transportation	Transportation	Private investment (INV_PRI)
17	Railway	Railway	Changes in inventories (VSTK)
18	Accommodation	Accommodation	
19	Information	Information	Capital accounts (3)
20	Financial activities	Financial activities	Households/firms (Cap-H)
21	Public administration	Public administration	Government (Cap-GOV)
22	Education	Education	Rest of the world (Cap-ROW)
23	Health	Health	
24	Other activities	Other services	

Table 5. Macro SAM 2014 (Percent of the GDP).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1 Labor								0.4	44.8										45.3
2 Capital								0.0	45.3										45.3
3 Households	43.9	39.0		10.4				2.4											95.7
4 Government			4.7		13.4	1.6	7.7	0.3	0.5		0.0								28.2
5 TD			13.4																13.4
6 TM										1.6									1.6
7 TI										7.7									7.7
8 ROW	1.4	6.3	1.5	0.8						56.4									66.4
9 Sectors										137.7	48.1								185.8
10 Domestic Com-s			56.6	13.0					95.1	16.7	3.5				13.6	15.0	6.6		220.1
11 Export Com-s								51.6											51.6
12 Cap-H			19.6											2.3					21.8
13 Cap-GOV				4.1								3.5		7.4					15.0
14 Cap-ROW								11.6											11.6
15 Private Investment												11.7		1.9					13.6
16 Public Investment													15.0						15.0
17 VSTK													6.6						6.6
18 TOTAL	45.3	45.3	95.7	28.2	13.4	1.6	7.7	66.4	185.8	220.1	51.6	21.8	15.0	11.6	13.6	15.0	6.6		

3. Results: structure of the Mongolian economy (2014)

3.1. Production structure

Livestock and trade sectors contribute most to labor income while metal ores sector contribute most to capital income. The crude oil, food, metal ores, and coke and chemicals sectors are highly capital-intensive while the public-administration, education, health, railway and livestock sectors are most labor-intensive (Table 6).

Table 6. Production structure (%).

Sector	Labor	Capital	Value added	Value added/Total output	Factor intensity	
					Labor	Capital
Agriculture	1.3	1.7	1.5	41.6	43.1	56.9
Livestock	23.7	3.2	13.4	77.6	87.9	12.1
Domestic coal	0.3	0.5	0.4	27.9	37.5	62.5
Exported coal	0.8	1.4	1.1	27.9	37.5	62.5
Crude oil	0.1	4.3	2.2	39.3	2.6	97.4
Metal ores	6.6	19.6	13.1	40.7	25.2	74.8
Other mining	0.9	1.1	1.0	33.1	46.1	53.9
Food	1.2	7.1	4.2	31.0	14.6	85.4
Textiles	1.4	1.3	1.4	42.6	51.8	48.2
Coke and chemicals	1.1	4.3	2.7	43.5	20.3	79.7
Manufacturing	1.1	1.8	1.5	39.0	38.1	61.9
Electricity	1.8	1.3	1.6	37.1	59.0	41.0
Water	0.5	0.3	0.4	35.0	61.8	38.2
Construction	4.2	5.7	4.9	22.0	42.1	57.9
Trade	17.5	8.0	12.7	64.7	68.5	31.5
Transportation	6.2	4.7	5.4	40.0	56.3	43.7
Railway	0.0	0.0	0.0	44.3	77.3	22.7
Accommodation	1.2	0.7	1.0	38.6	63.7	36.3
Information	1.7	3.3	2.5	54.0	34.3	65.7
Financial activities	3.0	7.3	5.2	78.3	29.0	71.0
Public administration	7.3	1.8	4.5	59.9	80.4	19.6
Education	8.0	1.9	5.0	76.5	80.6	19.4
Health	3.5	0.6	2.1	60.6	85.0	15.0
Other activities	6.2	18.4	12.3	61.1	25.2	74.8
Total	100.0	100.0	100.0		49.7	50.3

4.2. Trade structure

Table 7 shows trade structure. Metal ores represents more than half of total exports. Fuel, coke-oven products, chemicals, and other manufacturing products contribute most of the imports. Crude oil and metal ores are almost exclusively exported. Most manufacturing commodities are imported. In

particular, fuel is not produced domestically and is exclusively imported. On the other hand, some commodities, including trade, railway, and public administration are not traded internationally.

Table 7. Trade structure (%).

Commodities	Export	Import	Export Intensity (except tax and margin)	Import Intensity
Agriculture	0.3	0.7	4.5	11.5
Livestock	3.6	0.2	11.4	0.8
Domestic coal	-	0.0	-	0.2
Exported coal	7.4	-	100.0	
Crude oil	10.5	-	99.4	-
Metal ores	53.2	0.0	99.4	0.5
Other mining	1.0	0.2	54.9	17.4
Electricity	0.0	1.9	0.1	20.0
Food	0.2	6.8	0.7	24.3
Textiles	2.0	3.3	32.9	49.5
Manufacturing	6.8	35.1	51.3	86.4
Fuel	-	17.8	-	100.0
Coke and chemicals	4.6	10.9	39.8	64.6
Construction	0.3	1.3	0.8	3.6
Trade	-	-	-	-
Accommodation	2.9	5.2	62.4	77.7
Transportation	3.4	2.1	13.2	10.1
Railway	-	-	-	-
Financial activities	0.3	2.1	2.1	16.8
Information	0.2	1.3	2.9	17.5
Public administration	-	-	-	-
Education	0.1	1.4	0.9	11.7
Health	0.0	0.8	0.5	13.5
Other services	3.1	9.0	6.8	19.6
Total	100.0	100.0		

4.3. Demand structure

Table 8 shows the demand structure for each commodity. Most of food, textiles, and accommodation and information services are consumed by households whereas public administration, education, and health are mostly consumed by the government. Electricity and mining commodities are mainly used as intermediate inputs for production. Trade and railway are a 100% margin commodity while 19% of other transport services are used as a margin. Construction services are mainly used for investment.

Table 8. Demand structure (%).

Commodities	Household consumption	Government consumption	Intermediate consumption	Margin	GFCF	VSTK	Total demand
Agriculture	42.7	-	57.2	-	0.0	0.1	100.0
Livestock	19.0	-	34.4	-	23.6	23.0	100.0
Domestic coal	11.2	-	96.8	-	-	-8.0	100.0
Crude oil	-	-	-	-	-	100.0	100.0
Metal ores	-	-	63.9	-	-	36.1	100.0
Other mining	1.0	-	101.3	-	-	-2.3	100.0
Electricity	8.6	-	91.4	-	-	-	100.0
Food	84.0	-	13.1	-	-	2.9	100.0
Textiles	65.2	-	30.0	-	1.6	3.2	100.0
Manufacturing	14.7	-	54.0	-	26.3	4.9	100.0
Fuel	17.8	-	78.4	-	-	3.8	100.0
Coke and chem.	13.6	-	84.4	-	-	2.0	100.0
Construction	0.3	-	26.0	-	73.6	-	100.0
Trade	-	-	-	100.0	-	-	100.0
Accommodation	66.9	0.2	32.9	-	-	-	100.0
Transportation	21.5	0.1	59.8	18.6	-	-	100.0
Railway	-	-	-	100.0	-	-	100.0
Financial act.	14.6	-	85.4	-	-	-	100.0
Information	58.2	1.2	40.6	-	-	-	100.0
Public admin.	3.3	88.9	7.7	-	-	-	100.0
Education	43.2	53.8	3.0	-	-	-	100.0
Health	34.2	59.2	6.5	-	-	-	100.0
Other services	32.6	4.8	58.1	-	4.5	-0.0	100.0

Food is the most important commodity for households which spend 31% of their consumption budget on it. The major commodities for government consumption are public administration, education, and health which contribute 47%, 27%, and 16% of total government consumption, respectively. Manufacturing, fuel, and coke and chemicals are the main intermediate goods and jointly receive 40% of total intermediate consumption spending. The main margin commodity is trade and 89% of total margin go to trade services. Construction services are the main investment commodity, absorbing more than half of total investment spending.

3.4. Household income, consumption, and savings

Table 9 shows the household/firm income and expenditure balance. The main sources of income for households are capital ownership and labor (jointly about 87% of household income). Households spend most of their income (59.2%) on purchasing commodities, 14% go to the government in direct taxes and 5% represents non-tax payments. Transfers to the ROW are relatively small (1.5%) while savings are equal to about 20% of total income. Labor and capital income of households include factor payments from abroad net of factor payments to foreigners. Transfers from/to ROW are taken from the BoP while

consumption spending of households is taken from the SUTs. Household savings is calculated as the difference between income and expenditure.

Table 9. Household/firm income and expenditures (%).

Household income		Household expenditures	
Wages	45.9	Consumption	59.2
Capital income	40.8	Direct taxes	13.9
Transfers from government	10.8	Transfers to the government	4.9
Transfers from ROW	2.5	Transfers to ROW	1.5
		Savings	20.4
Total	100.0	Total	100.0

3.5. Government activities

The government receive the majority of its revenue from households (firms) as direct taxes (47.3%) and transfers (16.7%). Commodity taxes make up 27.4% of its revenue. Other sources of income are relatively small. Almost half the government budget is spent on purchasing goods and services while 36.7% go to households as government transfers. Government savings, used to finance capital expenditures, are 14.4% of the total budget. Import duties, export taxes, net taxes on products, net taxes on production and public consumption are taken from the SUTs and transfers from/to ROW are taken from the BoP. Government savings are calculated as government revenue minus current expenditures. Direct tax revenue is calculated as a residual by subtracting other types of taxes from total tax revenue in the actual budget data. Similarly, transfers from households is calculated as a residual to replicate total government revenue in the actual budget data. Transfers to households is also calculated as a residual to balance the government account.

Table 10. Government budget (%).

Government revenue		Government expenditures	
Transfers from households	16.7	Transfers to households	36.7
Direct taxes/TD	47.3	Transfers to ROW	2.8
Import duties/TM	5.7	Public consumption	46.1
Export taxes	0.0	Savings	14.4
Net taxes on products/TI	27.4		
Transfers from ROW	1.1		
Net taxes on production	1.8		
Total	100.0	Total	100.0

3.6. Rest of the world (ROW)

Table 11 shows the transactions of the ROW. The ROW receive most of its income from imports. Capital income contribute about 10% of total ROW income while other sources of income are relatively small. The ROW spends 78% of its income on purchasing Mongolian goods and

services while saving 17.5% of its income and transferring 3.6% to Mongolian households (private sector). Other items on the expenditure side are almost insignificant. Exports and imports take their values from the SUTs while factor payments, factor income, and transfers from/to Mongolian domestic institutions are taken from the BoP. Finally, savings of the ROW is computed as the difference between total income and total expenditures.

Table 11. Rest of the world account.

ROW income		ROW expenditure	
Wages	2.1	Compensation of employees	0.7
Capital income	9.5	Capital payments	0.0
Transfers from government	1.2	Savings	17.5
Transfers from households	2.2	Transfers to households	3.6
Imports	85.1	Transfers to government	0.5
		Exports	77.7
Total	100.0	Total	100.0

3.7. Investment/savings structure

More than half of total investment is financed by private savings. Rest of the world and the government contribute nearly 33% and 12% of total investment budget (source) respectively. The majority of the investment budget is dedicated to financing gross fixed capital formation (that is, private and public investment at 38.5% and 42.6% respectively). A relatively small fraction (18.9%) is spent on inventory changes.

Table 12. Investment/savings structure (%).

Source		Allocation	
Household/firm	55.5	Private investment	38.5
Government	11.5	Public investment	42.6
Rest of the world	32.9	Change in inventories	18.9
Total	100.0	Total	100.0

4. Discussion

This paper presents the building of the Mongolian SAM for 2014 and some basic analysis on the SAM. The SAM is constructed using the Mongolian National Accounting System database and integrated all transactions in the economy for 2014 to exhibit a general and complete picture of the economy at one glance. This SAM is the main database for Mongolian researchers who are interested in performing analysis using CGE models. As well as, this paper can serve as a reference for those who are interested in the Mongolian economy and the methodology of SAM construction. However, there are some areas for further improvement of the SAM. For example, the SAM can be extended in various ways. One can further disaggregate some accounts of the SAM such as households and make it a financial SAM by including financial institutions and instruments. Moreover, one can apply more

advanced methods to balance the SAM instead of the current manual approach to decrease its dependency on the constructor's judgements.

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Conflict of interest

All authors declare no conflicts of interest in this paper.

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