

R Saudi Arabia

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R.1 Introduction

This document describes the adaptation of the 2021 Saudi input-output (I-O) table for input to the Global Trade Analysis Project (GTAP). The short paper is organised as follows. Section 2 briefly describes the source data. Section 3 discusses strengths and limitations of the published input-output (I-O) data. Section 4 discusses the processing to correct anomalies in the raw data. Section 5 presents the mapping between the 85 Saudi I-O sectors, 65 GTAP sectors, and the more aggregated 44 sectors of the submitted KSA IO table.

R.2 Data Sources

The main source of this data is the recently released 85 sector input output table published by Saudi General Statistics (GSTAT) . The 2021 I-O data is measured in thousands of Saudi Riyals. The input-output data satisfy the sectoral balance condition, and contain most of the data ready for conversion to the GTAP format. These data include :

- Intermediate Demand Matrix
- Final Demand Matrix
- Value Added Matrix
- Production Matrix
- Supply and Use Tables

The Supply table shows the total outputs of 85 domestic products, total imports, transport and trade margins, and taxes on domestic and imported goods, by commodity. The Use table shows the demand for those commodities by industries, private households, government, investment, changes in inventories, and exports.

1. A MAKE matrix of domestic production at basic prices, commodity by commodity. The matrix shows the output of 85 activities by 85 commodities. This matrix is symmetric, because commodities are the same as industries.

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2. An Absorption matrix at basic prices showing the use of 85 domestically-produced commodities by 85 industries and by five final users (private consumption, government consumption, investment, exports, and changes in stocks). The matrix also contains the values of compensation of employees, consumption of fixed capital formation, other taxes on production, subsidies and operating surplus, by industry.

R.3 Strengths and Limitations of the Original Input-Output Data

We have conducted a number of checks on the data. They include checks of the non-negativity condition and the balancing conditions of the tables. We also check the plausibility of tax rates, margin rates implied in the data, and the structure of industries' costs and sales. This section discusses the strengths and limitations of the data. The procedures that we used to address these limitations are discussed in the next section.

Strengths

1. The biggest strength is the more detailed information about Supply and Use Table for 85 Activities. They provide most of the data needed for GTAP IO.
2. The supply table shows the total outputs of 85 domestic products, total imports, transport and trade margins, and taxes on domestic and imported goods, by commodity. The Use Table shows the demand for those commodities by industries, private households, government, investment, changes in inventories and exports.
3. They have a separate Production and Commodity Tax data. There are separate domestic and import matrices at basic values; (b) There are separate trade and transport margins on domestic and imported commodities; and (c) There are separate tax data for domestic and imported commodities.
4. The tables are balanced.

Limitations

1. There are no separate values for capital and land rentals. They are grouped in only one vector of operating surplus.
2. There are no separate data for tariffs or export taxes.

R.4 Data Processing

The original IOT was a symmetric matrix of 85 products, and 6 final demand accounts: households, Government, non-profit organizations, Fixed capital formation, changes in inventories (stocks) and

Table 8.32: Mapping to GTAP final demands and value added

Original Final Demand Account	Assigned GTAP Account
Households Final Consumption Expenditures	Consumption
Government Final Consumption Expenditures	Government
Non-Profit Institutions	Government
Fixed Capital Formation	Investment
Changes in inventories	Stocks
Exports	Exports
Compensation of employees	Labor
Gross Operating Surplus	Capital
Imports	Imports

exports. On the input side the table provides: compensation of employees, Gross operating surplus. These were mapped to GTAP demand and value-added accounts as follows:

R.5 Mapping Between Saudi I-O Sectors and GTAP Sectors

The 85 sectors of the Saudi I-O table were aggregated to a set of 44 sectors that best correspond to elements of GTAP's standard 65 commodities. The mappings from 85 and 44 sectors are reported in Table 8.33.

Table 8.33: Mapping from Original Sectors (85) to 44 Aggregated Sectors

No.	Original sectors - 85	Aggregated IO Sectors - 44
1	Crop and animal production, hunting and related service activities	CropAniPro
2	Forestry and logging	Forestry
3	Fishing and aquaculture	FishingAqua
4	Mining of coal and lignite	Coal
5	Extraction of crude petroleum and natural gas	Crude
6	Mining of metal ores	MiningQua
7	Other mining and quarrying activities	MiningQua
8	Mining support service activities	MiningQua
9	Manufacture of food products	FoodProd
10	Manufacture of beverages	BevTobacco
11	Manufacture of tobacco products	BevTobacco
12	Manufacture of textiles	Textiles
13	Manufacture of wearing apparel	Wap
14	Manufacture of leather and related products	Leather
15	Manufacture of woods, wood products and cork, except furniture	WoodProd
16	Manufacture of paper and paper products	PaperProd
17	Printing and reproduction of recorded media	PaperProd
18	Manufacture of coke and refined petroleum products	CokePetroleum
19	Manufacture of chemicals and chemical products	Chemical
20	Manufacture of basic pharmaceutical products and pharmaceutical preparations	Pharma

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No.	Original sectors - 85	Aggregated IO Sectors - 44
21	Manufacture of rubber and plastics products	RubberPlasti
22	Manufacture of other non-metallic mineral products	Non_MethMine
23	Manufacture of basic metals	BasicMetals
24	Manufacture of fabricated metal products, except machinery and equipment	FabricatedMe
25	Manufacture of computer, electronic and optical products	CompuElect
26	Manufacture of electrical equipment	ElecEquipmen
27	Manufacture of machinery and equipment n.e.c.	MachineryEqu
28	Manufacture of motor vehicles, trailers and semi-trailers	MotorVehicle
29	Manufacture of other transport equipment	TransportEqu
30	Manufacture of furniture	OthManuFurn
31	Other manufacturing	OthManuFurn
32	Repair and installation of machinery and equipment	MachineryEqu
33	Electricity, gas, steam and air conditioning supply	ElecGasSteam
34	Water collection, treatment and supply	Water
35	Sewerage	Water
36	Waste collection, treatment and disposal activities; materials recovery	Water
37	Remediation activities and other waste management services	Water
38	Construction of buildings	Construction
39	Civil engineering	Construction
40	Specialized construction activities	Construction
41	Wholesale and retail trade and repair of motor vehicles and motorcycles	Trade
42	Wholesale trade, except of motor vehicles and motorcycles	Trade
43	Retail trade, except of motor vehicles and motorcycles	Trade
44	Land transport and transport via pipelines	LanDTranspor
45	Water transport	WaterTrans
46	Air transport	AirTransport
47	Warehousing and support activities for transportation	WareHousng
48	Postal and courier activities	Communicatio
49	Accommodation	Accomodation
50	Food and beverage service activities	Accomodation
51	Publishing activities	Communicatio
52	Motion picture, video and television programme production, sound recording and music publishing activities	Communicatio
53	Programming and broadcasting activities	Communicatio
54	Telecommunications	Communicatio
55	Computer programming, consultancy and related activities	Communicatio
56	Information service activities	Communicatio
57	Financial service activities, except insurance and pension funding	FinanServ
58	Insurance, reinsurance and pension funding, except compulsory social security	Insurance
59	Activities auxiliary to financial service and insurance activities	FinanServ
60	Real estate activities	RSA_DWE
61	Legal and accounting activities	OthBusServ
62	Activities of head offices; management consultancy activities	OthBusServ
63	Architectural and engineering activities; technical testing and analysis	OthBusServ
64	Scientific research and development	OthBusServ
65	Advertising and market research	OthBusServ
66	Other professional, scientific and technical activities	OthBusServ
67	Veterinary activities	OthBusServ
68	Rental and leasing activities	OthBusServ
69	Employment activities	RecreatAct

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No.	Original sectors - 85	Aggregated IO Sectors - 44
70	Travel agency, tour operator, reservation service and related activities	RecreatAct
71	Security and investigation activities	OthBusServ
72	Services to buildings and landscape activities	Construction
73	Office administrative, office support and other business support activities	OthBusServ
74	Public administration and defence; compulsory social security	PubAdmin
75	Education	Education
76	Human health activities	HumanHealth
77	Residential care activities	RecreatAct
78	Social work activities without accommodation	HumanHealth
79	Creative, arts and entertainment activities	RecreatAct
80	Libraries, archives, museums and other cultural activities	RecreatAct
81	Sports activities and amusement and recreation activities	RecreatAct
82	Activities of membership organizations	OthBusServ
83	Repair of computers and personal and household goods	RecreatAct
84	Other personal service activities	RecreatAct
85	Activities of households as employers of domestic personnel	RecreatAct

R.6 Converting the IO Table into GTAP format

As discussed above, the original IO has 85 sectors which are mapped to Aggregated/contributed IO 44 sectors that best correspond to elements of GTAP's original 65 commodities. These 44 contributed sectors are then mapped to 65 corresponding GTAP commodities. The mappings are as reported in the table below.

Table 8.34: Concordance between 65 GTAP Sectors to Contributed IO 44 table

No.	GTAP 65 Sectors - Code	GTAP 65 Sectors - Short Names	Contributed IO Sectors - 44
1	pdr	PaddyRice	CropAniPro
2	wht	Wheat	CropAniPro
3	gro	CerGrains	CropAniPro
4	v_f	VegFruit	CropAniPro
5	osd	OilSeeds	CropAniPro
6	c_b	SugarCane	CropAniPro
7	pfb	Plantfibers	CropAniPro
8	ocr	CropsNec	CropAniPro
9	ctl	Cattle	CropAniPro
10	oap	animalProd	CropAniPro
11	rmk	RawMilk	CropAniPro
12	wol	Wool	CropAniPro
13	frs	forestry	Forestry
14	fsh	Fishing	FishingAqua
15	coa	Coal	Coal
16	oil	Oil	Crude
17	gas	Gas	ElecGasSteam
18	oxt	Minerals	MiningQua
19	cmt	Bovine	FoodProd
20	omt	Meat	FoodProd
21	vol	VegOil	FoodProd
22	mil	Milk	FoodProd

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No.	GTAP 65 Sectors - Code	GTAP 65 Sectors - Short Names	Contributed IO Sectors - 44
23	pcr	ProcRice	FoodProd
24	sgr	Sugar	FoodProd
25	ofd	FoodProd	FoodProd
26	b_t	BevTobaco	BevTobacco
27	Tex	Textiles	Textiles
28	Wap	Wap	Wap
29	Lea	leather	Leather
30	Lum	WoodProd	WoodProd
31	ppp	PaperProd	PaperProd
32	p_c	Petroleum	CokePetroleum
33	chm	Chemical	Chemical
34	bph	Pharma	Pharma
35	rpp	RubberPlasti	RubberPlasti
36	nmm	MineralsPRod	Non_MethMine
37	i_s	FerMetal	BasicMetals
38	nfm	Metals	FabricatedMe
39	fmp	MetalsProd	FabricatedMe
40	ele	ComputerElec	CompuElect
41	eeq	Electrical	ElecEquipmen
42	ome	MachineryEqu	MachineryEqu
43	mvh	MotorVehicle	MotorVehicle
44	otn	TransportEqu	TransportEqu
45	omf	Manufactres	OthManuFurn
46	ely	Electricity	ElecGasSteam
47	gdt	GasDistribut	ElecGasSteam
48	wtr	Water	Water
49	cns	Construction	Construction
50	trd	Trade	Trade
51	afs	Accomodatio	Accomodation
52	otp	RoaTransport	LanDTranspor
53	wtp	WaterTranspo	WaterTrans
54	atp	AirTransport	AirTransport
55	whs	Warehousng	WareHousng
56	cmn	Communicat	Communicatio
57	ofi	Financial	FinanServ
58	ins	Insurance	Insurance
59	rsa	RealEstate	RSA_DWE
60	obs	BusinessServ	OthBusServ
61	ros	Recreational	RecreatAct
62	osg	Public	PubAdmin
63	edu	Education	Education
64	hht	HumanHealth	HumanHealth
65	dwe	Dewllings	OthBusServ

R.7 Checking Sectoral Balance and Non-negativity Conditions

After converting the I-O table of Saudi Arabia to the format required by the GTAP database, the table passes the balance and sign conditions.