

AZ.1 Introduction

This document provides an overview of the Ukrainian input-output (IO) table contribution process to the Global Trade Analysis Project (GTAP) database version 11. The contributed IO table has a 2017 reference year, matching the most recent reference year of the GTAP v11 database. For further sectoral disaggregation, a 2005 Ukrainian IO table is used, which allows to split the 2017 Ukrainian IO table into 81 individual sectors. The latter are further mapped to 46 mutual categories of the GTAP sectoral classification. With this contribution, Ukraine is now represented in the GTAP database with four IO tables that have 2004, 2007, 2013 and 2017 reference years.

AZ.2 Data sources

The contributed IO table for Ukraine is based on the State Statistic Service of Ukraine's (SSSU) official release of the 2017 Input-Output table at basic prices (SSSU 2019). SSSU also publishes input-output tables at consumer prices, but taking into account the GTAP construction process, an IO table at basic prices was considered to be preferable for the contribution. The reference year of the contributed IO table – 2017 – exactly matches the most recent reference year of the GTAP v11 database. The source IO table uses the commodity-by-commodity approach and all flows are measured in local currency – millions of Ukrainian hryvnas (mn UAH).

On the supply side, the Ukrainian IO table has a separate representation of trade and transportation margins, as well as taxes and subsidies on goods (Figure 8.34). Trade and transportation margins are excluded from the intermediate consumption (from “Trade; repair of motor vehicles, household appliances and personal demand items” and “Activity of transport” respectively) and as a result, the initial IO table is unbalanced – the column sums (for aforementioned trade and transport activities) exceeds corresponding rows sum exactly by the amount of trade and transportation margins.

The second quadrant of the Ukrainian IO table (Final use) includes Final consumption categories: households, non-profit institutions that serve households and general government (both collective and individual). There is also a gross capital formation category that includes gross fixed capital formation, change in inventories and net acquisition of valuables. Finally, there are export and import columns, the latter one is with the minus sign (Figure 8.34).

The third quadrant of the table (Gross value added) includes compensation of employees, other taxes, excluding other production subsidies and gross operating surplus, mixed income (Figure 8.34). As additional information, the Ukrainian IO table also includes a matrix of taxes

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Figure 8.34: Schematic representation of the Ukrainian input-output table at basic prices

Output Expenditures	Intermediate consumption by economic activities	Final use				Total used
		Final consumption expenditure	Gross capital formation	exports	Imports (-)	
Goods(services) at basic prices Transport margin on used goods Trade margin on used goods Taxes excluding subsidies on used goods Total use at consumer prices	Ist Quadrant	IInd Quadrant				
Compensation of employees Other production-related taxes excluding subsidies Gross operating surplus, mixed income Gross value added	IIIrd Quadrant					
Output at basic prices						

and subsidies, which allocates net taxes among different commodities as well as final consumption categories. Taxes and subsidies on imported commodities as well as import duties are included in this matrix and aggregated with domestic taxes. Another supplementary table of the Ukrainian IO table includes the allocation of imports between intermediate and final consumption categories (matrix of imports).

AZ.3 Processing of the source IO table

A source 2017 IO table has 42 commodities, which can be mapped to 27 GTAP sectors. The Ukrainian IO table has a more detailed representation of services, while the agricultural and production sectors are more aggregated than in GTAP. We implement further disaggregation of the Ukrainian IO table can be done using the 2005 IO table, which has 80 supply sectors and 81 demand sectors with a more detailed representation of transport activities, manufacturing, food production, etc (SSSU 2007).

Within the disaggregation process, changes in stock are further aggregated with investments. In cases when aggregated changes in stock and investments are negative, we distribute changes in stock between investments and exports of the corresponding sector. We further adjust capital/labor shares for the sectors with negative profits. In the case of the 2017 IO table, this includes the Motor vehicles (“mvh”) sector. Reconciled capital/labor shares for these sectors are based on the 2006 UIOT (SSSU 2008). Matrixes of taxes and subsidies, trade and transport margins, as well as imports are also reshaped to account for the new data structure.

The 2005 IO table has 80 supply sectors and 81 demand sectors, although not all of them

are using and producing goods or services. In particular, Activities of membership organizations, n.e.c. do not use any intermediate inputs, but just serve to redistribute services provided by different activities (e.g. Post and telecommunication, Real estate activities, Other business activities, etc.) to final households' consumption. We aggregate this sector with Other service activities at the pre-processing step. The 2005 IO table also contains information about "Financial intermediation services indirectly measured". It represents a difference between interest, received by financial institutions under credits and paid under deposits. Because it is impossible to split this category by activities, these data are reflected in the intermediate consumption, as a separate column in the "Finance" row, and when determining gross value added it is shown with a minus sign. In order to move to the square intermediate consumption matrix "Financial intermediation services indirectly measured" data were distributed between other economic activities proportionally to value-added shares. After these pre-processing steps, we have constructed the 2005 IO table with 79 sectors.

We use the 2017 IO table to disaggregate two sectors in the 2005 IO table. In particular, we split the Post and telecommunications sector ("cmn") of the 2005 IO table into Postal and courier activities ("cmnp") and Telecommunications ("telc"). We also split Other business activities into Legal and accounting activities ("legl") and Advertising and market research ("adve"). Such a split produces a 2005 IO table with 81 sectors. We use the RAS approach, following the SPLITCOM implementation (Horridge n.d.), to balance the disaggregated 2005 IO table. In the next step, we use the disaggregated 2005 IO table to split the 2017 IO table, which we further balance using the RAS routines from the SPLITCOM implementation. As a result, we produce an 81-sectoral IO with a 2017 reference year. Appendix A provides a mapping between sectors represented in the 2005 and 2017 IO tables for Ukraine.

In the final step, we develop a mutual mapping between 65 sectors represented in the standard GTAP v11 database (Aguiar, Chepeliev, Corong, and Mensbrugghe 2022) and the disaggregated 2017 Ukrainian IO table. An intersection of both classifications suggests that a set of 46 mutual sectors can be used to map the disaggregated Ukrainian IO table to the GTAP database. Appendix B reports the corresponding mapping. With the contribution of the 2017 Ukrainian IO table, the GTAP database now includes four IO tables for Ukraine with 2004, 2007, 2013 and 2017 reference years, extending on a previous contribution of the 2013 Ukrainian IO table (Chepeliev 2022) within the GTAP 10 Data Base (Aguiar, Chepeliev, Corong, McDougall, et al. 2019).

References

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Table 8.120: Sectoral mapping between 2005 and 2017 IO tables

2005 IO			2017 IO		
Sector name	NACE rev. 1.1	Sector code	Sector code	ISIC rev.4	Sector name
Crop farming	01.1, 01.3	crp	agri	A01-A03	Agriculture, forestry and fishing
Stockbreeding and hunting	01.2, 01.5	breed			
Stockbreeding and hunting services	1.4	breedsrv			
Forestry	2	frs			
Fish farming	5	fsh			
Mining of coal and lignite; extraction of peat; mining of uranium and thorium ores	10, 12	coa	coal	B05	Mining of coal and lignite
Extraction of crude petroleum and natural gas	11	oil_gas	oilg	B06	Extraction of crude petroleum and natural gas
Mining of metal ores	13	metore	omnf	B07-B09	Mining of metal ores and other mining
Quarrying of stone; Quarrying of sand and clay	14.1; 14.2	stone			
Mining of chemical and fertilizer minerals	14.3	chmmin			
Production of salt; Other mining and quarrying n.e.c.	14.4, 14.5	salt			
Production, processing and preserving of meat and meat products	15.1	cmt_omt	food	C10-C12	Food products, beverages and tobacco
Processing and preserving of fish and fish products	15.2	fish			
Processing and preserving of fruit and vegetables	15.3	pfv			
Manufacture of vegetable and animal oils and fats	15.4	vol			
Manufacture of dairy products	15.5	mil			
Manufacture of grain mill products, starches and starch products	15.6	grain			
Manufacture of prepared animal feeds	15.7	anf			

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2005 IO			2017 IO		
Sector name	NACE rev. 1.1	Sector code	Sector code	ISIC rev.4	Sector name
Manufacture of other food products; Manufacture of beverages; Manufacture of tobacco products	15.8, 15.9, 16	ofd_bt			
Manufacture of textiles; Manufacture of wearing apparel; dressing and dyeing of fur	17, 18	tex_wap	text	C13-C15	Textiles, clothes, leather and related products
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	19	lea			
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	20	lum	wood	C16-C18	Wood, paper and printing
Manufacture of pulp, paper and paper products	21	pap			
Publishing, printing and reproduction of recorded media	22	ppm	pppa	J58-J60	Publishing, printing, broadcasting
Manufacture of coke oven products; Processing of nuclear fuel	23.1, 23.3	coke	coke	C19.1	Manufacture of coke
Manufacture of refined petroleum products	23.2	petrol	petr	C19.2	Manufacture of refined petroleum products
Manufacture of basic chemicals	24.1	bch	chem	C20	Chemicals and chemical products
Manufacture of pesticides and other agro-chemical products	24.2	agch			
Manufacture of paints, varnishes and similar coatings, printing ink and mastics	24.3	pvi			
Manufacture of pharmaceuticals, medicinal chemicals and botanical products	24.4	pmch	phrm	C21	Pharmaceutical products
Manufacturing of other chemical products	24.5, 24.6	och	chem	C20	Chemicals and chemical products

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2005 IO			2017 IO		
Sector name	NACE rev. 1.1	Sector code	Sector code	ISIC rev.4	Sector name
Manufacture of man-made fibres	24.7	fib			
Manufacture of rubber and plastic products	25	chem_rub	rubp	C22	Rubber and plastic products
Manufacture of glass and glass products	26.1	glass	nmmp	C23	Other non-metallic mineral products
Manufacturing of other ceramic products	26.2, 26.3, 26.4	cer			
Manufacture of cement, lime and plaster; Manufacture of articles of concrete, plaster and cement	26.5, 26.6	clp			
Cutting, shaping and finishing of ornamental and building stone; Manufacture of other non-metallic mineral products	26.7, 26.8	onmm			
Manufacture of basic metals	27	bmet	metl	C24	Manufacture of basic metals
Manufacture of fabricated metal products, except machinery and equipment	28	fmet	fbmp	C25	Fabricated metal products (excl. machinery)
Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines	29.1	mmp	othm	C28	Machinery and equipment n.e.c.
Manufacture of other general purpose machinery	29.2	mgp			
Manufacture of agricultural and forestry machinery	29.3	maf			
Manufacture of machine tools	29.4	mmt			
Manufacture of other special purpose machinery; Manufacture of weapons and ammunition	29.5, 29.6	msp			
Manufacture of domestic appliances n.e.c.	29.7	mda	eleq	C27	Electrical equipment

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2005 IO			2017 IO		
Sector name	NACE rev. 1.1	Sector code	Sector code	ISIC rev.4	Sector name
Manufacture of office machinery and computers	30	ele_nec	comp	C26	Computers, electronic and optical products
Manufacture of electrical machinery and apparatus n.e.c.	31	mel	furn	C31-C33	Furniture, other products, machinery repair
Manufacture of radio, television and communication equipment and apparatus	32	ele_com	comp	C26	Computers, electronic and optical products
Manufacture of medical, precision and optical instruments, watches and clocks	33	mmpow	furn	C31-C33	Furniture, other products, machinery repair
Manufacture of motor vehicles, trailers and semi-trailers	34	mvh	mvht	C29	Motor vehicles, trailers and semi-trailers
Manufacture of other transport equipment	35	otn	otne	C30	Other transport equipment
Manufacture of furniture; manufacturing n.e.c.	36	omfm	furn	C31-C33	Furniture, other products, machinery repair
Recycling	37	omfr	wtrs	E36-E39	Water supply, sewerage and waste management
Production and distribution of electricity	40.1	ely	egsd	D35	Electricity, gas and steam distribution
Manufacture of gas; distribution of gaseous fuels through mains	40.2	gdt			
Steam and hot water supply	40.3	hdt			
Collection, purification and distribution of water	41	wtr	wtrs	E36-E39	Water supply, sewerage and waste management
Construction	45	cns	cnsr	F41-F43	Construction
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	50, 51, 52	trd	trdr	G45-G47	Trade, repair of motor vehicles
Hotels and restaurants	55	accom	acmf	I55-I56	Accommodation and food service activities
Land transport; transport via pipelines	60	otp_l	trnw	H49-H52	Transport, warehousing
Water transport	61	wtp			
Air transport	62	atp			

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2005 IO			2017 IO		
Sector name	NACE rev. 1.1	Sector code	Sector code	ISIC rev.4	Sector name
Supporting and auxiliary transport activities; activities of travel agencies	63	otp_s			
Post and telecommunications	64	cmn	cmnp	H53	Postal and courier activities
			telc	J61	Telecommunications
Financial intermediation, except insurance and pension funding	65	ofi_fin	fina	K64-K66	Financial and insurance activities
Insurance and pension funding, except compulsory social security	66	isr			
Activities auxiliary to financial intermediation	67	ofi_aux			
Real estate activities	70	rea	real	L68	Real estate activities
Renting of machinery and equipment without operator and of personal and household goods	71	rent	admn	N77-N82	Administrative and support services
Computer and related activities	72	progr	prgr	J62-J63	Computer programming and consultancy
Research and development	73	rnd	rnda	M72	Scientific research and development
Other business activities	74	leg	legl	M69-M71	Legal and accounting activities
			adve	M73-M75	Advertising and market research
Public administration and defense; compulsory social security	75	govn	govn	O84	Public administration and defense
Education	80	edu	educ	P85	Education
Health and social work	85	healt	heal	Q86-Q88	Human health, residential care
Sewage and refuse disposal, sanitation and similar activities	90	sew	wtrs	E36-E39	Water supply, sewerage and waste management
Recreational, cultural and sporting activities	92	arts	arts	R90-R93	Arts, entertainment and recreation

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2005 IO			2017 IO		
Sector name	NACE rev. 1.1	Sector code	Sector code	ISIC rev.4	Sector name
Other service activities; Activities of households as employers of domestic staff; Activities of membership organizations n.e.c.	91, 93, 95	osa	oths	S94-S96, T97	Other service activities

Table 8.121: Mapping between disaggregated 2017 IO table for Ukraine and GTAP sectors

No.	2017 IO table sector	NACE rev. 1.1	ISIC rev 4 code	Description	Mutual coding mapping	GTAP sectoral codes
1	crp	01.1, 01.3	011, 012, 013, 015	Crop farming	crops	PDR, WHT, GRO, V_F, OSD, C_B, PFB, OCR
2	breed	01.2, 01.5	014, 017	Stockbreeding and hunting	animals	CTL, OAP, RMK, WOL
3	breedsv	1.4	16	Stockbreeding and hunting services	animals	
4	frs	2	2	Forestry	frs	FRS
5	fish	5	3	Fish farming	fish	FSH
6	coa	10, 12	5	Mining of coal and lignite	coa	COA
7	oil_gas	11	6	Extraction of crude petroleum and natural gas	oil_gas	OIL, GAS
8	metore	13	7	Mining of metal ores	oxt	OXT
9	stone	14.1; 14.2	81	Quarrying of stone; Quarrying of sand and clay	oxt	OXT
10	chmmin	14.3	891	Mining of chemical and fertilizer minerals	oxt	OXT
11	salt	14.4, 14.5	0892, 0893, 0899, 09	Production of salt; Other mining and quarrying, extraction of peat	oxt	OXT
12	cmt_omt	15.1	101	Production, processing and preserving of meat	cmt_omt	CMT, OMT
13	fish	15.2	102	Processing and preserving of fish and fish products	ofood	PCR, SGR, OFD, B_T
14	pfv	15.3	103	Processing and preserving of fruit and vegetables	ofood	
15	vol	15.4	104	Manufacture of vegetable and animal oils and fats	vol	VOL
16	mil	15.5	105	Manufacture of dairy products	mil	MIL
17	grain	15.6	106	Manufacture of grain mill products and starch products	ofood	PCR, SGR, OFD, B_T
18	anf	15.7	108	Manufacture of prepared animal feeds	ofood	
19	ofd.bt	15.8, 15.9, 16	107, 110, 120	Manufacture of other food products, beverages and tobacco	ofood	

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No.	2017 IO table sector	NACE rev. 1.1	ISIC rev 4 code	Description	Mutual coding mapping	GTAP sectoral codes
20	tex_wap	17, 18	13, 14	Manufacture of textiles and clothes	tex_wap	TEX, WAP
21	lea	19	15	Tanning and dressing of leather; luggage and footwear	lea	LEA
22	lum	20	16	Manufacture of wood and of products of wood	lum	LUM
23	pap	21	17, 18	Manufacture of pulp, paper and paper products	ppp	PPP
24	ppm	22	58-60	Publishing, printing and reproduction of recorded media	cmn	CMN
25	coke	23.1, 23.3	191	Manufacture of coke oven products; nuclear fuel	p_c	P_C
26	petrol	23.2	192	Manufacture of refined petroleum products	p_c	P_C
27	bch	24.1	201	Manufacture of basic chemicals	chm	chm
28	agch	24.2	2021	Manufacture of pesticides and other agro-chemicals	chm	chm
29	pvi	24.3	2022	Manufacture of paints, varnishes and similar coatings	chm	chm
30	pmch	24.4	21	Manufacture of pharmaceuticals, medicinal chemicals	bph	bph
31	och	24.5, 24.6	2023, 2029	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations. Manufacturing of other chemical products	chm	chm
32	fib	24.7	203	Manufacture of man-made fibers	chm	chm
33	chem_rub	25	22	Manufacture of rubber and plastic products	rpp	rpp
34	glass	26.1	231	Manufacture of glass and glass products	nmn	nmn

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No.	2017 IO table sector	NACE rev. 1.1	ISIC rev 4 code	Description	Mutual coding mapping	GTAP sectoral codes
35	cer	26.2, 26.3, 26.4	2391, 2392, 2393	Manufacturing of other ceramic products	nmn	nmn
36	clp	26.5, 26.6	2394, 2395	Manufacture of cement, lime and plaster. Manufacture of articles of concrete, plaster and cement.	nmn	nmn
37	onmm	26.7, 26.8	2396, 2399	Ornamental and building stone; other mineral products	nmn	nmn
38	bmct	27	24	Manufacture of basic metals	i_s_nfm	i_s, nfm
39	fmet	28	25	Manufacture of fabricated metal products	fmp	fmp
40	mmp	29.1	2811, 2812, 2813, 2814	Manufacture of machinery for the production and use of mechanical power	ome	ome
41	mcp	29.2	2815, 2816, 2817, 2819	Manufacture of other general purpose machinery	ome	ome
42	maf	29.3	2821	Manufacture of agricultural and forestry machinery	ome	ome
43	mmt	29.4	2818, 2822	Manufacture of machine tools	ome	ome
44	mcp	29.5, 29.6	2823, 2824, 2825, 2826, 2829	Manufacture of other special purpose machinery; weapons and ammunition	ome	ome
45	mda	29.7	27	Manufacture of electrical equipment	eeq	eeq
46	ele_nec	30	2610, 2620	Manufacture of office machinery and computers	ele	ele
47	mel	31	3312, 3313, 3314, 3320	Manufacture of electrical machinery and apparatus n.e.c.	omf	omf
48	ele_com	32	2630, 2640	Manufacture of radio, TV and communication equipment	ele	ele
49	mmpow	33	265, 2660, 267, 268	Manufacture of medical, precision and optical instruments, watches	ele	ele
50	mvh	34	29	Manufacture of motor vehicles, trailers and semi-trailers	mvh	mvh

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No.	2017 IO table sector	NACE rev. 1.1	ISIC rev 4 code	Description	Mutual coding mapping	GTAP sectoral codes
51	otn	35	30	Manufacture of other transport equipment	otn	otn
52	omfm	36	31, 32, 3311, 3315, 3319	Manufacture of furniture; manufacturing n.e.c.	omf	omf
53	omfr	37	36-39	Recycling	wtr	wtr
54	ely	40.1	351	Electricity generation and distribution	ely	ely
55	gdt	40.2	352	Manufacture of gas; distribution of gaseous fuels through mains	gdt	gdt
56	hdt	40.3	353	Steam and hot water supply	ely	ely
57	wtr	41	36-39	Collection, purification and distribution of water	wtr	wtr
58	cns	45	41-43	Construction	cns	cns
59	trd	50, 51, 52	45-47	Wholesale and retail trade; repair of motor vehicles	trd	trd
60	accom	55	55-56	Hotels and restaurants	afs	afs
61	otp_l	60	49	Land transport; transport via pipelines	otp	otp
62	wtp	61	50	Water transport	wtp	wtp
63	atp	62	51	Air transport	atp	atp
64	otp_s	63	52	Supporting and auxiliary transport activities	whs	whs
65	cmnp	64	53	Postal and courier activities	cmn	cmn
66	telc		61	Telecommunications	cmn	cmn
67	ofi_fin	65	64	Financial intermediation, except insurance and pension funding	ofi_ins	OFI, INS
68	isr	66	65	Insurance and pension funding, except compulsory social security	ofi_ins	
69	ofi_aux	67	66	Activities auxiliary to financial intermediation	ofi_ins	
70	rea	70	68	Real estate activities	rsa	rsa
71	rent	71	77-82	Renting of machinery and equipment without operator	obs	obs
72	progr	72	62-63	Computer and related activities	cmn	cmn

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No.	2017 IO table sector	NACE rev. 1.1	ISIC rev 4 code	Description	Mutual coding mapping	GTAP sectoral codes
73	rnd	73	72	Research and development	obs	obs
74	legl	74	69-71	Legal and accounting activities	obs	obs
75	adve		73-75	Advertising and market research	obs	obs
76	govn	75	84	Public administration and defense; compulsory social security	osg	osg
77	edu	80	85	Education	edu	edu
78	healt	85	86-88	Health and social work	hht	hht
79	sew	90	36-39	Sewage and refuse disposal, sanitation and similar activities	wtr	wtr
80	arts	92	90-93	Recreational, cultural and sporting activities	ros	ros
81	osa	93, 95	94-97	Other service activities	ros	ros