AT Serbia

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AT.1 Introduction

The presented document describes the procedures followed for incorporating the Republic of Serbia as a separate country into the Global Trade Analysis Project (GTAP) Database. In the previous versions of the GTAP Database, Republic of Serbia was represented as a part of the "Rest of Europe" regional coalition. The first part of the respective procedure composed the harvesting of the initial data reported by the Statistical Office of the Republic of Serbia (SORS). Following, a bunch of modification to the collected data took place, in order to tackle some compilation problems that existed and increase the level of detail of the information provided for the Serbian economy; thus converting the data to the appropriate format for being incorporated into the GTAP database.

The document apart from this introductory section, is structured along five sections. Section 2 presents the initial data reported by the SORS, while in Section 3 their quality is assessed. Section 4 discusses the procedure followed to improve the quality of the initial data, while Section 5 presents the mapping took place between the 65 Serbian I-O sectors, to the 40 GTAP sectors.

AT.2 Data Sources

The SAM reported by the GTAP database v11 was prepared based on the data provided by the SORS. In particular, the Input-Output (I-O) table of the Serbian economy for 2015 as supplied by SORS[65] was used as a starting point. I-O tables, similar to SAMs, depict the circular monetary flows that occur inside an economy for a specific time frame. However, they do it in a more aggregate way than SAMs[66], not examining sub-categories of the agents represented, e.g., households. Thus, SAMs provide a more detailed and representative picture of the economy in question.

The 2015 I-O table of the Serbian economy has the following characteristics:

i It expresses the monetary flows took place within Serbian economy for 2015 in million Serbian dinars (RSD).

ii It reports transactions in basic prices, i.e., the amount receivable by the producer exclusive of taxes payable on products and inclusive of subsidies receivable on products.

iii It is expressed in a commodity by commodity format, i.e., each sector represented is assumed to produce only one commodity.

[64] Decision Support Systems Laboratory (DSS Lab), National Technical University of Athens (NTUA)
[65] Available at: `https://www.stat.gov.rs/en-us/oblasti/nacionalni-racuni/godisnji-nacionalni-racuni-ponuda-i-upotreba/`
[66] La Marca, Massimiliano & Jiang, Xiao, 2017. From IO and Supply-and-Use to Social Accounting Matrix Analysis.

iv It covers sixty-five (65) production sectors of the Serbian economy, which were mapped to forty (40) sectors of the GTAP database.

AT.3 Quality Assessment of the 2015 I-O Table of the Serbian Economy

The quality of the data reported by the 2015 I-O table of the Serbian economy have been checked from multiple perspectives. First, the non-negativity and balancing conditions were reviewed. Moreover, the plausibility of tax rates, margin rates implied in the data, and the structure of industries' costs and sales were also checked. The results of this valuation are presented below along with the points identified that were needed further remediation.

As it can be extracted from the previous section, the original data provided by SORS, provide a representativeness picture of the Serbian economy for 2015. First, they cover 65 production sectors of the Serbian economy, thus encompassing a high level of detail. Moreover, they distinguish between the domestic production and imports (supplied in a vector format), as well as taxes on domestic products and the ones applied on imports.

However, some compilation problems existed in the data, as well as some cases that the information provided must have be analyzed to a higher level of detail. These cases can be summarized to the following points:

i The value-added components (labor, capital and land,) were provided in an aggregated form, i.e., it was given their sum.

ii The exports of some sectors were greater than their corresponding production level, suggesting the existence of re-exports, i.e., a part of the imports of these sectors was following being exported in the same year.

iii A negative entry on capital remuneration on the Fishing industry: "Fish and other fishing products; aquaculture products; support services to fishing" existed, which was probably due to a bad compilation.

iv The sector "Services auxiliary to financial services and insurance services" contained information that referred to the sectors "Financial services, except insurance and pension funding" and "Services auxiliary to financial services and insurance services", and thus had to be split.

AT.4 Data Processing

In this section, the adjustments took place in order to handle the compilation issues described above, are presented. First, the main modification made was the re-classification of the value-added components, in order to enhance the representativeness of the data. In this effort, the total value-added amount of each sector was split between labor and capital production factors, while the value-added of the land production factor was set to zero, as the corresponding values would be later imputed within the GTAP Data Base construction process. The ratio of labor to capital was calculated based on the data of a reference country with similar characteristics in terms of regional proximity and per capita GDP level, in particular of the Republic of Bulgaria. It should be mentioned that this procedure is a convention used when the disaggregation of some sectoral information is needed in more details and the respective data are not available.

In regard to the issue about the existence of re-exports, first the share of re-exports (prop) of each sector that lied in this category was calculated based on the following formula[67]:

$$PROP(i) = \frac{M(i)}{M(i)+P(i)},$$

where M(i) are the imports of sector (i) and P(i) is the production level of sector (i). After calculating the share of re-exports, values of re-exports were calculated by multiplying the total exports of these sectors with the share of re-exports. The re-exports were then subtracted from the initial imports and exports to ensure that the I-O table balances.

Another issue in terms of data quality that had to be addressed, was a negative entry of capital remuneration in the Fishing industry: “Fish and other fishing products; aquaculture products; support services to fishing”. A conventional assumption within the CGE modelling framework is that the return on capital is non-negative, thus corresponding negative entry was adjusted by calculating the ratio of capital remuneration in the fishing industry to the total capital remuneration in the reference country, in particular, the Republic of Bulgaria, which was selected for the reasons mentioned above. Then, this ratio was multiplied by the total capital remuneration in the Serbian economy in order to calculate the capital remuneration in the fishing industry of the Serbian economy. Since the balance of the SAM was affected by the abovementioned modification, the estimated difference was assumed being a production tax on the fishing sector, meaning that the loss was considered being subsidized by the Serbian government.

Finally, in view of splitting the information of the sector “Services auxiliary to financial services and insurance services” into the sectors “Financial services, except insurance and pension funding” and “Services auxiliary to financial services and insurance services”, a 50:50 split weights approach was adopted, i.e., the data were split in a symmetric way.

AT.5 Mapping Between Serbian I-O Sectors and GTAP Sectors

The 65 sectors of the Serbian I-O table were aggregated to a set of 40 sectors that best correspond to elements of GTAP’s standard 65 commodities. As a result, the table that arise contained 40 sectors. This mapping is shown in Table 8.92.

[67]GTAP, GTAP Data Bases: About Re-Exports, 2011. Retrieved from: `https://www.gtap.agecon.purdue.edu/databases/contribute/reexports.asp`

Table 8.92: Concordance between the 65 Serbian I-O sectors and GTAP 65 sectors.

		Original I-O table		GTAP Sectors Mapped
No.	Code	Description	Code	Description
1	CPA_A01	Products of agriculture, hunting and related services	pdr, wht, gro, v_f, osd, c_b, pfb, ocr, ctl, oap, rmk, wol	paddy rice, wheat, cereal grains, vegetables, fruit, nuts, oil seeds, sugar cane, sugar beet, plant-based fibers, crops, bovine cattle, sheep and goats, horses
2	CPA_A02	Products of forestry, logging and related services	frs	Forestry
3	CPA_A03	Fish and other fishing products; aquaculture products; support services to fishing	fsh	Fishing
4	CPA_B	Mining and quarrying	coa, oil, gas, oxt	Coal, oil, gas, other Extraction
5	CPA_C10T12	Food products, beverages, and tobacco products	cmt, omt, vol, mil, pcr, sgr, ofd, b_t	Foods (meat, food products, vegetable oils and fats, dairy products, sugar, beverages, and tobacco products)
6	CPA_C13T15	Textiles, wearing apparel and leather products	tex, wap, lea	Textiles, wearing apparel, leather products
7	CPA_C16	Wood and products of wood and cork, except furniture; articles of straw and plaiting materials	lum	Wood products
8	CPA_C17	Paper and paper products	ppp	Paper products, publishing
9	CPA_C18	Printing and recording services	ppp	Paper products, publishing
10	CPA_C19	Coke and refined petroleum products	p_c	Petroleum, coal products
11	CPA_C20	Chemicals and chemical products	chm	Chemical products
12	CPA_C21	Basic pharmaceutical products and pharmaceutical preparations	bph	Basic pharmaceutical products
13	CPA_C22	Rubber and plastics products	rpp	Rubber and plastic products
14	CPA_C23	Other non-metallic mineral products	nmm	Mineral products
15	CPA_C24	Basic metals	i_s, nfm	Ferrous and non-ferrous metals
16	CPA_C25	Fabricated metal products, except machinery and equipment	fmp	Basic Metals
17	CPA_C26	Computer, electronic and optical products	ele	Computer, electronic and optic
18	CPA_C27	Electrical equipment	eeq	Electrical equipment
19	CPA_C28	Machinery and equipment	ome	Machinery and equipment
20	CPA_C29	Motor vehicles, trailers and semi-trailers	mvh	Motor vehicles and parts
21	CPA_C30	Other transport equipment	otn	Transport equipment nec
22	CPA_C31_32	Furniture; other manufactured goods	omf	Manufactures nec
23	CPA_C33	Repair and installation services of machinery and equipment	omf	Manufactures nec
24	CPA_D35	Electricity, gas, steam and air-conditioning	ely, gdt	Electricity, gas manufacture, distribution

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No.	Code	Original I-O table Description	Code	GTAP Sectors Mapped Description
25	CPA_E36	Natural water; water treatment and supply services	wtr	Water
26	CPA_E37T39	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	wtr	Water
27	CPA_F	Constructions and construction works	cns	Construction
28	CPA_G45	Wholesale and retail trade and repair services of motor vehicles and motorcycles	trd	Trade
29	CPA_G46	Wholesale trade services, except of motor vehicles and motorcycles	trd	Trade
30	CPA_G47	Retail trade services, except of motor vehicles and motorcycles	trd	Trade
31	CPA_H49	Land transport services and transport services via pipelines	otp	Transport nec
32	CPA_H50	Water transport services	wtp	Water transport
33	CPA_H51	Air transport services	atp	Air transport
34	CPA_H52	Warehousing and support services for transportation	whs	Warehousing and support activities
35	CPA_H53	Postal and courier services	cmn	Communication
36	CPA_I	Accommodation and food services	afs	Accommodation, Food and Services
37	CPA_J58	Publishing services	cmn	Communication
38	CPA_J59_60	Motion picture, video and television programs production services, sound recording and music publishing; programming and broadcasting services	cmn	Communication
39	CPA_J61	Telecommunications services	cmn	Communication
40	CPA_J62_63	Computer programming, consultancy and related services; information services	cmn	Communication
41	CPA_K64	Financial services, except insurance and pension funding	ofi	Financial services
42	CPA_K65	Insurance, reinsurance and pension funding services, except compulsory social security	ins	Insurance
43	CPA_K66	Services auxiliary to financial services and insurance services	ofi	Financial services
44	CPA_L68B	Real estate services excluding imputed rents	rsa	Real estate activities
45	CPA_L68A	Imputed rents of owner-occupied dwellings	dwe	Dwellings
46	CPA_M69_70	Legal and accounting services; services of head offices; management consulting services	obs	Business services

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No.	Code	Original I-O table Description	Code	GTAP Sectors Mapped Description
47	CPA_M71	Architectural and engineering services; technical testing and analysis services	obs	Business services
48	CPA_M72	Scientific research and development services	obs	Business services
49	CPA_M73	Advertising and market research services	obs	Business services
50	CPA_M74_75	Other professional, scientific and technical services; veterinary services	obs	Business services
51	CPA_N77	Rental and leasing services	obs	Business services
52	CPA_N78	Employment services	obs	Business services
53	CPA_N79	Travel agency, tour operator and other reservation services and related services	obs	Business services
54	CPA_N80T82	Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services	obs	Business services
55	CPA_O84	Public administration and defense services; compulsory social security services	osg	Public administration and defense
56	CPA_P85	Education services	edu	Education
57	CPA_Q86	Human health services	hht	Human health and social work
58	CPA_Q87_88	Social work services	hht	Human health and social work
59	CPA_R90T92	Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services	ros	Recreational and other services
60	CPA_R93	Sporting services and amusement and recreation services	ros	Recreational and other services
61	CPA_S94	Services furnished by membership organizations	ros	Recreational and other services
62	CPA_S95	Repair services of computers and personal and household goods	ros	Recreational and other services
63	CPA_S96	Other personal services	ros	Recreational and other services
64	CPA_T	Services of households as employers; undifferentiated goods and services produced by households for own use	ros	Recreational and other services
65	CPA_U	Services provided by extraterritorial organizations and bodies	osg	Public administration and defense

AT.6 Checking Sectoral Balance and Non-negativity Conditions

After converting the Serbian I-O table to the format required by GTAP Data Base, sectoral balance and non-negativity checks were conducted. The new data base passed the sectoral balance check and non-negativity conditions.