

S.1 Introduction

The Ivorian data in the Global Trade Analysis Project (GTAP) database was constructed from the 1998 Supply-use Table for Côte d'Ivoire (Koné and Diallo, 2007). This information, which is therefore about 23 years old, no longer corresponds to the structure of the Ivorian economy and, consequently, its use is questionable. To ensure greater reliability in the use of the database, it is necessary to update the statistical information with more recent data. To this end, we have undertaken to collect and process more up-to-date data on the Ivorian economy to design a new input-output table for the GTAP database. The main objective of this paper is to present the steps followed in the preparation of this new input-output table following the GTAP format (Huff, McDougall, and Walmsley, 2000). Section 2 of the document indicates the source of the data used and gives a brief description of them. Section 3 presents the steps followed in the elaboration of the Input-Output table. Section 4 presents some key elements of the final Input-Output Table for Côte d'Ivoire.

S.2 Data Sources

The data source for the input-output table for GTAP is a social accounting matrix (SAM) for Côte d'Ivoire developed for the Ministry of Economy and Finance of Côte d'Ivoire (Diallo, 2018). This was constructed using a combination of three main databases: the Supply-Use table of the Ivorian economy for the year 2015, the household living standards survey for 2015, and the balance of payments for the same year. All this information was collected from the National Institute of Statistics (INS) with the assistance of the Department of Forecasting, Policies and Economic Statistics (DPPSE) of the General Directorate of the Economy (DGE) of Côte d'Ivoire. The SAM consists of 53 industries, 53 products, five institutional agents (two categories of representative households - a rural household, an urban household - a government, a representative firm, and the rest of the world), five tax accounts (taxes on production net of subsidies, indirect taxes on products, taxes on exports, taxes on imports and direct taxes on household and firms income), and two primary factors (capital and labor). Table 8.34 presents the industries/products of the SAM.

Table 8.34: Sectors of Cote d'Ivoire's Social Accounting Matrix (SAM)

No.	Sector / Product	Code	No.	Sector / Product	Code
1	Corn	pmais	28	Beverages	pindb
2	Rice	priz	29	Tobacco	pindtab
3	Yam	pignam	30	Textile and clothing industry products	pindtex
4	Cassava	pmanic	31	Leather and footwear	pindcuir
5	Plantain	pbaplai	32	Woodworking products and wooden articles	ptbfa
6	Other food crops	ptvivr	33	Paper and cardboard; printed and published products	pindpci
7	Cocoa	pcacao	34	Products of the refining, coking industry	prafcoc
8	Coffee	pcafe	35	Chemical products	pindch
9	Cotton	pcoton	36	Rubber and plastic products	pindaou
10	Sweet banana and pineapple	pbanan	37	Other non-metallic mineral products and articles	pfaup
11	Palm tree	ppalmier	38	Basic metal products and articles of metal	ppmetal
12	Other oilseeds	Patrolea	39	Machinery, electrical appliances and transport equipment	pfmeq
13	Hevea	phevea	40	Furniture, products of various industries	pfmindd
14	Cashew nuts	panacard	41	Electricity, gas, water and ice	ppdisel
15	Other industrial products	patrpi	42	Construction works	pconstr
16	Plants and seeds	pplsem	43	Wholesale and retail sales	pcomgd
17	Livestock and hunting products	pelchas	44	Repairs	prepart
18	Forestry products	psylv	45	Hotel and restaurant services	photres
19	Fishing and fish farming products	pppis	46	Transportation and communication	ptranco
20	Oil industry products	pindpetr	47	Postal and telecommunication services	pptelcom
21	Other extractive industries products	paindex	48	Financial services	pafinanc
22	Meat and fish	ppv	49	Real estate services	paimmo
23	Grain processing and starch products	ptrgfp	50	Business services	psferfent
24	Cocoa and coffee products	picacaf	51	Public administration and security services	padmpss
25	Oilseed industry	pindolea	52	Education	peduc
26	Bakery, pastry and pasta products	pbpp	53	Health and social services	psant
27	Dairy products, fruit products	pindlf			

Source: Author's elaboration.

Data are reported in billions of CFA francs. Several key characteristics emerge from an examination of the matrix. It appears that:

- * GDP at market prices is estimated at 19,595.38 billion CFA francs;
- * Total value added is 17,189.27 billion CFA francs.
- * Agriculture continues to be an important sector of the economy. It generated 25.92% of total value added in 2015;
- * Despite the central role of agriculture, services now contribute the most to the formation of total value added (about 50% in 2015);
- * The Ivorian economy displays, in 2015, a positive trade balance. Exports amounted to around CFAF 9,584 billion, while imports were around CFA 8,840 billion;
- * Gross fixed capital formation stands at 3,826.94 billion CFA francs.

Based on this matrix, which is used as the empirical basis for the computable general equilibrium model of the Department of Economic Forecasting, Policies and Statistics (DPPSE) of the Ministry of Economy and Finance of Côte d'Ivoire, we have built the new Input-Output table for Côte d'Ivoire for the GTAP database.

S.3 Construction of the Input-Output Table for GTAP

Data handling and preparation

The Input-output table of Côte d'Ivoire for the GTAP was built following the methodology developed by Horridge et al. (2008) and Huff et al. (2000). Starting with the SAM, the data were reorganized according to the model suggested by Horridge et al. (2008) to obtain an Input-Output table at producer prices of dimension 57x62.

The analysis of the original SAM data showed that generally the share of capital in value added is greatly overestimated. This is due to the fact that mixed income includes a share of wage income that was not deducted in the data processing. In general, the wage income of owners of individual and/or family businesses has not been included in labor income. This is particularly common in industries with a high share of informal activities. To correct this, we used information on the factorial distribution of value added from the SAM of Diallo, Koné and Kamagaté (2010). Then the SAM was rebalanced before starting the work of constructing the SUT table for Côte d'Ivoire in GTAP format.

The rows of the table thus constructed refer to production inputs plus primary factors (labor, capital, and land) and taxes on production net of subsidies. The columns refer to the uses of commodities, including intermediate use, private household consumption, government consumption, investment, changes in inventories, and exports. To this, we added other columns related

to the commodity tax on domestic goods (DomTax), the value of imports (Mcif), net commodity taxes on imports (Mtax), and net Tariffs (MTar). The construction of the input table respects the main assumptions of Horridge et al. (2008). In this regard:

- * The table shows the intermediate use and value-added inputs used in the production of the 53 commodities; as well as sales to final demand;
- * The totals of the first 53 rows correspond to the total use (sales) of domestic goods at producer prices (including taxes). They are equal to the first 53 column totals, corresponding to the products (costs) of goods;
- * Three columns are related to import information. They indicate border values (Mcif), tariff revenue (Mtar), and other consumption taxes on imports (Mtax). The figures are entered as negative numbers;
- * The "Land" row in our table was left blank because the social accounting matrix that was used to support this work does not explicitly highlight land.

Commodity Aggregation and Splits

To ensure better processing of the data in terms of matching the 65 sectors in the GTAP database, we analyzed the sector/product nomenclature of the Côte d'Ivoire SAM and performed an aggregation that reduced the sectors from 53 to 41. Table 8.35 below shows how these sectors were mapped. Column 1 of the table shows the numbers of the SAM sectors that were aggregated to arrive at the 41 sectors/products that were subsequently used for the rest of the exercise. These 41 sectors/products were mapped to the 65 sectors/products in the GTAP database. The last two columns show how the 41 sectors in the Côte d'Ivoire data were linked to the 65 sectors in GTAP.

After transforming the SAM into an input-output table as recommended by Horridge et al. (2008), the data and sets were organized into two files usable by GEMPACK. These files are the ORIG.HAR file which contains the data and the SETS.HAR file which defines the sets. These files were used as input to run the methodology in different steps (see Table 8.36).

S.4 Côte d'Ivoire's GTAP Input-Output Table Description

Following the procedure described in Horridge et al. (2008), it was possible to generate a series of tables that met the classification and data requirements of GTAP. These tables include, among others:

- * UF: Usage of input *i* in use *u*, commodity tax excluded;
- * UP: Usage of input *i* by use *u*, commodity tax inclusive;
- * OP: Output of sector *i*, non-commodity indirect tax included;

Table 8.35: Concordance between Cote d'Ivoire SAM's sectors and GTAP sectors

SAM sector number	Aggregated sectors (53 sectors into 40 sectors)	Mapping GTAP Sectors (65)		
	Description	Code	Number	Codes
1	Corn	gro	3	gro
2	Rice	pdr	1	pdr
3-5, 10	Root and tuber crops, plantain, sweet banana and pineapple	v_f	4	v_f
6	Other food crops	wht	2	wht
7-9, 13-16	Other industrial products	c_bpbc	6; 7; 8	c_b; pfb; ocr
11, 12	Palm and other oilseeds	osd	5	osd
17	Livestock and hunting products	ctloap	9; 10	ctl; oap
18	Forestry products	frs	13	frs
19	Fishing and fish farming products	fsh	14	fsh
20	Oil industry products	oilgas	16; 17	oil; gas
21	Other extractive industries products	coaot	15; 18	coa; oxt
22	Meat and fish	omtcmt	19; 20	cmt; omt
23	Products of grain processing and starch products	pcsrgr	23; 24	pcr; sgr
24, 26	Products of cocoa, coffee, bakery, pastry and pasta	ofd	25	ofd
25	Oilseed industry	vol	21	vol
27	Dairy products, fruit products	rmkmil	11; 22	rmk; mil
28, 29	Beverages and tobacco	b_t	26	b_t
30	Products of the textile and clothing industry	woltexw	12; 27; 28	wol; tex; wap
31	Leather and footwear	lea	29	lea
32	Woodworking products and wooden articles	lum	30	lum
33	Paper and cardboard; printed products	ppp	31	ppp
34	Products of the refining, coking industry	p_c	32	p_c
35	Chemical products	chmbph	33; 34	chm; bph
36	Rubber and plastic products	rpp	35	rpp
37	Other non-metallic mineral products and articles	nmm	36	nmm
38	Basic metal products and articles of metal	isfmfmp	37; 38; 39	i_s; nfm; fmp
39	Machinery, electrical appliances and transport equipment	eleqomtn	40; 41; 42; 43; 44	ele; eeq; ome; mvh; otn
40, 44	Furniture, miscellaneous industrial products and repairs	omf	45	omf
41	Electricity, gas, water and ice	elygdwtr	46; 47, 48	ely; gdt; wtr
42	Construction works	cns	49	cns
43	Wholesale and retail sales	trd	50	trd
45	Hotel and restaurant services	afsros	51; 61	afs; ros
46	Transportation and communication	otpwtp	52; 53; 54	otp; wtp; atp
47	Post and telecommunications services	cmn	56	cmn
48	Financial Services	ofinsrsa	57; 58; 59	ofi; ins; rsa
49	Real Estate Services	dwe	65	dwe
50	Business services	whsobs	55; 60	whs; obs
51	Public administration and security services	osg	62	osg
52	Education	edu	63	edu
53	Health and social services	hht	64	hht

Source: Author's elaboration.

Table 8.36: Stages in Processing Cote d'Ivoire Data

Stage	Program	Input	Output	Task
0	STEP0.TAB	ORIG.HAR, SETS.HAR	STEP0.HAR	We need to re-order the final demand and value-added appropriately. The program STEP0.TAB allows us to do this and check the balance and sign.
1	STEP1.TAB	STEP0.HAR	STEP1.HAR	STEP1.TAB use SETP0.HAR as input to split commodity flows into imported and domestic parts (at producer prices).
2	STEP2.TAB	STEP1.HAR	STEP2.HAR	STEP2.TAB separates the basic and tax parts of these flows and split imported and domestic commodity flows into basic and tax parts.
3	STEP3.TAB	STEP2.HAR	STEP3.HAR	STEP3.TAB is used aggregate sectors to eliminate sector detail not needed by GTAP
4	STEP4.TAB	STEP3.HAR	STEP4.HAR	The STEP4.TAB program converts data from the STEP3.HAR the country I-O Table to GTAP contributor format and write diagnostic and summary data

Source: Author's elaboration.

* MF: Imports of commodity i, import duties excluded, etc.

For more details, see Table A1 in the appendix. As shown in table 8.37 below, the absolute difference between sectoral sales and costs is almost zero.

According to the results of the construction of the Input-Output table for Côte d'Ivoire, the expenditure GDP side is about 19,595 billion CFA francs (Table 8.38). The difference between expenditure and income GDP is almost zero (0.002).

At the sectoral level, analysis of the results indicates that agriculture in general and the industrial and export agriculture sector, which includes the cocoa sector, occupies an important place in the Ivorian economy. It contributes about 11% of total value added and 7.75% of total production (Table 8.39).

Table 8.37: Absolute difference between Sectoral sales and costs

Sector	SALE	COST	Absolute difference
1 gro	272	272	0,002
2 pdr	382	382	-0,001
3 v_f	1804	1804	0,001
4 wht	209	209	0,002
5 c_bpbc	2509	2509	0,001
6 osd	187	187	-0,002
7 ctloap	141	141	0
8 frs	314	314	0
9 fsh	60,1	60,1	0
10 oilgas	1104	1104	-0,001
11 coaoxt	181	181	0,002
12 omtcmt	411	411	0
13 pcrsgr	327	327	-0,002
14 ofd	1294	1294	0,002
15 vol	874	874	0,001
16 rmkmil	393	393	0
17 b_t	299	299	0,001
18 woltexwa	397	397	0
19 lea	83,1	83,1	-0,001
20 lum	263	263	0
21 ppp	199	199	0
22 p_c	1709	1709	-0,001
23 chmbph	486	486	0
24 rpp	940	940	0,002
25 nmm	349	349	0,001
26 isfmfmp	564	564	-0,002
27 elegomtn	56,2	56,2	0
28 omf	816	816	-0,001
29 elygdwtr	536	536	0
30 cns	1791	1791	-0,002
31 trd	5473	5473	0
32 afsros	138	138	0
33 otpwtptp	1124	1124	0
34 cmn	1107	1107	0
35 ofinsrsa	395	395	0
36 dwe	863	863	0
37 whsobs	1514	1514	-0,001
38 osg	1885	1885	0
39 edu	711	711	0
40 hht	229	229	0
Total	32393	32393	0,001

Source: Author's elaboration.

Table 8.38: Cote d'Ivoire GDP structure (2015)

Component	Value (billion of CFA)	Share of GDP
GDP – Income side		
Labor	7246	36,98%
Capital	9942	50,74%
Land	-	-
Production Taxes	276	1,41%
Commodities Taxes	1744	8,90%
Tarif	387	1,97%
GDP	19595	100
GDP – Expenditure side		
Investment	3827	19,53%
Private Consumption	12198	62,25%
Government Consumption	2657	13,56%
Stock Change	169	0,86%
Exports	9585	48,92%
Imports	-8840	-45,11%
GDP	19595	100%

Source: Author's elaboration.

Table 8.39: Sectoral distribution of total value-added and production

Description	Sectors	Code	Value-added		Production	
			Value	Share (%)	Value	Share (%)
Corn		gro	237,8	1,38	272	0,84
Rice		pdr	289,7	1,69	382	1,18
Root and tuber crops, plantain, sweet banana and pineapple		v_f	1499	8,72	1804	5,57
Other food crops		wht	192,7	1,12	209	0,65
Other industrial products		c_bpbc	1886	10,97	2509	7,75
Palm and other oilseeds		osd	181,8	1,06	187	0,58
Livestock and hunting products		ctloap	107,1	0,62	141	0,44
Forestry products		firs	49,4	0,29	314	0,97
Fishing and fish farming products		fish	13,51	0,08	60,1	0,19
Oil industry products		oilgas	882	5,13	1104	3,41
Other extractive industries products		coaoxt	59,8	0,35	181	0,56
Meat and fish		omtcmt	49,1	0,29	411	1,27
Products of grain processing and starch products		pcrsgr	39,9	0,23	327	1,01
Products of cocoa, coffee, bakery, pastry and pasta		ofd	370	2,15	1294	4,00
Oilseed industry		vol	249	1,45	874	2,70
Dairy products, fruit products		rmkmil	210,2	1,22	393	1,21
Beverages and tobacco		b_t	117,4	0,68	299	0,92
Products of the textile and clothing industry		woltexwa	128,3	0,75	397	1,23
Leather and footwear		lea	35,9	0,21	83,1	0,26
Woodworking products and wooden articles		lum	70,6	0,41	263	0,81
Paper and cardboard; printed products		ppp	69,8	0,41	199	0,61
Products of the refining, coking industry		p_c	411	2,39	1709	5,28
Chemical products		chmbph	157,3	0,92	486	1,50
Rubber and plastic products		rpp	396	2,30	940	2,90
Other non-metallic mineral products and articles		nmm	141,1	0,82	349	1,08
Basic metal products and articles of metal		isfmfmp	153,6	0,89	564	1,74
Machinery, electrical appliances, and transport equipment		eleqomtn	17,06	0,10	56,2	0,17
Furniture, miscellaneous industrial products, and repairs		omf	457	2,66	816	2,52
Electricity, gas, water and ice		elygdwtr	365	2,12	536	1,65
Construction works		cns	918	5,34	1791	5,53
Wholesale and retail sales		trd	1677	9,76	5473	16,90
Hotel and restaurant services		afsros	54	0,31	138	0,43
Transportation and communication		otpwtp	494	2,87	1124	3,47
Post and telecommunications services		cmn	898	5,22	1107	3,42
Financial Services		ofinsrsa	112,1	0,65	395	1,22
Real Estate Services		dwe	846	4,92	863	2,66
Business services		whsobs	1304	7,59	1514	4,67
Public administration and security services		osg	1319	7,67	1885	5,82
Education		edu	583	3,39	711	2,20
Health and social services		hht	147,1	0,86	229	0,71
Total			17189,27	100	32389,4	100

Source: Author's elaboration.

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