PANAP: General Annual Meeting

Pan-African Network for Economic Analysis of Policies

Database: from National accounts and surveys to SAMs. SAM Multipliers, SAM into CGE models.

Andrea El Meligi
Andrea.EL-MELIGI@.ec.europa.eu

15th September 2022

Index

- **Introduction**
  - What is a SAM?
  - Importance
- **Database: from National Statistics to Social Accounting Matrix**
  - Data sources
  - Macroeconomic and microeconomic data in a SAM
  - Construction and Balancing
  - SAM structure
  - Economic agents and accounts
- **Use of Social Accounting Matrices for policy analysis (multipliers analysis)**
  - Linear SAM model
  - Types of multipliers based on SAMs
  - Job calculator

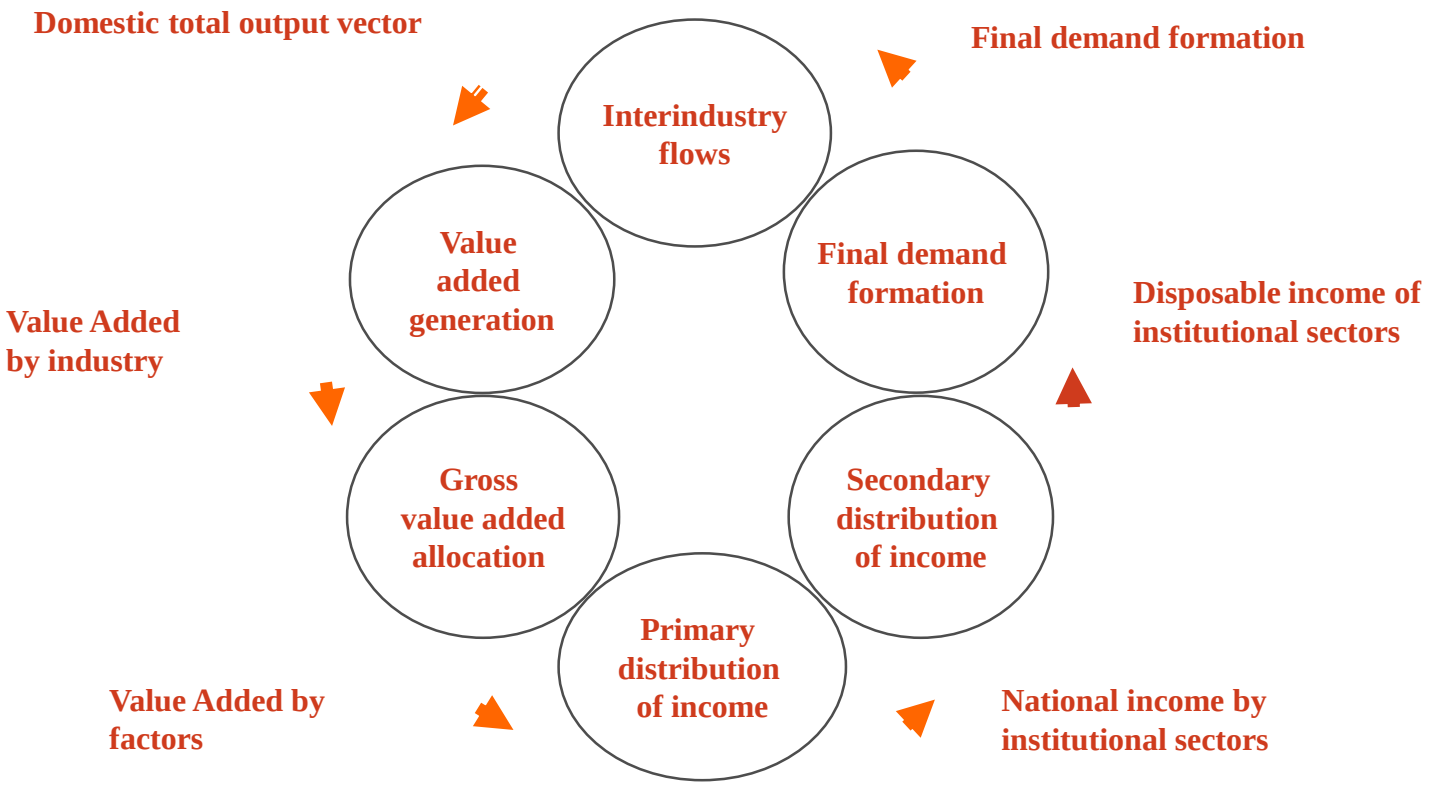
Introduction

- The origins of SAMs are found in the pioneering works of Stone (1947) and subsequent advances in their use as a model for economic analysis (Miyazawa 1976, Defourny & Thorbecke, 1984; Pyatt & Round, 1985).
- A SAM extends the information provided by the Input-Output table by using a more disaggregated accounting structure of expenditure and income.
- This allows closing circular flow of income.

What is a SAM?

- A Social Accounting Matrix (SAM) is a comprehensive and economy-wide database recording data of all transaction between economic agents in a specific economy for a certain period of time.
- It incorporates all economic transactions, between institutional sectors, productive activities, goods and services and factors of production.
- It describes the circular flow of income and spending in a national economy.

Figure 1. The circular flow (simple version).



Importance

- Bring together data from several sources.
- Describe the structural characteristics of an economy providing a visual display of the linkages among agents in the economy and the circular flow of income.
- They are used to the application of multisectoral linear models (e.g. multipliers).
- They are the reference database for the calibration and development of Computable General Equilibrium models (CGE).

Database: from National Statistics to Social Accounting Matrix

Data sources

Macroeconomic and microeconomic data in a SAM

Construction and Balancing

SAM structure

Economic agents and accounts

European Commission

Data sources

- The Input-output full frame: supply and use tables (or symmetric table).
- National Accounts.
- Data on consumption and expenditure patterns of households and to the source of their income.
  - ✓ Households' surveys or similar.
- Statistics on the labour market and its composition: skilling, employment, wages, sectors, etc.
- Databases relating to external sector imports and exports of goods and services.
- Others: Surveys / agricultural census/Government budget accounts/ Tax data.

Construction and Balancing

- Usually, there are two main steps in the construction of a SAM:

1. Construction of the **Macro SAM**:

➢ Built a Macro SAM using the National Accounts and various other sources. This defines a **set of control totals** for the subsequent disaggregation's and means that the SAM is consistent with any macro analysis (Reinert & Roland-Holst, 1997).

2. Construction of the detailed **Micro SAM**:

➢ **Using shares** (from data such as Input-Output tables) to re-calibrate and **fit to the macroeconomic aggregates**.

➢ Balancing the SAM using statistical data or econometric optimization methods (RAS, GRAS, Cross Entropy Method) (McDougall, 1999; Robinson et al., 2001).

Construction and Balancing

Macro SAM example:

	Activities	Commodities	Factors	Enterprises	Households	Government	Taxes	Investment	Rest of the World	Total
Activities		2,151,741								2,151,741
Commodities	735,638				1,099,313	148,837		588,705	122,366	2,694,859
Factors	1,416,103								9,282	1,425,386
Enterprises			509,423			5,595			277	515,295
Households			910,486	369,922		11,211			127,340	1,418,959
Government				18,729	8,298		188,892		28,570	244,489
Taxes		118,590		41,207	29,096					188,892
Saving				84,828	279,600	73,063			151,215	588,705
Rest of the World		424,528	5,478	610	2,652	5,783				439,051
Total	2,151,741	2,694,859	1,425,386	515,295	1,418,959	244,489	188,892	588,705	439,051	

- Mainar, Ferrari & McDonald. (2018). **Social Accounting Matrices: basic aspects and main steps for estimation.**
- Robinson, S., Cattaneo, A., & El-Said, M. (2001). **Updating and estimating a social accounting matrix using cross entropy methods**. *Economic Systems Research*, 13(1), 47-64.
- McDougall, R. A. (1999). **Entropy theory and RAS are friends**. GTAP Working Papers, 6.
- System of National Accounts 2008.
- ISIC: International Standard Industrial Classification of All Economic Activities.

SAM structure

- Square matrix
- Column accounts record spending
- Row accounts record income
- Each cell (*i*,*j*) shows the transaction between account *i* and *j*, in which account *i* receives income from *j*.
- For each agent, total expenditure (column account total) must equal total income (row account total).

Usually, a SAM has six basic groups of accounts:

- Activities/Commodities
- Factors
- Private institutions
- Government
- Combined capital accounts
- Rest of the World

SAM structure

Final demand

Matrix Input-Output

Value added

		Producers					Products						Factors			Institutions							
		Agriculture	Mining	Manu-facturing	Other Industry	Services	Agriculture	Mining	Manu-facturing	Other Industry	Services	Trade Margins	Labour	Land	Capital	Enterprises	Households	Gov	Tax	Savings-Investment	Stocks	ROW	Tot
Producers	Agriculture	-	-	-	-	-	24 788	-	-	-	-	-	-	-	-	-	5 168	-	-	-	-	-	29 956
	Mining	-	-	-	-	-	-	30 803	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30 803
	Manu-facturing	-	-	-	-	-	-	-	25 745	-	-	-	-	-	-	-	1 806	-	-	-	-	-	27 551
	Other Industry	-	-	-	-	-	-	-	-	41 433	-	-	-	-	-	-	-	-	-	-	-	-	41 433
	Services	-	-	-	-	-	-	-	-	-	119 661	-	-	-	-	-	-	-	-	-	-	-	119 661
Products	Agriculture	782	-	8 699	-	1 869	-	-	-	-	-	-	-	-	-	-	13 703	-	-	-	1 300	5 557	31 910
	Mining	8	87	4 692	3 427	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 239	24 841	34 311
	Manu-facturing	3 040	12 184	6 239	12 417	17 777	-	-	-	-	-	-	-	-	-	-	29 425	-	-	9 571	-	6 264	96 916
	Other Industry	374	1 403	409	1 209	4 470	-	-	-	-	-	-	-	-	-	-	7 174	-	-	26 394	-	0	41 433
	Services	1 478	8 966	832	2 084	35 100	-	-	-	-	-	22 439	-	-	-	-	31 371	22 341	-	-	-	19 250	43 860
	Trade Margins	-	-	-	-	-	5 117	2 222	15 101	-	-	-	-	-	-	-	-	-	-	-	-	-	22 439
Factors	Labour	8 653	1 870	1 931	2 719	28 023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43 196
	Land	8 387	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8 387
	Capital	7 233	6 293	4 749	19 577	32 405	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	781	71 038
Institutions	Enterprises	-	-	-	-	-	-	-	-	-	-	-	-	-	63 966	-	-	9 020	-	-	-	-	72 986
	Households	-	-	-	-	-	-	-	-	-	-	-	43 196	8 387	4 177	59 256	-	1 571	-	-	-	5 025	121 612
	Gov	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6 101	289	-	22 455	-	-	2 762	31 607
	Tax	-	-	-	-	-	750	39	12 742	0	1 532	-	-	-	-	3 826	3 566	-	-	-	-	-	22 455
	Savings-Investment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3 804	29 111	(3 053)	-	-	-	8 643	38 504
	Stocks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2 540	-	-	2 540
	ROW	-	-	-	-	-	1 256	1 248	43 328	0	22 667	-	-	-	2 895	-	-	1 729	-	-	-	-	73 123
	Tot	26 273	30 803	27 551	41 433	119 661	31 910	34 311	96 916	41 433	143 860	22 439	43 196	8 387	71 038	72 986	121 612	31 607	22 455	38 504	2 540	73 123	-

Payments

Income distribution and transfer between institutions

Incomes

European Commission

Macroeconomic and microeconomic data in a SAM

- The data in a SAM provide a summary description of a nation's economic activity.
- Provide **macroeconomic indicators** (private consumption expenditure, imports) and **descriptive macroeconomic statistics** (GDP).
- It illustrates how the macroeconomic behaviour of an economy rests on the microeconomic behaviour of firms and households.
- Microeconomic data describes a nation's economic activity in detail.
  - e.g. data on production describe the amount spent by each industry on each type of intermediate and factor input.
  - e.g. data on household demand describe expenditure on each type of commodity.

Figure 2. A SAM standard structure

	Commodities	Activities	Factors	Households	Enterprises / Corporations	Government	Savings-Investment	Rest of the World	Total
Commodities		Intermediate (inputs) consumption		Household consumption		Government expenditure	Investment and stock changes	Exports	Demand
Activities	Domestic production								Gross output / Production (activity income)
Factors		Remuneration of factors / Factor income						Factor income from RoW	Factor income
Households			Factor income distribution to households	(Inter Households transfers)	Distribution of corporations income to households	Government transfers to households		Transfers to Households from RoW	Household income
Enterprises / Corporations			Factor income distribution to enterprises			Government transfers to enterprises		Transfers to Enterprises from RoW	Enterprise income
Government	Net taxes on products	Net taxes on production	Factor income to Government / Factor taxes	Direct Household taxes / Transfers to Government	Direct Enterprise taxes / Transfers to Government			Transfers to Government from RoW	Government income
Savings-Investment			(Depreciation)	Household savings	Enterprise savings	Government savings	(Capital accounts transfers)	Capital transfers from RoW (Balance of Payments)	Savings
Rest of the World	Imports		Factor income distribution to RoW	Household transfers to RoW	Corporations income to Row	Government transfers to RoW			Payments to RoW
Total	Supply	Costs of production activities	Expenditure on factors	Household expenditure	Enterprise expenditure	Government expenditure	Investment	Incomes from RoW	

Source: Aragie et al. (2017), Kiringai et al. (2007) and Round (2003).

Economic agents and accounts in a SAM

- **Activities**

By column:

-Intermediate consumption

-Remuneration of factors

-Net taxes on production

By row: values of commodities produced by each activity.

- **Commodities**

By column: supply of commodities

-Domestic production

-Net taxes on products

-Margins

-Imports

By row: demand side

-Intermediate consumption

-Final demand consumption

- **Factors of production**

Resources used in the production process (i.e. labour, land).

By row: income it receives (wages, rent, etc.) from the production activities in which it is employed.

By column: income distribution to the owners of the factors of production (Household, Enterprises and Government and RoW).

- **Trade and transport (Margins)**

Margins are trade and transport cost associated with moving goods between producers, markets and national boarders, either for domestic, import or export trade.

Trade and transport margins are part of the cost of supplying the commodities.

Economic agents and accounts in a SAM

- **Households**

By column: household expenditure.

By row: incomes received (from factors supplied, transfers from Enterprises, from the Government (direct transfers), from the Rest of the World (usually for labour services and remittances)).

- **Enterprises**

Represent the institutional part of the productive sector, so they do not consume any goods.

By column: revenues transferred to other institutions (households in the form of dividends), pay direct taxes or savings.

By row: receive incomes related to the asset ownership and income by transfers form other institutions.

- **Government**

The Public Administration institutional sector and accounts specific for each tax category.

By column: consumption demand of goods and services, transfers to other institutions in form of subsidies or benefits or to other countries, government surplus or government deficit.

By row: income comes from taxes, transfers received and the remuneration of factors of production.

- **Taxes**

By row: describe the economic activities on which taxes are levied and the amount of tax revenue that is generated.

By column: taxes allocated to the government

Economic agents and accounts in a SAM

- **Saving-Investment**

By row: savings generated by all domestic institutions and transfers of capital from foreign institutions.

By column: capital investment, the Gross Fixed Capital Formation (GFCF) and changes in stocks.

- **Rest of World**

Shows the economic interaction within the country (or region) analysed and the rest of the world.

By row: income received by the rest of the world account that include imports of commodities, transfers to abroad from the domestic institutions, and the remuneration of factors of production abroad.

By column: expenditures by the rest of the world, divided into the purchase of goods and services (exports), the payments to domestic factors of production used abroad and transfers recorded from other economies (factor payments, foreign loans and aid, remittances, etc.).

The balance, reflects the surplus or deficit with the Rest of the World.

Home Production for Home Consumption

- In developing countries, the dual role of households as producers and consumers is often a typical characteristic: home production for home consumption (HPHC) in a SAM.
- The HPHC concept is introduced by assuming that each household also has a "productive activity" consuming their own-produced output.
- Separate the commodities produced by these households for own consumption and other marketed commodities. HPHC commodities can only be produced by the RHGs that consume those commodities.

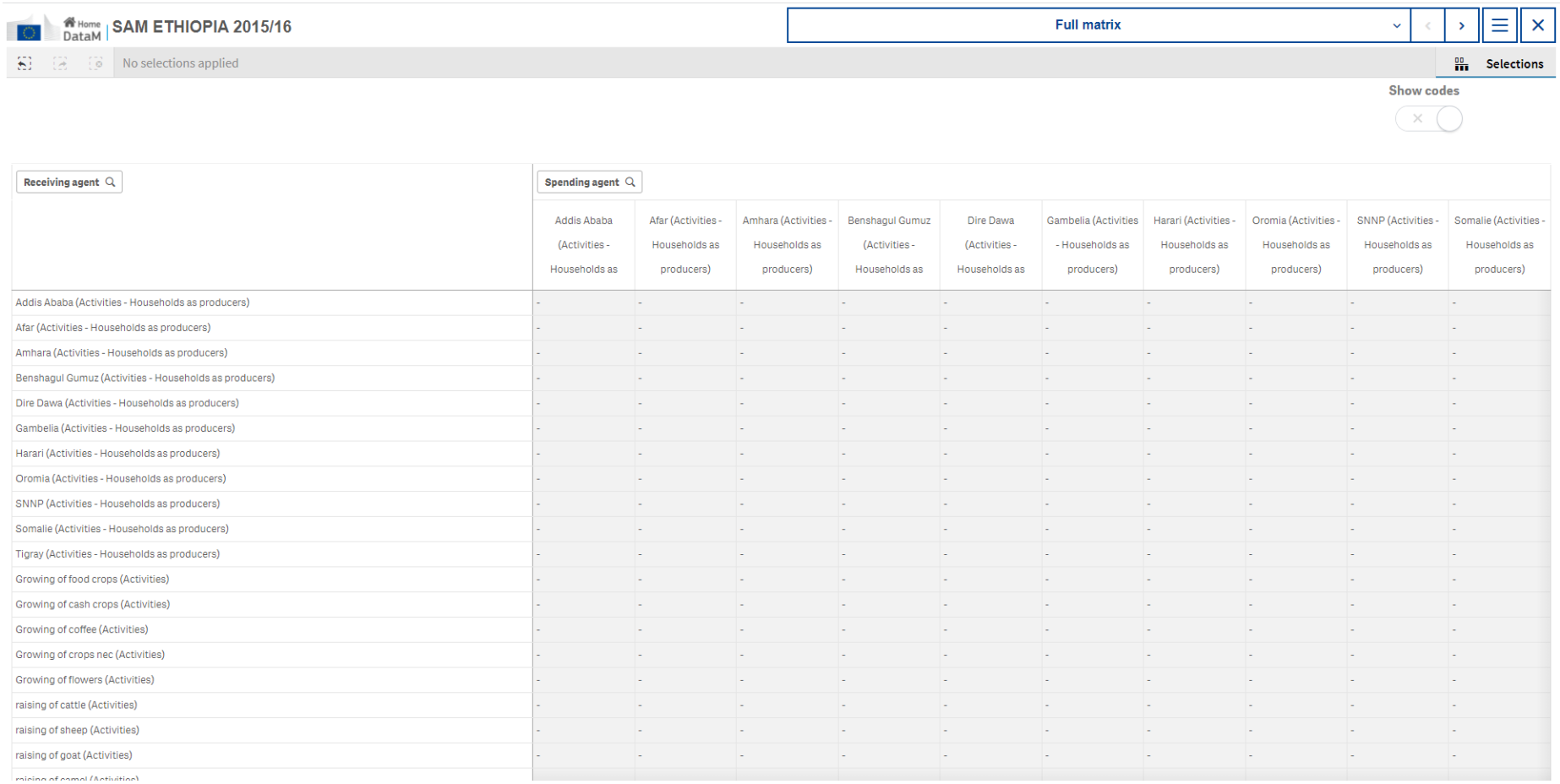
Home Production for Home Consumption

Figure 2. Split of activities and commodities considering the HPHC approach

		Commodities		*Activities*								
		HPHC Commodities (CH)	**Marketed Commodities (C_M)**	**Households as Activities (A_H)**	**Activities (A)**	**(F)**	**(H)**	**(E)**	**(G)**	**(S-I)**	**(RoW)**	***Total***
Commodities	**HPHC Commodities (C_H)**			Intermediate (inputs) consumption			Household consumption			Stock changes		*Demand of HPHC commodities*
	Marketed Commodities (C_M)			Intermediate (inputs) consumption	Intermediate (inputs) consumption		Household consumption		Government expenditure	Investment and stock changes	Exports	*Demand of marketed commodities*
Activities	**Households as Activities (A_H)**	Domestic production	Domestic production									*Gross output / Production (Households activities)*
	Activities (A)		Domestic production									*Gross output / Production (activity income)*
	Factors (F)			Remuneration of factors / Factor income	Remuneration of factors / Factor income							
	Households (H)											
	Enterprises / Corporations (E)											
	Government (G)		Net taxes on products		Net taxes on production							
	Savings-Investment (S-I)											
	Rest of the World (RoW)		Imports									
	Total	*Supply of HPHC commodities*	*Supply of marketed commodities*	*Costs of production for Households as activities*	*Costs of production activities*							

Source: Mainar-Causapé, A. J., Boulanger, P., Dudu, H., & Ferrari, E. (2020). *Policy impact assessment in developing countries using Social Accounting Matrices: The Kenya SAM 2014*. Review of Development Economics, 24(3), 1128-1149.

SAM Ethiopia

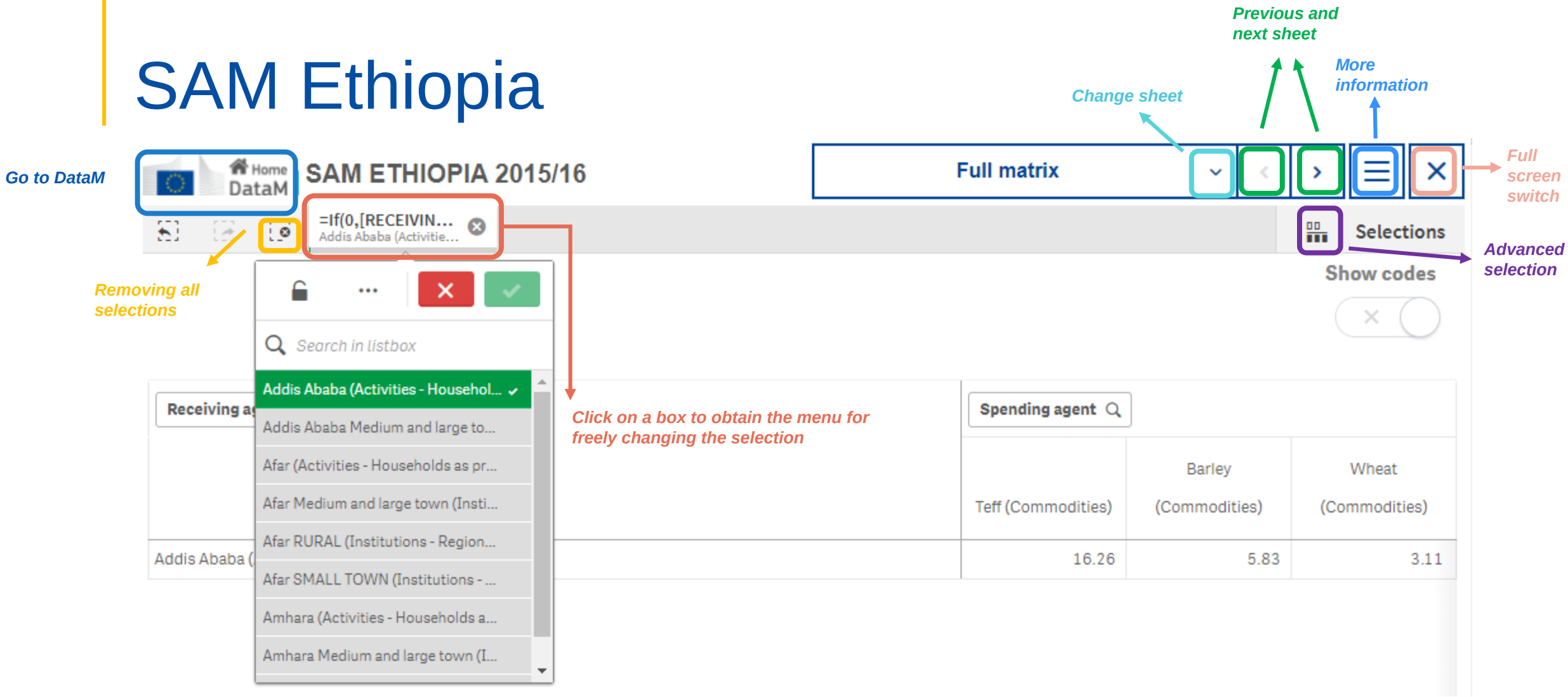


Link: https://datam.jrc.ec.europa.eu/datam/mashup/SAM_ET_201516/

Source: DataM, provided by the European Commission – Joint Research Centre. Dashboard: SAM - Ethiopia 2015/2016, accessed on 06/10/2021.

European Commission

SAM Ethiopia



Source: DataM, provided by the European Commission – Joint Research Centre. Dashboard: SAM - Ethiopia 2015/2016, accessed on 06/10/2021.

European Commission

SAM for policy analysis: Multipliers analysis

The linear SAM model and multipliers

Types of multipliers based on SAM

Jobs Calculator

European Commission

The linear SAM model and multipliers

- SAM are used as databases for linear multiplier models, enabling the **linkages** between sectors to be analysed.
- Multiplier effects show those commodities with capacity to generate output, employment and value added, and therefore, identified which ones are suitable to be promoted through policies.
- Multiplier analysis is a useful tool for ex-ante policy evaluation (although the exact results must be taken with some caution).
- A simple exercise can be developed showing the variation in output and employment, generated by an exogenous demand shock due to changes in a selected commodity.

The linear SAM model and multipliers

$$\boldsymbol{y_n = A_{nn} y_n + x_n}$$

$$\boldsymbol{y_n = (I - A_{nn})^{-1} x_n}$$

$$\boldsymbol{M_{nn} = (I - A_{nn})^{-1}}$$

$$\boldsymbol{y_n = M_{nn} x_n}$$

- $\boldsymbol{y_n}$ is the column vector of income of the endogenous accounts.
- $\boldsymbol{x_n}$ is the vector of final demand variables where a shock can be introduced.
- A_{nn} is the matrix of coefficients. Its components (a_{ij}) represents the share of payments of a sector j in another sector i on the total expenditures of sector j.
- $M_{nn}$is the **matrix of SAM accounting multipliers** and each element m_{ij} shows the output requirements of account i to increase the final demand of account j by one unit.

Types of multipliers based on SAM

- Multipliers reveal the variation in output, number of jobs or value added, that can be expected from change in the additional output from each activity generated by an exogenous demand shock.
- Multipliers calculate the resulting ‘direct’, ‘indirect’ and ‘induced’ effects resulting from an increase or decrease in output value in activity ‘*j*’.

Types of multipliers based on SAM

- **Output multiplier**

The sum of the multiplier values of the commodities column of $\boldsymbol{M_a}$.

Indicates the increase in gross output of the economy due to a unitary exogenous shock in the demand for the corresponding commodity.

- **Employment multiplier**

The employment multiplier measure the increment in the number of jobs generated by an exogenous shock in final demand.

$$\boldsymbol{M_e = E \times M_a}$$

$\boldsymbol{E}$ =number of jobs per output value.

$\boldsymbol{M_a}$ = multiplier matrix with commodities columns.

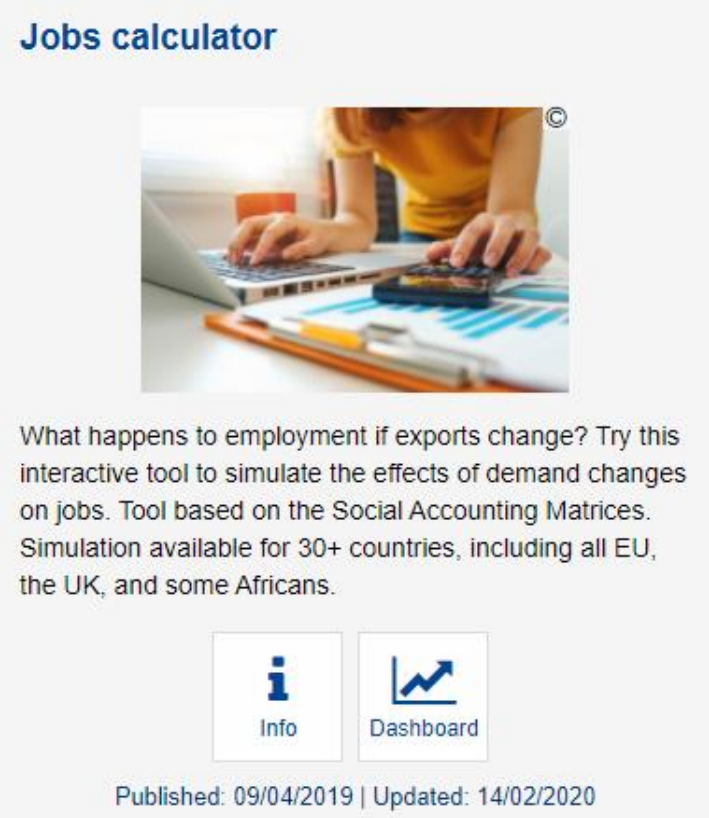
Each element in $\boldsymbol{M_e}$, $\boldsymbol{me_{ij}}$ is the increment in the number of jobs in sector $\boldsymbol{i}$ when there is a unit exogenous injection into the final demand account of $\boldsymbol{j}$.

- **Value added multiplier**

The Value added multiplier relates the new value added created in each sector in response to the exogenous shock (Miller & Blair, 2009).

A value added vector can be used to calculate the Value added multiplier. The vector $\boldsymbol{v}$ contains the ratios between the value added and the output of each activity.

Jobs Calculator



- Interactive tool is based on SAMs that provides the number of jobs that would be generated by an exogenous shock in final demand for the selected commodities.
- Link: https://datam.jrc.ec.europa.eu/datam/area/PANAP#

Jobs Calculator

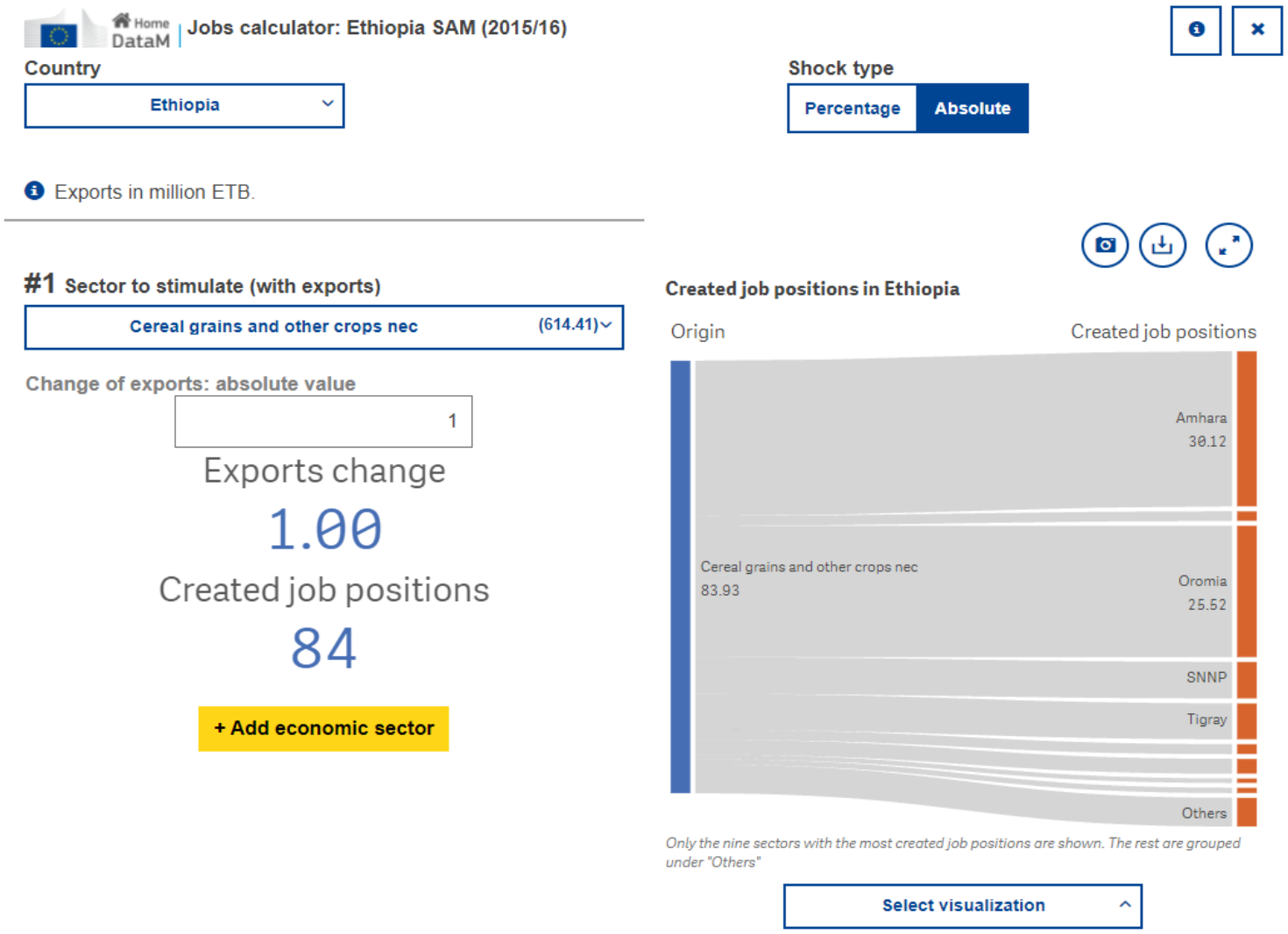
What happens to employment if exports change?

- Demand shock may refer to either external trade, investment and public expenditure.
- Please do NOT interpret results as an accurate forecast of job creation!
- The results are subject to several assumptions such as: constant prices and fixed technology production functions (Leontief type) and do not take into account variations or changes in other socio-economic variables.
- Please take results as an indication of the different potential that commodities have in the employment in the different sectors.

Jobs Calculator

- **Structure**
  - Country view
  - Shock type view:
    - % increase/decrease in the initial value of exports.
    - increase/decrease in the absolute value of exports.
- **Sector to stimulate (with exports)**
  - Shocks can be introduced in several sectors at the same time.
  - Change of exports (absolute value or %)

Jobs Calculator



European Commission

Jobs Calculator

- **Results**
  - Show the variation in job creation in each of the sectors shocked and the aggregate variation (total jobs, jobs in the main productive sector of the commodity, jobs in the other sectors).
  - Created job positions (total job multiplier), origin and created job positions.
  - Visualization: Table, Barchart, Sankey, Radar (Top 10).

Jobs Calculator

Exports in million ETB.

#1 Sector to stimulate (with exports)

Cereal grains and other crops nec (614.41)

Change of exports: absolute value: 1

Exports change	Created job positions
1.00	84

#2 Sector to stimulate (with exports)

Dairy products (6.26)

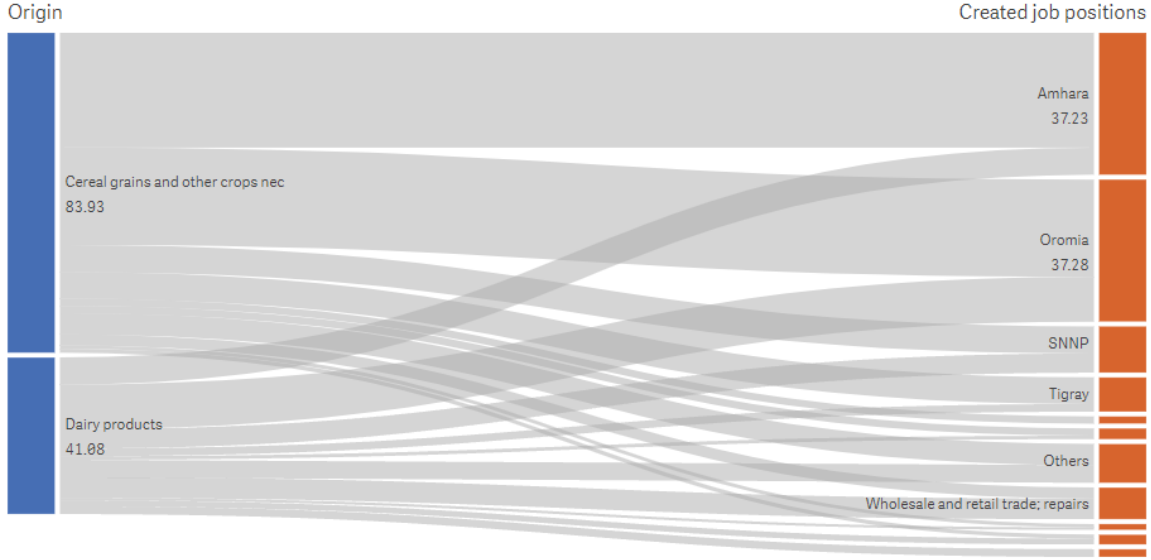
Change of exports: absolute value: 1

Exports change	Created job positions
1.00	41

Totals:	Total exports change	Total created job positions
	2.00	125

+ Add economic sector

Created job positions in Ethiopia



Only the nine sectors with the most created job positions are shown. The rest are grouped under "Others"

Select visualization

European Commission

Jobs Calculator

Created job positions in Ethiopia

Origin	Created job positions	Initial exports (Ethiopia)	Exports change (Ethiopia)	Created job positions (Ethiopia)
Totals		**620.66**	**2.00**	**125.02**
Cereal grains and other crops nec	Addis Ababa	614.41	1.00	0.18
Cereal grains and other crops nec	Afar	614.41	1.00	0.22
Cereal grains and other crops nec	Amhara	614.41	1.00	30.12
Cereal grains and other crops nec	Benshagul Gumuz	614.41	1.00	1.89
Cereal grains and other crops nec	Dire Dawa	614.41	1.00	0.23
Cereal grains and other crops nec	Gambelia	614.41	1.00	0.12
Cereal grains and other crops nec	Harari	614.41	1.00	0.07
Cereal grains and other crops nec	Oromia	614.41	1.00	25.52
Cereal grains and other crops nec	SNNP	614.41	1.00	7.11
Cereal grains and other crops nec	Somalie	614.41	1.00	0.44
Cereal grains and other crops nec	Tigray	614.41	1.00	6.99
Cereal grains and other crops nec	Growing of food crops	614.41	1.00	1.94
Cereal grains and other crops nec	Growing of cash crops	614.41	1.00	0.31
Cereal grains and other crops nec	Growing of coffee	614.41	1.00	0.17

Table

Environmental sustainability and job creation

A SAM-based approach for Cameroon

The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

Objectives

- New and environmentally extended Social Accounting Matrix for Cameroon for 2016 highly disaggregated.
- Presentation of the indicator **Employment intensity of Carbon (eq):** shows the amount of employment associated to CO2 (eq) emitted by the production of goods and services.
- Represents a measure of efficiency useful to determine the **sensitivity** of different sectors and regions to **mitigation-driven changes** in consumption expenditure and its implications on the employment.
- Identify those sectors that with an external impact can reduce the highest quantity of emissions with the least possible impact on employment. Policy implications in view of the potential emissions reduction target.

Database: SAM for Cameroon and satellites accounts

- Sources:
  - National Accounts
  - Surveys:
    - Fourth Cameroonian Household Survey (2014)
    - Supplementary Survey to the Fourth Cameroon Household Survey (2016)
    - Second Survey on Employment and the Informal Sector (2010)
  - Emissions: “GTAP-E data” and “Non- CO_2 emissions data”
- Main characteristics:
  - Employment divided by informal/formal, rural/urban, skill levels and regions.
  - Emissions by type of gas (CO_2, CH4, N2O, F-Gas in CO_2 eq).

Methodology

- Multipliers matrix: $\mathbf{M} = [\mathbf{I} - \mathbf{S}]^{-1}$
  - *each element m_{ij} shows the requirements of account i to increase the final demand of account j by one monetary unit.*
- Employment multiplier:
  - *Provides the number of jobs generated by an exogenous shock in final demand.*
  - $\mathbf{e}[\boldsymbol{I} - \boldsymbol{S}]^{-1}\,\bar{\boldsymbol{f}}$
- Emissions multiplier:
  - *Indicates how much CO_2 is created by an additional unit of final demand.*
  - $\mathbf{g}[\boldsymbol{I} - \boldsymbol{S}]^{-1}\,\bar{\boldsymbol{f}}$

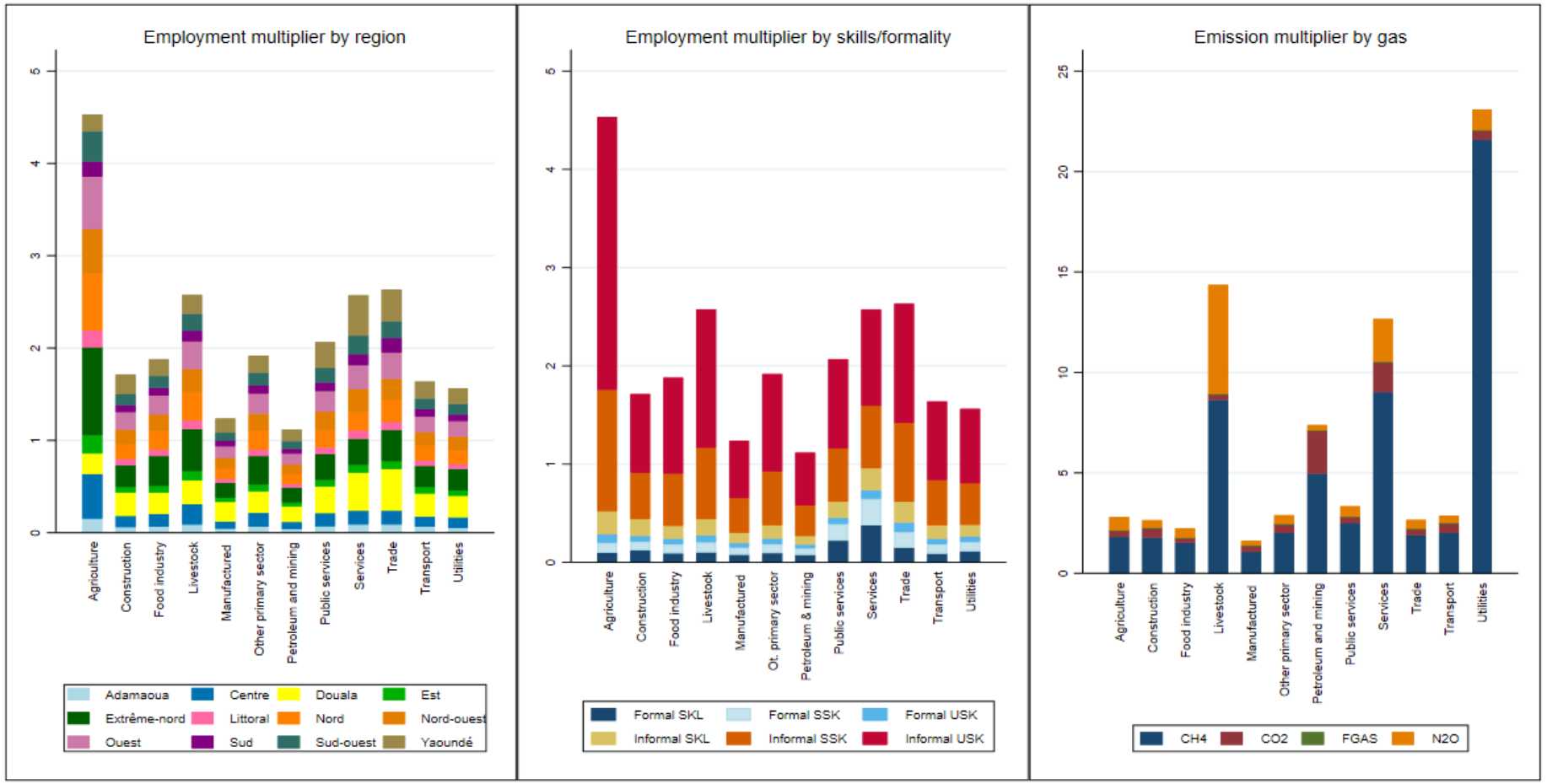
Employment intensity of carbon

- Calculation: $\frac{Employment\ multiplier}{tCO2eq\ emission\ multiplier}$
- Shows the amount of employment associated to tCO_2eq emitted by the production of goods and services.
- Results interpretation:
  - Every million FCFA spent in each commodity creates simultaneously an impact in the consumption-based emissions and in the employment due to the increase in the production.
  - For example, in the agricultural sector, a unitary increase in the final demand would result in 1.6 job created per a tonne of CO_2eq emitted.

Overall results

Emissions and employment multipliers

Figure 3. Employment (jobs **per million FCFA** of demand) and emissions multipliers (in tonne CO_2 Eq).



Source: author's calculation based on Cameroon SAM 2016 and satellites account.

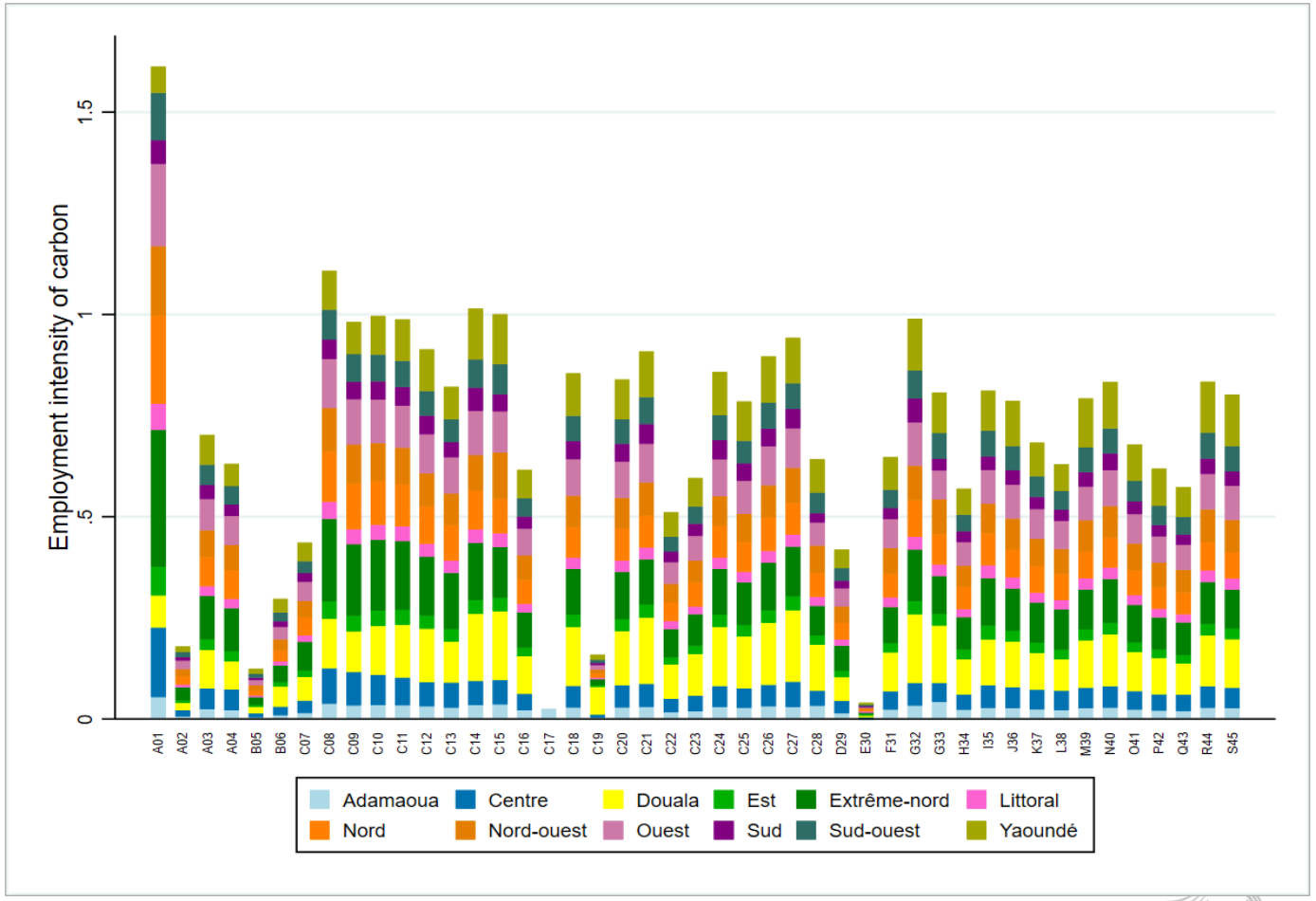
European Commission

Overall results

Employment intensity of carbon

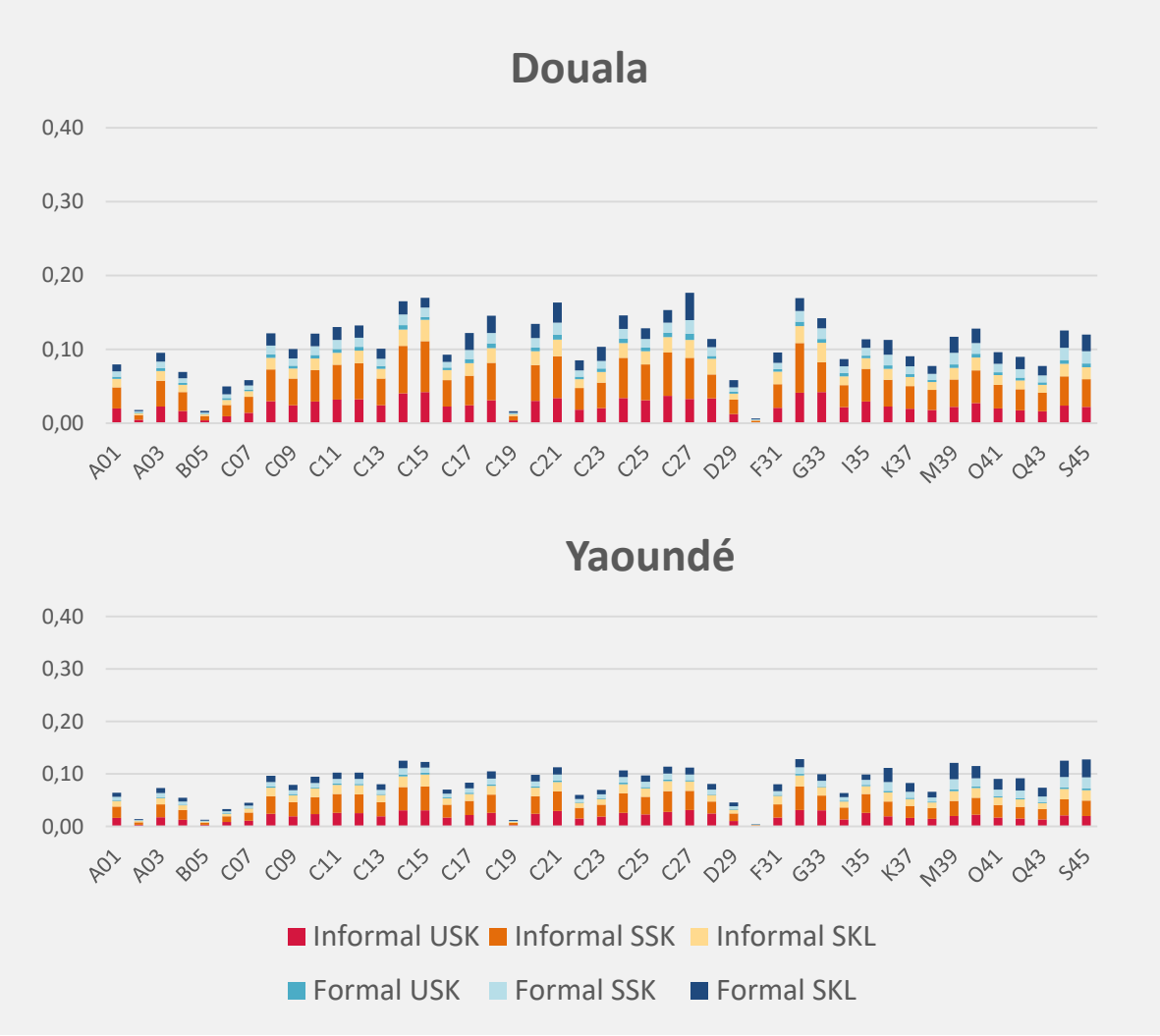
Cameroon regions

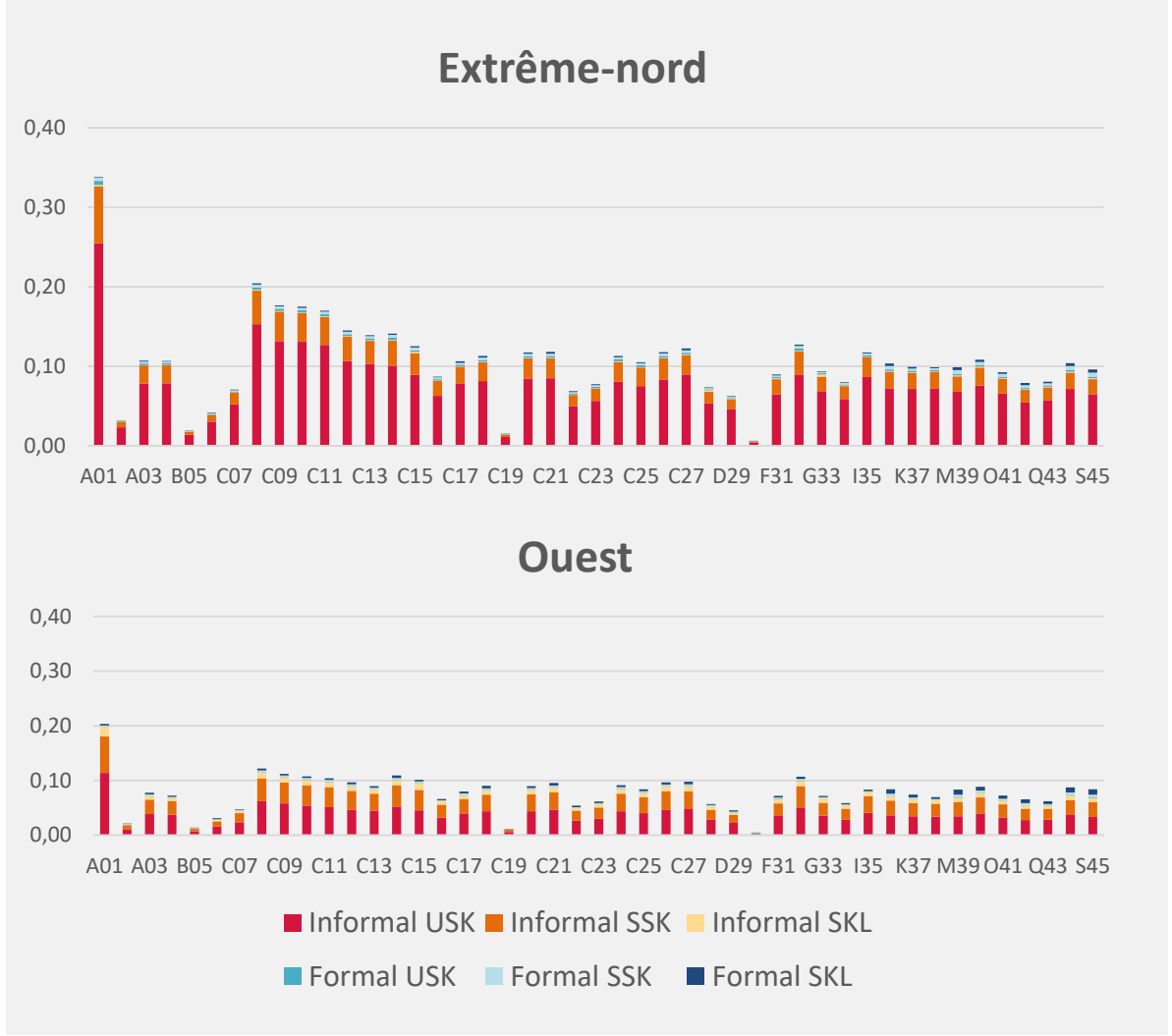
Figure 4. Employment by region associated to CO_2Eq. emissions (tonnes) generated due to an exogenous impact on commodities demand.



Regional results

Figure 5. Employment by region associated to CO_2 emissions (tonnes) generated due to an exogenous impact on commodities demand.





Policy implications

Contribution prevue determine au plan national (2015): reduce GHG emissions by **35%** by **2030.**

- Unconditional scenario:

➢ **12% reduction** of GHG emissions by 2030= **14,898 Gg CO2Eq.**

- Conditional scenario:

➢ **35% reduction** of GHG emissions by 2030= **42,259 Gg CO2Eq.**

Table 1. Share of reduction by sector in 2030.

Conditional			
Total reduction			**35.50%**
Total reduction Gg CO2Eq			**42,259**
Reduction by main sector		Share of each sector in the total reduction	Share of each sector in percentage reduction
Agriculture	6,808	16.10%	5.7%
FAT	19,379	45.90%	16.3%
Energy	13,370	31.60%	11.2%
Waste	2,702	6%	2.3%
Total	42,259	100%	35.5%

Unconditional			
Total reduction			**12%**
Total reduction Gg CO2Eq			**14,898**
Reduction by main sector		Share of each sector in the total reduction	Share of each sector in percentage reduction
Agriculture	2,399	16.10%	1.93%
FAT	6,838	45.90%	5.51%
Energy	4,708	31.60%	3.79%
Waste	953	6.40%	0.77%
Total	14,898	100%	12%

Cocoa disaggregation

A SAM-based approach for Côte d'Ivoire 2015

Objectives

- New highly disaggregated Social Accounting Matrix for Côte d'Ivoire 2015.
  - Agriculture highly disaggregated.
  - Cocoa production by regions.
  - Industrial processing of cocoa disaggregated from the food industry.

Database

- Sources:
  - National Accounts
  - Household Standard of Living Survey 2015 conducted by the National Statistical Institute.
  - FAO:
    - Production
    - Food Balances
    - Trade
  - International Cocoa Organization
  - Comtrade

Database

- Main characteristics:
  - Households agriculture production and consumption by regions.
  - Employment divided by skill levels, rural/urban and regions.
  - Land use for agricultural activities by each region.
  - Cocoa production disaggregated by regions.
  - Land use for cocoa production by each region.
  - Cocoa processing sector included.

Policy implications

- Policy implications related to:
  - Cocoa production by regions.
  - Destination of cocoa beans (exports or domestic processing).
  - Cocoa domestic processing.
  - Cocoa farmers inequality.
  - Environmental impact related to cocoa production (like deforestation).

References

- Aragie, E.; Dudu, H.; Ferrari, E.; Mainar-Causapé, A.; McDonald, S & Thierfielder, K, STAGE_DEV. A variant of the STAGE model to analyse developing countries, EUR 28627 EN, JRC Technical Reports, Publications Office of the European Union, Luxembourg, 2017, doi:10.2760/90737.
- Defourny, J., & Thorbecke, E. Structural Path Analysis and Multiplier Decomposition within a Social Accounting Matrix Framework. The Economic Journal, Vol. 94, No 373, 1984, pp. 111–136. https://doi.org/10.2307/2232220
- Mainar-Causapé, A. J., Boulanger, P., Dudu, H., & Ferrari, E. Policy impact assessment in developing countries using Social Accounting Matrices: The Kenya SAM 2014. Review of Development Economics, 24(3), 2020, 1128-1149.
- McDougall, R.A. Entropy Theory and RAS are Friends, GTAP, Working Paper, 300, Department of Agricultural Economics, Purdue University, 1991.
- Mengistu, Andualem Telaye; Woldeyes, Firew Bekele; Dessie, Ermias; Ayalew, Zewdu; Yeshineh, Alekaw; Mainar Causapé, Alfredo; Ferrari, Emanuele (2020): SAM - Ethiopia - 2015/16. European Commission, Joint Research Centre (JRC).
- Miller, R & Blair, P. Input-Output Analysis: Foundations and Extensions (2nd edition), Cambridge University Press, Cambridge, 2009.
- Pulido, A & Fontela, E. Análisis Input-Output: modelos, datos y aplicaciones. Pirámides, Madrid, 1993.
- Pyatt, G & Round, J. Social Accounting Matrices: a Basis for Planning, The World Bank, Washington, 1985.
- Reinert, K. A & Roland-Holst, D.W. Social Accounting Matrices, edited by J. F. Francois y K. A. Reinert, Applied Methods for Trade Policy Analysis: A Handbook, Cambridge University Press, Cambridge, 1997.Kiringai et al. (2007) and Round (2003).
- Robinson, S.; Cattaneo, A & El-Said, M. Updating and Estimating a Social Accounting Matrix Using Cross Entropy Methods. Economic System Research, Vol. 13, No 1, 2001, pp. 47-64.
- Stone, R. Measurement of national income and the construction of social accounts, Naciones Unidas, Ginebra, 1947.

Thank you

European Commission