UNITED NATIONS

الاسكوا

ESCWA

WELCOME

Session 9

Constructing a closed economy 2 sectors CGE model using GAMS

AUTA MODEL

Hypotheses

- Closed economy
- Without government
- 2 representative households :
  - *Laborers*
  - *Capitalists*
- 3 sectors / products:
  - *Agriculture*
  - *Industry*
  - *Services.*

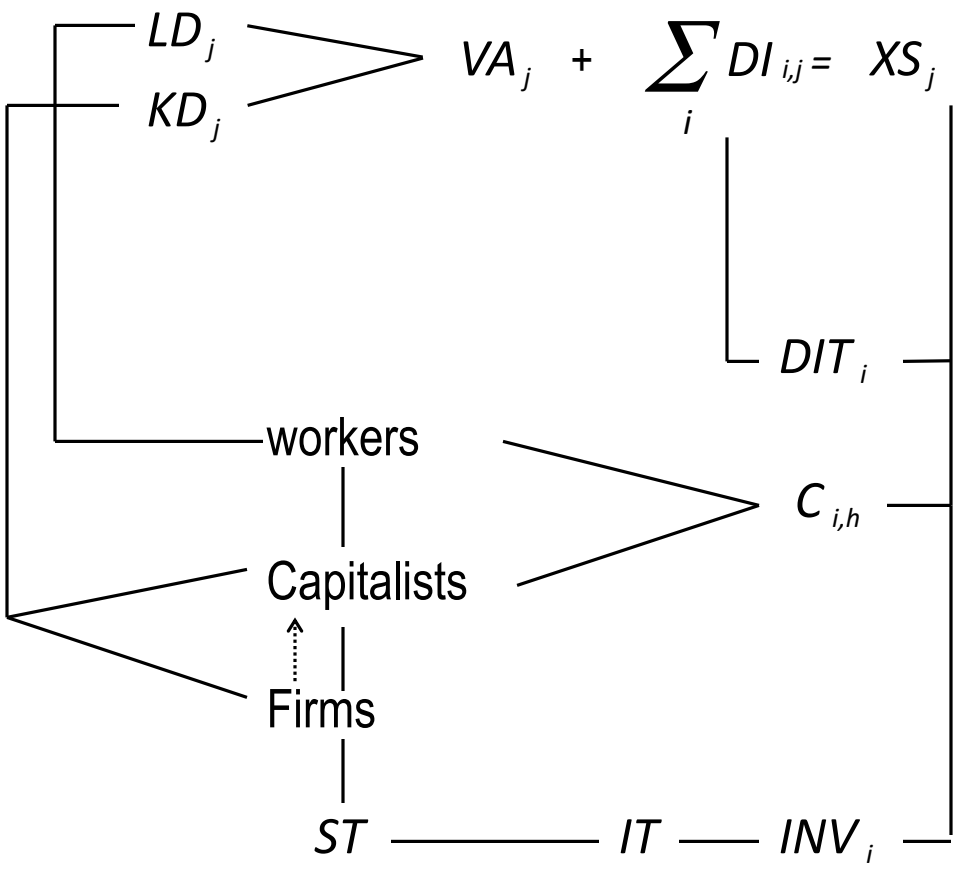
AUTA MODEL
Social Accounting Matrix (SAM)

Revenues → / Expenditures ↓	FACTORS		AGENTS			Productive sectors			ACC.	TOTAL
	1	2	3	4	5	6	7	8	9	(1 à 9)
1. Labor						SL_A	SL_I	SL_S		SL
2. Capital						RK_A	RK_I	RK_S		RK
3. Working households	SL									YM_{HS}
4. Capitalistes households		RK_{HK}			DIV					YM_{HK}
5. Firms		RK_E								YE
6. Agriculture			$VC_{A,HS}$	$VC_{A,HK}$		$CI_{A,A}$	$CI_{A,I}$	$CI_{A,S}$	IV_A	VXD_A
7. Industry			$VC_{I,HS}$	$VC_{I,HK}$		$CI_{I,A}$	$CI_{I,I}$	$CI_{I,S}$	IV_I	VXD_I
8. Services			$VC_{S,HS}$	$VC_{S,HK}$		$CI_{S,A}$	$CI_{S,I}$	$CI_{S,S}$		VXD_S
9. Accumulation			SM_{HS}	SM_{HK}	SE					ST
TOTAL (1 à 9)	SL	RK	YM_{HS}	YM_{HK}	YE	VX_A	VX_I	VX_S	IT	

Numerical Example

Revenu → / Expenditures ↓	FACTORS		AGENTS			PRODUCTIVES SECTORS			ACC.	TOTAL
	1	2	3	4	5	6	7	8	9	(1 à 9)
1. Labor						5760	7560	15540		28860
2. Capital						1440	11340	5720		18500
3. Working households	28860									28860
4. Capitalistes households		11100			1900					13000
5. Firms		7400								7400
6. Agriculture			4329	650		120	2526.9	275.5	1098.6	9000
7. Industry			11544	3900		1544	21709.1	5815.5	9887.4	54400
8. Services			10101	5850		136	11264	3349		30700
9. Accumulation			2886	2600	5500					10986
TOTAL (1 à 9)	28860	18500	28860	13000	7400	9000	54400	30700	10986	

Schematic representation



Building the AUTA Model

Equation
Saving - Revenue

6 - $$YM_{hs} = s\sum_{j} LD_{j}$$

7 - $$YM_{hk} = \lambda\sum_{j} r_{j} KD_{j} + DIV$$

8 - $$SM_{h} = \psi_{h} YM_{h}$$

9 - $$YE = (1-\lambda)\sum_{j} r_{j} KD_{j}$$

10 - $$SE = YE - DIV$$

Demand

11 - $$C_{i,h} = \frac{\gamma_{i,h} YM_h}{P_i}$$

12 - $$INV_i = \frac{\mu_i IT}{P_i}$$

13 - $$DIT_i = \sum_j aij_{i,j} CI_j$$

Price

14 - $$PV_j = \frac{P_j XS_j - \sum_i P_i DI_{i,j}}{VA_j}$$

15 - $$r_j = \frac{PV_j VA_j - s\ LD_j}{KD_j}$$

Equilibrium

16 - $$XS_i = DIT_i + \sum_h C_{i,h} + INV_i$$

17 - $$LS = \sum_j LD_j$$

18 - $$IT = \sum_h SM_h + SE$$

Endogenous Variables

- $C_{i,h}$: Consumption of household h of product i
- CI_j: Total intermediary consumption of branch j (volume)
- $DI_{i,j}$: Intermediary demand for product i by branch j (volume)
- DIT_i: Intermediary demand for product i (volume)
- INV_i: Investment demand for product i
- IT: Total investment
- LD_j: Labor demand by branch j
- P_i: Producer's price of product i
- PV_j: Price of added value in branch J

- r_j: Rate of return on capital in branch j
- s: Wage rate
- SE: Corporate savings
- SM_h: Household h savings
- VA_j: Added value of branch j (volume)
- XS_j: Production of branch j (volume
- YE: Corporate income
- YM_h: Household h income

Exogenous variables

- DIV: Dividend paid to capitalist households
- KD_j: Capital demand of sector j (volume)
- LS: Labor supply

Parameters

- A_j : Coefficient of scale (Cobb-Douglas function)
- a_j : Elasticity (Cobb-Douglas function)
- $aij_{i,j}$: Input-Output Coefficients
- $\gamma_{i,h}$: Amount (in value) of product i in household total consumption h
- io_j : Technical Coefficient (Leontief function)
- Λ : Amount of remuneration from the capital given to the capitalist households
- μ_i : Amount (in value) of product i in total investment
- ψ_h : Propensity to save of the household h
- ν_j : Technical coefficient (Leontief function)

Sets

i, j ∈ = $\{AGR.IND, SERV\}$

h ∈ H = $\{HS, HK\}$

Solution Assessment

- To verify the existence of the solution in the system, compare the total number of equations to the number of unknown variables.

- AUTA model has 50 equations and 55 variables. For our system to have a solution , we must make 5 variables exogenous in order to have 50 equations & 50 endogenous variables.

- This is a necessary condition for the existence of a solution but not a sufficient one

Calibration

- The calibration consists of choosing numerical values from the different parameters and coefficients of the model that are compatible with the equilibrium of the initial SAM

- This model does not contain unrestricted parameters


Thank
You!
Y'all Come Back