# *A Two Sector Closed Economy CGE Model: Part 1*



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## *Outline*

- Introduction
- Economic Data & Behaviour
- *The Model in Algebra and GAMS*
  - *Prices*
  - *Production*
  - *Factors*
  - *Households*
  - *Government*
  - *Saving-Investment*
  - *Other Equations*
- *Model Closure & Market Clearing*



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## *Aims*

- An understanding of coding extensions to CGE models.
- The development of generic (GAMS) programming skills.
- The provision of an introduction to policy modelling using policy instruments found in typical economies.
- The development of an understanding of macroeconomic closure 'rules'.
- The provision of an introduction to variations in the factor market clearing conditions.



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## *Closed Economy General Equilibrium*

- 2*(2*)2*2 Model
  - Standard model from intermediate microeconomics
  - Isoquants/Indifference curves/Edgeworth boxes
- Agents
  - 2 commodities (products)
  - 2 activities (industries)
  - 2 factors
  - 2 households
- Intermediate inputs
- Government – three tax instruments
- Savings/investment – no time or macroeconomy
- No trade



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## *Policy Instruments and Behaviour*

- Three tax instruments
  - Commodity tax (GST) *ad valorem (ts)*
  - Production tax *ad valorem (tx)*
  - Income taxes *average tax rates (ty)*
- Savings – current *vv* future consumption
  - No time – no intertemporal optimising behaviour
  - No macroeconomy



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## *Mathematical Model*



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## *Society's Programming Problem*

$$\max_{X,Y} W = W\left(u^A, u^B\right)$$

subject to

$X = X^A + X^B = x\left(L^x, K^x\right)$ $Y = Y^A + Y^B = y\left(L^Y, K^Y\right)$ technology

$u^A = u^A\left(X^A, Y^A\right)$ $u^B = u^B\left(X^B, Y^B\right)$ preferences

$\bar{L} = L^x + L^y$ $\bar{K} = K^x + K^y$ factor endowments

**An optimisation problem**

**A system of simultaneous equations**

**BUT with 'distortions'**



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## *Functional Forms*

$X = \alpha_x L_x^{\beta_1} K_x^{\beta_2}$

$Y = \alpha_y L_y^{\beta_3} K_y^{\beta_4}$

Technology expressed as production functions

**Non linear**

$U_A = \alpha_A X_A^{\gamma_1} Y_A^{\gamma_2}$

$U_B = \alpha_B X_B^{\gamma_3} Y_B^{\gamma_4}$

Preferences expressed as utility functions

$\bar{L} = L_X + L_Y$

$\bar{K} = K_X + K_Y$

Endowments ← **Linear**



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# *Economic Data & Behaviour*



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# *Social Accounting Matrix*

| | | Commodities | | Activities | | Factors | | Households | | Government | Investment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Primary | Secondary | Agriculture | Industry | Labour | Capital | Urban | Rural | | | Total |
| **Commodities** | Primary | | | **30** | **50** | | | 50 | 70 | **20** | **15** | 235 |
| | Secondary | | | **50** | **100** | | | 90 | 60 | **60** | **40** | 400 |
| **Activities** | Agriculture | 215 | | | | | | | | | | 215 |
| | Industry | | 375 | | | | | | | | | 375 |
| **Factors** | Labour | | | 60 | 140 | | | | | | | 200 |
| | Capital | | | 65 | 75 | | | | | | | 140 |
| **Households** | Urban | | | | | 100 | 90 | | | | | 190 |
| | Rural | | | | | 100 | 50 | | | | | 150 |
| **Government** | | **20** | **25** | **10** | **10** | | | **25** | **5** | | | 95 |
| **Savings** | | | | | | | | **25** | **15** | **15** | | 55 |
| **Total** | | 235 | 400 | 215 | 375 | 200 | 140 | 190 | 150 | 95 | 55 | |



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# *Behavioural Relationships*

| | Commodities | Activities | Factors | Households | Government | Investment | Total | Prices |
|---|---|---|---|---|---|---|---|---|
| **Commodities** | 0 | Leontief Input-Output Coefficients | 0 | Cobb-Douglas Utility Functions | Fixed in Real Terms | Fixed Shares of Savings | Commodity Demand | Consumer Commodity Prices |
| **Activities** | Cobb-Douglas Production Functions | 0 | 0 | 0 | 0 | 0 | Activity Output | Activity Prices |
| **Factors** | 0 | Factor Demands | 0 | 0 | 0 | 0 | Factor Income | Factor Prices |
| **Households** | 0 | 0 | Fixed Shares of Factor Income | 0 | 0 | 0 | Household Income | |
| **Government** | *Ad valorem* GST | *Ad valorem* | 0 | Average Income Tax rates | 0 | 0 | Government Income | |
| **Savings** | 0 | 0 | 0 | Household Savings | Government Savings (Residual) | 0 | Total Savings | |
| **Total** | Commodity Supply | Activity Input | Factor Expenditure | Household Expenditure | Government Expenditure | Total Investment | | |
| | Producer Commodity Prices | Value Added Prices | | | | | | |

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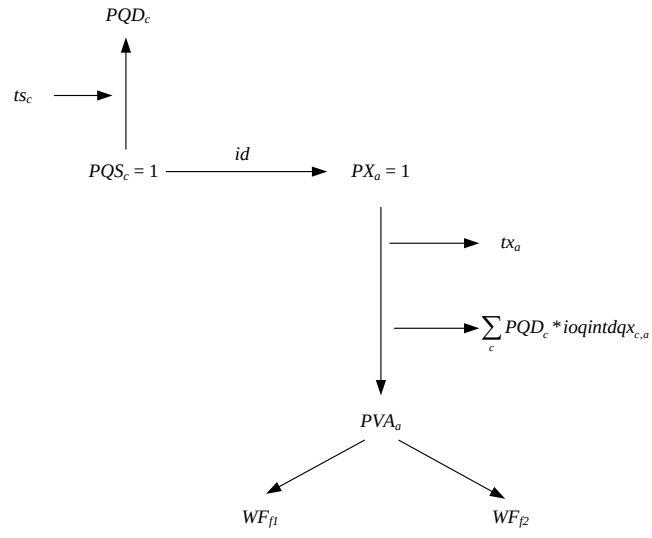
# *Price System*

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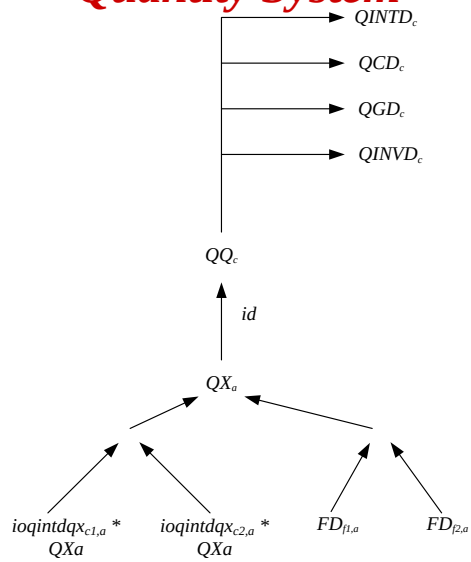
## *Quantity System*



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## *The End*

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