

General Equilibrium Modelling

Multiple Households and Multiple
Sector Model

Structure of the Model

- Four households
- Three production sectors
- One government which imposes taxes
 - Consumption
 - Labour income
 - Capital income
- Market Clearing prices
- Sectoral allocation and redistribution

CES Demand

$$\text{Max } U_h = \left(\sum_i \alpha_{i,h} C_{i,h}^{\rho_h} + \beta_h L_h^{\rho_h} \right)^{\frac{1}{\rho_h}}$$

Subject to

$$I_h = r(1 - t_k) \bar{K}_h + (1 - t_l^h) w \bar{L}_h + TR_h$$

$$C_{i,h} = \left(\frac{\alpha_{i,h} I_h}{\left(P_i(1 + t_i^v) \right)^{\sigma_h} \left(\sum_i \alpha_{i,h} \left(P_i(1 + t_i^v) \right)^{\sigma_h} + \beta_h \left(w(1 - t_l^h) \right)^{\sigma_h} \right)} \right)$$

$$L_h = \left(\frac{\beta_h \cdot I_h}{\left(w(1 - t_l^h) \right)^{\sigma_h} \left(\sum_i \alpha_{i,h} \left(P_i(1 + t_i^v) \right)^{\sigma_h} + \beta_h \left(w(1 - t_l^h) \right)^{\sigma_h} \right)} \right)$$

Supply

$$\max \Pi_i = P_i X_i - wL_i - rK_i - \sum_j P_j M_{j,i}$$

$$Y_i = \Omega_i \left((1 - \delta_i)(K_i)^{\gamma_i} + \delta_i(L_i)^{\gamma_i} \right)^{\frac{1}{\gamma_i}}$$

$$LS_h = \bar{L}_h - L_h$$

$$\sum_h TR_h = \sum_i t_k rK_i + \sum_h t_i^v P_i C_{i,h} + \sum_h t_l^h wLS_h$$

Market Clearing Conditions

$$X_i = C_i + \sum_{j=1}^N a_{ij} X_j$$

$$C_i = \sum_h C_{i,h}$$

$$\sum_h \bar{K}_h = \sum_i K_i$$

$$\sum_h LS_h = \sum_i LS_i$$

Benchmark Data Set

TABLE 1

Illustrative Input-output value transactions matrix for the platform model

Sectors	Sector 1	Sector 2	Sector 3	Sector 4
Sector 1	2	1	2	3
Sector 2	4	3	1	2
Sector 3	2	1	1	1
Sector 4	2	1	1	0

Benchmark Data Set

TABLE 2

Illustrative Data on consumption, income, output and taxes for the platform model

Sectors	Sector 1	Sector 2	Sector 3	Sector 4
Consumption 1	4	2	4	1
Consumption 2	2	3	1	3
Consumption 3	1	1	3	4
Capital Income	1	2	3	1
Labour Income	2	4	3	1
Indirect Taxes	1	2	1	1
VAT	1	2	1	3
Base year price	1	1	1	1
Total Output	15	16	13	12

Benchmark Data Set

Table 3

Illustrative Data on Sources of Income to the households for the platform model.

	Household 1	Household 2	Household 3
Interest income	5	1	1
Wage income	3	3	4
Transfer income	6	7	6
Household taxes	3	2	2

Calibrated Share Parameters

TABLE 4

Calibrated share parameters in consumption in illustrative example of a platform economy.

Sectors	Sector 1	Sector 2	Sector 3	Sector 4
Household 1	0.429	0.167	0.338	0.078
Household 2	0.245	0.286	0.125	0.268
Household 3	0.122	0.100	0.375	0.357

TABLE 5

Calibrated shares of capital and labour in production in illustrative example of a platform economy.

Sectors	Share of capital income	Share of labour income
Sector 1	0.333	0.667
Sector 2	0.333	0.667
Sector 3	0.500	0.500
Sector 4	0.500	0.500

Elasticity and Tax Rates

TABLE 6

Elasticity of substitution in consumption and production

	Elasticity of substitution
Among consumption goods	1.5
Capital and labour	0.75

TABLE 7

Capital and Value added Tax rates in the base year in illustrative example of a platform economy.

Sectors	Tax Rate on Capital Income	Value-added Tax Rates
S1	1.00	0.17
S2	1.00	0.50
S3	0.33	0.14
S4	1.00	0.60

Tax Rates in Household Income

TABLE 8

Household tax rates in illustrative example of a platform economy

Households	Household income tax rates	Net transfers as fraction of household income
H1	0.27	0.27
H2	0.22	0.55
H3	0.22	0.44

Evaluation of Welfare Change Between Counterfactual and Benchmark Scenarios

$$EV^h = \left(\frac{U_C^h - U_B^h}{U_B^h} \right) I_C^h$$

$$CV^h = \left(\frac{U_B^h - U_C^h}{U_C^h} \right) I_B^h$$

$$TEV = \frac{\sum_h EV^h}{\sum_h I_o^h}$$

Efficiency and Redistribution Impacts of Tax Reform

TABLE 9

Welfare gains from removing tax distortions in the platform model (EV, CV as a fraction of income).

Households	Equivalent Variation	Compensating Variation
H1	0.299	-0.230
H2	-0.226	0.291
H3	-0.119	0.135

economy wide impact of tax distortions, measured through Equivalent Variation is 0.00703

Labour Leisure Choice Model

TABLE 10
Input-output table for platform model 2

Sectors	Sector 1	Sector 2	Sector 3
Sector 1	2	1	5
Sector 2	4	3	3
Sector 3	4	2	3

TABLE 11
Data on consumption, income, output and taxes for platform model 2

Sectors	Sector 1	Sector 2	Sector 3
Consumption 1	4	2	4
Consumption 2	2	3	2
Consumption 3	1	1	5
Capital Income	1	2	3
Labour Income	1	3	1
Indirect Taxes	1	3	1
VAT	1	2	4
Base year price	1	1	1
Total Output	14	14	16

TABLE 12

Income source data for platform model 2.

	Household 1	Household 2	Household 3
Interest income	5	1	1
Transfer income	6	6	7
Household taxes	3	2	2
Leisure	1	1	3
Labour Supply	2	2	1
Labour supply to s1	1	0	0
Labour supply to s2	1	2	0
Labour supply to s3	0	0	1
Price of leisure	1	1	1

TABLE 16

Elasticities of substitution in consumption and production in platform model 2.

	Elasticity of substitution
Leisure and consumption	0.75
Among consumption goods	2.0
Capital and labour	2.0

Redistribution Impacts in Labour Leisure Choice Model

TABLE 19

Welfare gains from removal of tax distortions in platform model 2.

Households	Equivalent Variation	Compensating Variation
H1	-0.31	0.31
H2	0.44	-0.44
H3	0.57	-0.57

References

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