Basic Trade Model

Code File: basicnlp.gms

Description:
This basic single country model without pollution is useful as a building block for later models. A single country is represented. It produces and consumes a non-zero amount of both good X and good Y. The technology for each is Cobb-Douglas but with different factor shares. Utility is also Cobb-Douglas. The market clearing conditions state that endowments must be used up in goods production and that income from endowments equals total expenditure on goods. Good Y is the numeraire good. As we change the price of good X we can simulate the effect of trade liberalization on production and consumption of each good where trade liberalization is taken to be a reduction in ice-berg transportation costs (as shown in Ch. 3 of text).

Model:

Variables:

L, K - labor and capital endowments

r, w - rent, wage

β - labor share in dirty good

σ - labor share in clean good

X_s, X_d - supply/demand of dirty good

Y_s, Y_d - supply/demand of clean good

L_x, K_x - labor, capital used in dirty good production

L_y, K_y - labor, capital used in clean good production

p_x, p_y - prices of dirty, clean good

ω - share of expenditure on dirty good

u - total utility

i - total income

Supply side equations

$$X_s = L_x^{\beta} K_x^{(1-\beta)}$$

$$rK_x = p_x(1-\beta)X_s$$

$$wL_x = p_x \beta X_s$$

$$Y_s = L_y^{\sigma} K_y^{(1-\sigma)}$$

$$rK_y = p_y(1-\sigma)Y_s$$

$$wL_y = p_y \sigma Y_s$$

Demand side equations

$u = X_d^{\omega} Y_d^{(1-\omega)}$

$p_x X_d = \omega i$

$p_y Y_d = (1-\omega) i$

Clearing conditions

$K = K_x + K_y$

$L = L_x + L_y$

$wL + rK = p_x X_d + p_y Y_d$

Output:
The model is run repeatedly for an increasing price of the dirty good. We see that initially the country is an importer and as the price rises it becomes an exporter. Notice that utility is increasing in the terms of trade. For *index* ≤ 5 the country is importing and when the price is rising, utility is falling. For *index* ≥ 5 the country is exporting and when the price is rising, utility is rising.

The following table is the result of a run with the following parameter values:

```
parameter
* tweak these to experiment with model
beta   labor share in x    / 0.3 /,
sigma  labor share in y    / 0.7 /,
omega  income share of x   / 0.6 /,
l      labor endowment           / 1 /,
k      capitalendowment    / 1 /,
xprice price of good x           / 1 /,
yprice price of good y           / 1 /,
xinc   price increment of x      / .1 /;
```

index	X price	Xd	Xs	Mx	pMx	Yd	Ys	Utility
1	0.85	0.721	0.3	0.421	0.358	0.409	0.767	0.575
2	0.9	0.693	0.388	0.304	0.274	0.416	0.69	0.565
3	0.95	0.67	0.469	0.201	0.191	0.424	0.615	0.558
4	1	0.651	0.543	0.109	0.109	0.434	0.543	0.554
5	1.05	0.637	0.612	0.025	0.027	0.446	0.472	0.552
6	1.1	0.626	0.676	-0.05	-0.055	0.459	0.403	0.553
7	1.15	0.617	0.736	-0.119	-0.137	0.473	0.336	0.555
8	1.2	0.61	0.793	-0.183	-0.22	0.488	0.268	0.558
9	1.25	0.605	0.848	-0.242	-0.303	0.505	0.202	0.563
10	1.3	0.602	0.899	-0.297	-0.386	0.522	0.136	0.569