

# EC6012 Lecture 8

## The Open Economy

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### New Notation

All the notation you're no doubt familiar with  $(C, G, Y)$ , etc is still in use, but for space and sanity, I'm only including the newer variables and parameters to be used in this model.

Symbol	Meaning
$N, S$	North and South Holdings, respectively. For example, $Y^N$ is the national income of the North.
$\mu$	Propensity to Import.
$X$	Exports
$IM$	Imports
$G_T^N$	Total Government expenditures injected in a period.

## 1 Introduction

PC and PCEX are extended here to show the interactions and feedbacks from a two region economy with trade. We partition PC into a North ( $N$ ) and a South ( $S$ ) and allow imports and exports to and from these regions.

	North households	South households	Government	Central bank	$\Sigma$
Cash money	$+H_h^N$	$+H_h^S$		$-H$	0
Bills	$+B_h^N$	$+B_h^S$	$-B$	$+B_{cb}$	0
Wealth (balancing item)	$-V_h^N$	$-V_h^S$	$-V_g$	0	0
$\Sigma$	0	0	0	0	0

Figure 1: Balance Sheet Matrix for REG

This is a complex, but still elementary model. The simplifying assumptions are enormous, but we still have 27 equations for REG! The assumptions are heroic: no domestic or foreign investment in fixed or working capital, no holdings of financial assets by firms, and no wage inflation or commercial banking. We include only rudimentary treatments of expectations, and still the model is quite complex. The balance sheet for our regional economy is given in figure 1.

Similarly, the transactions matrix is given by figure 1. We can see that REG is just the simple version of PC with two regional sectors now, which trade goods in a manner similar to the European Union. The behavioural equations of the two region economy are similar to those of PC, but each region now has it's

	North households	North production	South households	South production	Government	Central bank	$\Sigma$
Consumption	$-C^N$	$+C^N$	$-C^S$	$+C^S$			0
Govt. exp.		$+G^N$		$+G^S$	$-G$		0
North Exports to South		$+X^N$		$-IM^S$			0
South Exports to North		$-IM^N$		$+X^S$			0
GDP	$+Y^N$	$-Y^N$	$+Y^S$	$-Y^S$			0
Interest payments	$+r_{-1} \cdot B_{h-1}^N$		$+r_{-1} \cdot B_{h-1}^S$		$-r_{-1} B_{-1}$	$+r_{-1} \cdot B_{cb-1}$	0
Profits of central bank					$+r_{-1} \cdot B_{cb-1}$	$-r_{-1} \cdot B_{cb-1}$	0
Taxes		$-T^N$		$-T^S$	$+T$		0
Change in cash		$-\Delta H_h^N$		$-\Delta H_h^S$		$+\Delta H$	0
Change in bills		$-\Delta B_h^N$		$-\Delta B_h^S$	$+\Delta B$	$-\Delta B_{cb}$	0
$\Sigma$	0	0	0	0	0	0	0

Figure 2: Transactions Matrix for REG

own set of equations, which are identical one region to the other. All the equations can be found in (Godley and Lavoie, 2006, pp.174–177). For exposition, I'll just use the North's equations here.

The equations determining national incomes of the North, which now include imports to the South, are:

$$Y^N = C^N + G^N + X^N - IM^N, \quad (1)$$

$$IM^N = \mu^N \cdot Y^N, \quad (2)$$

$$X^N = IM^S. \quad (3)$$

$$(4)$$

The next equations describe the evolution of regional disposable income, taxes, wealth, consumption, money demand and bills (we call them bonds) demand functions.

It is important to note that there is still only one taxation rate.,  $\theta$ , and one (fixed) interest rate,  $r$ , so we apply a consistent fiscal and monetary policy to the two regions. The various behavioural parameters are different, however, so  $\lambda_1^N \neq \lambda_1^S$ , for example.

$$YD^N = Y^N - T^N + r_{-1} \cdot B_{h-1}^N \quad (5)$$

$$T^N = \theta \cdot (Y^N + r_{-1} \cdot B_{h-1}^N) \quad 0 < \theta < 1 \quad (6)$$

$$V^N = V_{-1}^N + (YD^N - C^N) \quad (7)$$

$$C^N = \alpha_1^N \cdot YD^N + \alpha_2^N \cdot V_{-1}^N \quad 0 < \alpha_1 < \alpha_2 < 1 \quad (8)$$

$$H_h^N = V^N - B_h^N \quad (9)$$

$$\frac{B_h^N}{V^N} = \lambda_0^N + \lambda_1^N \cdot r - \lambda_2^N \cdot \left( \frac{YD^N}{V^N} \right) \quad (10)$$

## 2 Steady State Solutions in REG

A region reaches their steady state when the change in household wealth from period to period is zero, so  $\Delta V = 0$ . The condition where this holds is

$$G_T^N + X^N = T^N + IM^N \quad (11)$$

In the stationary state, GDP in the North will depend on the following condition:

$$Y^{N*} = \frac{G_T^N + X^N}{\theta + \mu^N} \quad (12)$$

Equation 12 shows the Harrod foreign trade multiplier, which shows how the North's output is dependent on the North's government expenditure and their exports, divided by the tax and import propensities.

What does this imply for policies to get the economy to the steady state?

## 3 Experiments with REG

Here I show some of the results of the simulations. We'll look at variants of these in the class.

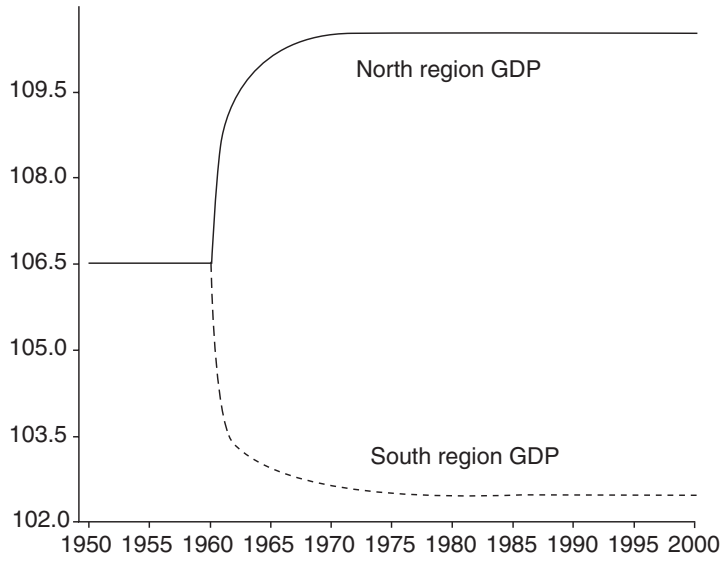


Figure 3: Evolution Balances North and South

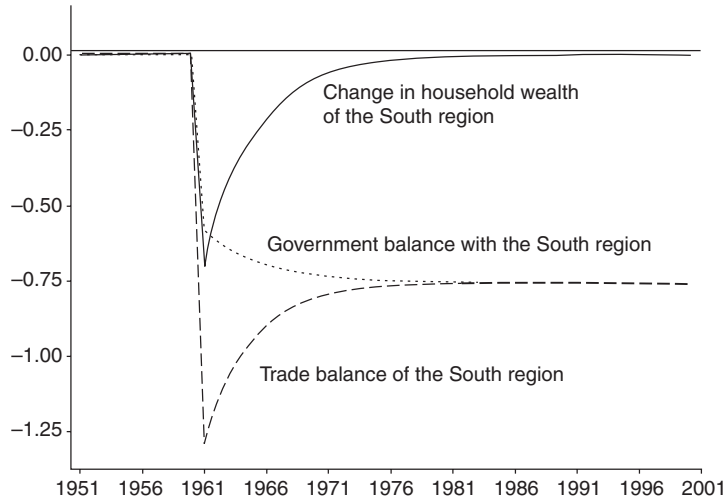


Figure 4: Evolution of GDP in North-South Regions following an increase in  $\mu^S$

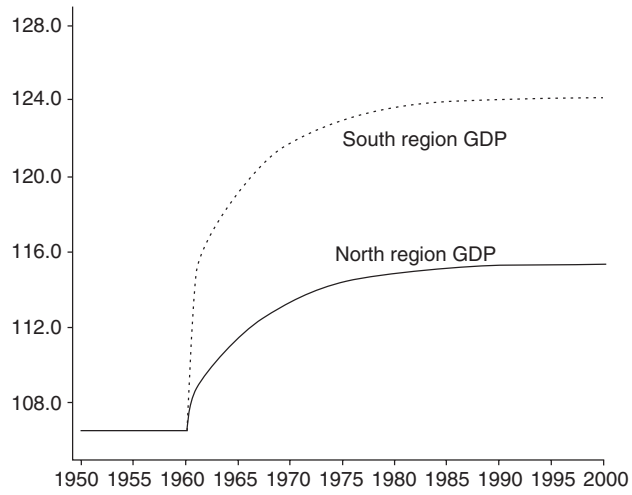


Figure 5: Evolution of GDP in North-South Regions following an increase in  $G_T^S$

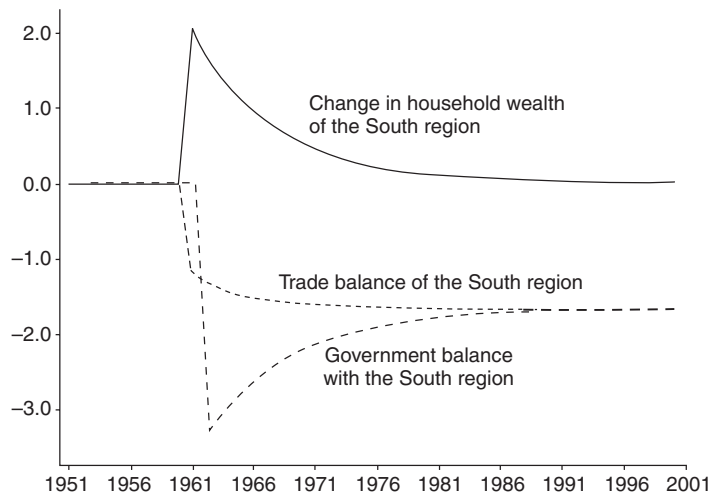


Figure 6: Evolution of Balances following an increase in  $G_T^S$

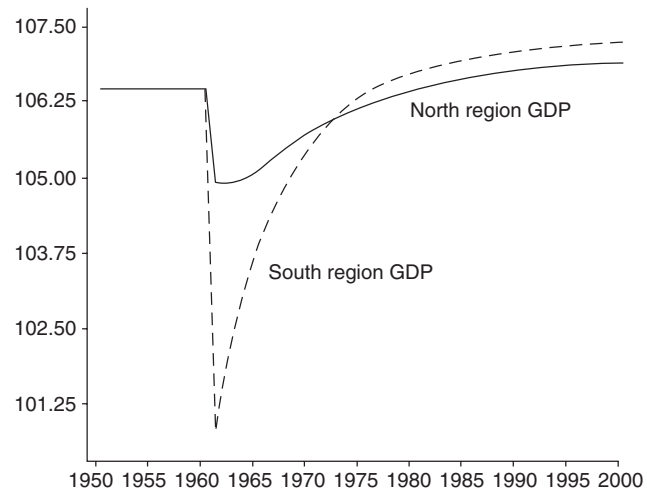


Figure 7: Evolution of GDP following an increase in Southern Propensities to Save

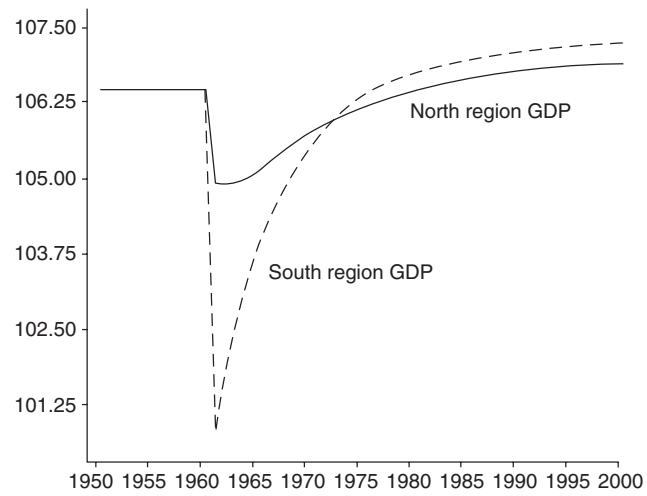


Figure 8: Evolution of Balances following an increase in  $\mu^S$

- 3.1 Increasing  $\mu^S$
- 3.2 Increasing  $G_T^S$
- 3.3 Increasing  $(1 - \mu^S)$
- 3.4 Changing Liquidity Preferences

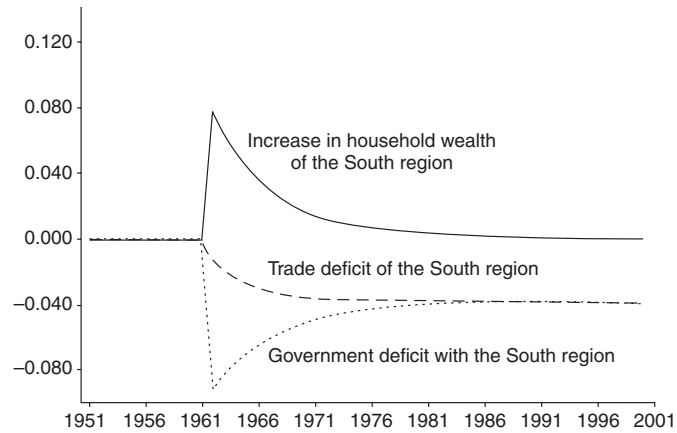


Figure 9: Evolution of Balances following a change in Southern liquidity preferences.

## References

Wynne Godley and Marc Lavoie. *Monetary Economics An Integrated Approach to Credit, Money, Income, Production and Wealth*. Palgrave-Macmillan, 2006. URL <http://www.palgrave.com/products/Catalogue.aspx?is=0230500552>.