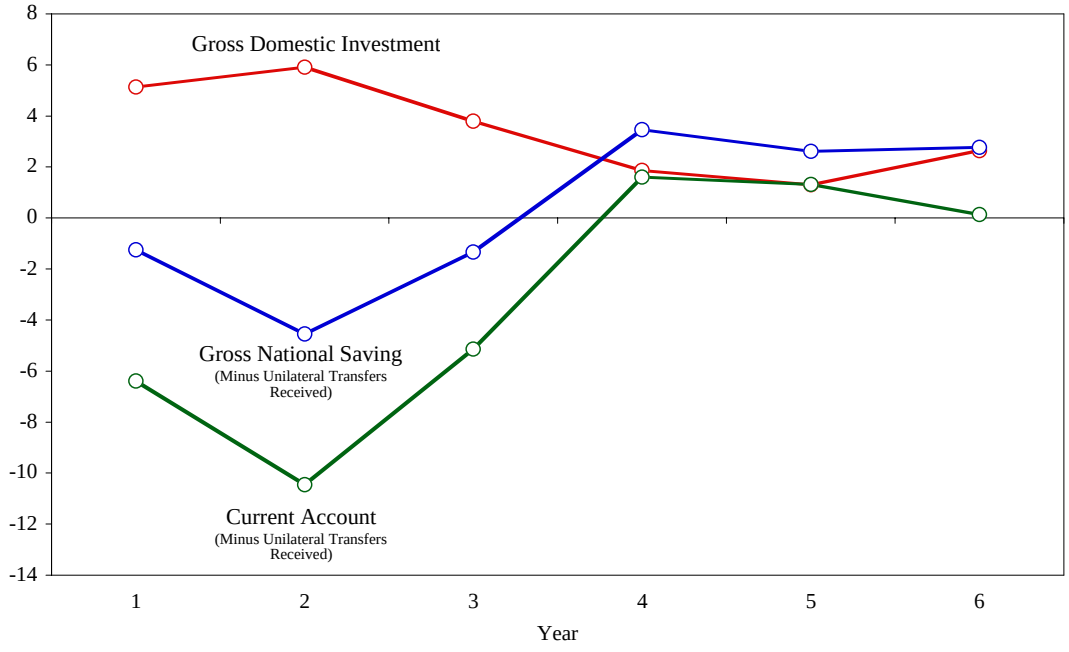
Chapter 17

The Balance of Payments in the Long Run: The Gains from Financial Globalization

(2/12/08)

Intertemporal Macroeconomics and the Long-Run Budget Constraint

- We here study the benefits of a country being open to the international financial market. This includes benefits of being able to run current account imbalances at times.
- As an example, consider the case of Honduras after it was hit by hurricane Mitch in 1998. See chart below. The country needed large investment expenditure to rebuild. Since it was able to import goods from abroad, it was able to carry out this investment without the need to cut the level of consumption and raise domestic saving. This made the rebuilding process less painful.



1. Intertemporal Macroeconomics and the Long-Run Budget Constraint

- The approach we take to address this issue is called "intertemporal macroeconomics", which looks at how an economy evolves over time.
- The fist step is to establish the set of choices available to an economy. This involves a budget constraint over time, called the "intertemporal budget constraint.
- Make the following assumptions
  - Assume country is a small open economy that can lend or borrow overseas at world real interest rate r* (constant).
  - Assume no unilateral transfers (NUT=0), no capital transfers (KA=0), and no capital gains on external wealth.
- Subscript for years, N and N-1.

Wealth Dynamics

- Track how a country's wealth (W) evolves over time.
- Assume it starts with 0 wealth.
- Change in W from beginning of year 0 to end of year 0 is just the current account in year 0.
- CA equals trade balance (TB) plus any net interest payments received (NFIA)
- Net interest payments equal interest earned on assets minus interest paid on liabilities
- Iterate N periods to find external wealth at any point in the future:

Wealth Dynamics

$$W_0 = TB_0$$

$$W_1 = (1 + r^*)TB_0 + TB_1$$

$$W_2 = (1 + r^*)^2 TB_0 + (1 + r^*)TB_1 + TB_2$$

$$W_N = (1 + r^*)^N TB_0 + (1 + r^*)^{N-1} TB_1 + (1 + r^*)^{N-2} TB + \ldots$$

$$+ (1 + r^*)TB_{N-1} + TB_N$$

Wealth Dynamics

- Thus

$$\frac{W_N}{(1+r^*)^N} = TB_0 + \frac{TB_1}{(1+r^*)} + \frac{TB_2}{(1+r^*)^2} + \cdots + \frac{TB_N}{(1+r^*)^N}$$

- Each part of this expression is known as a **present value**
  - <u>Left side = present value of external wealth N periods into the future.</u>
  - <u>Right side = present value of trade surpluses</u> from year 0 to year N.

Wealth Dynamics

- <u>Assume</u>:

$$\frac{W_N}{(1+r^*)^N} \to 0 \quad as \quad N \to \infty$$

- EXAMPLE for intuition:
  - You borrow $100,000 from bank at interest rate of 10% annually.
  - Suppose you pay neither interest nor principal but ask the bank to rollover interest and principal each year. In year 1, the overdue interest is $10,000, and the debt grows to $110,000. In year 2, the overdue interest is $11,000, and debt grows by 10% again to $121,000. This goes on, ad infinitum.
  - This is not sustainable, since the debt explodes: each year it grows by a factor equal to the gross rate of interest, which is 1.1 (> 1).
  - Refer to this rollover scheme as pyramid scheme or “Ponzi game.”
  - We this idea to borrowing (TB<0) from abroad, or lending abroad (TB>0), ruling out exploding debts or assets.

Long-Run Budget Constraint
LRBC AND THE TRADE BALANCE

- Hence, if left hand side tends to zero, so must the right hand side.
- We require:

$$TB_0 + \frac{TB_1}{(1+r^*)} + \frac{TB_2}{(1+r^*)^2} + \frac{TB_3}{(1+r^*)^3} + \frac{TB_4}{(1+r^*)^4} + \cdots = 0$$

- This is the **<u>long-run budget constraint</u>** <u>(LRBC)</u> for a country with zero initial wealth.
  - Expression is a weighted sum of future trade balances.
  - Clearly a country cannot run trade deficits forever or trade surpluses forever, without seeing its wealth explode on one direction or another.
  - For a country to abide by this constraint, it must ensure that its <u>future trade deficits and surpluses "cancel out" on average.</u>

Long-Run Budget Constraint
LRBC AND GNE VERSUS GDP

- By definition

$$TB = GDP - (C + I + G) = GDP - GNE$$

- So we may write the LRBC as

$$\underbrace{GDP_0 + \frac{GDP_1}{(1+r^*)} + \frac{GDP_2}{(1+r^*)^2} + \cdots}_{\substack{\text{present value of GDP} \\ = \\ \text{present value of the country's resources}}} = \underbrace{GNE_0 + \frac{GNE_1}{(1+r^*)} + \frac{GNE_2}{(1+r^*)^2} + \cdots}_{\substack{\text{present value of GNE} \\ = \\ \text{present value of the country's spending}}}$$

- An intuitive way to see that this indeed is a budget constraint:
  - LRBC says that in the long run, in <u>present value terms, a country's expenditures (GNE) must equal its production (GDP).</u>
  - Thus, the LRBC describes how the economy must <u>"live within its means" over the long run.</u>

Long-Run Budget Constraint
SUMMING UP

- The key lessons can be summed up by looking at two constraints:
  - 1. In a closed economy, by definition, the trade balance must equal zero in each and every period.
  - 2. In an open economy, the LRBC only requires that the present value of the trade balance must equal zero. It can run a trade balance of 0 each period if it wants, or it can run deficits in some years balanced by surpluses in other years.
- Since the open economy is subject to a less restrictive constraint than the open economy, it should be able to do better.

Understanding present values

- To understand the long run budget constraint one must understand present values.
  - Suppose you are paid 100 every year forever starting next year (year 1). Suppose the interest rate is 5%.
  - The present value of this sequence is:

$$\frac{100}{(1+0.05)}+\frac{100}{(1+0.05)^2}+\frac{100}{(1+0.05)^3}+\cdots=\left(\frac{1}{0.05}\right)100=2000$$

- This example can be interpreted as a stream of interest payments on a perpetual loan. If the amount loaned by the creditor is 2000 in year 0, and this principal amount is outstanding forever, then the interest that must be paid each year is 5% of 2000, or 100.

2. Gains from Consumption Smoothing

- First of the gains from globalization: consumption smoothing.
- We assume
  - Output takes the form of an endowment Q, (owned by a representative household and sold through a representative firm.) This output may be subject to shocks.
  - Consumers prefer to have no fluctuations in consumption: that is, if possible, they would prefer to set their consumption level C at a constant value.
  - This assumption is motivated by the idea that households are averse to risk, in particular to risk in the flow of consumption.
  - For now—we assume there are no other sources of demand, so investment I and government spending G are both equal to zero.
- Under these assumptions, GDP = Q, GNE = C, and trade balance = Q minus C.

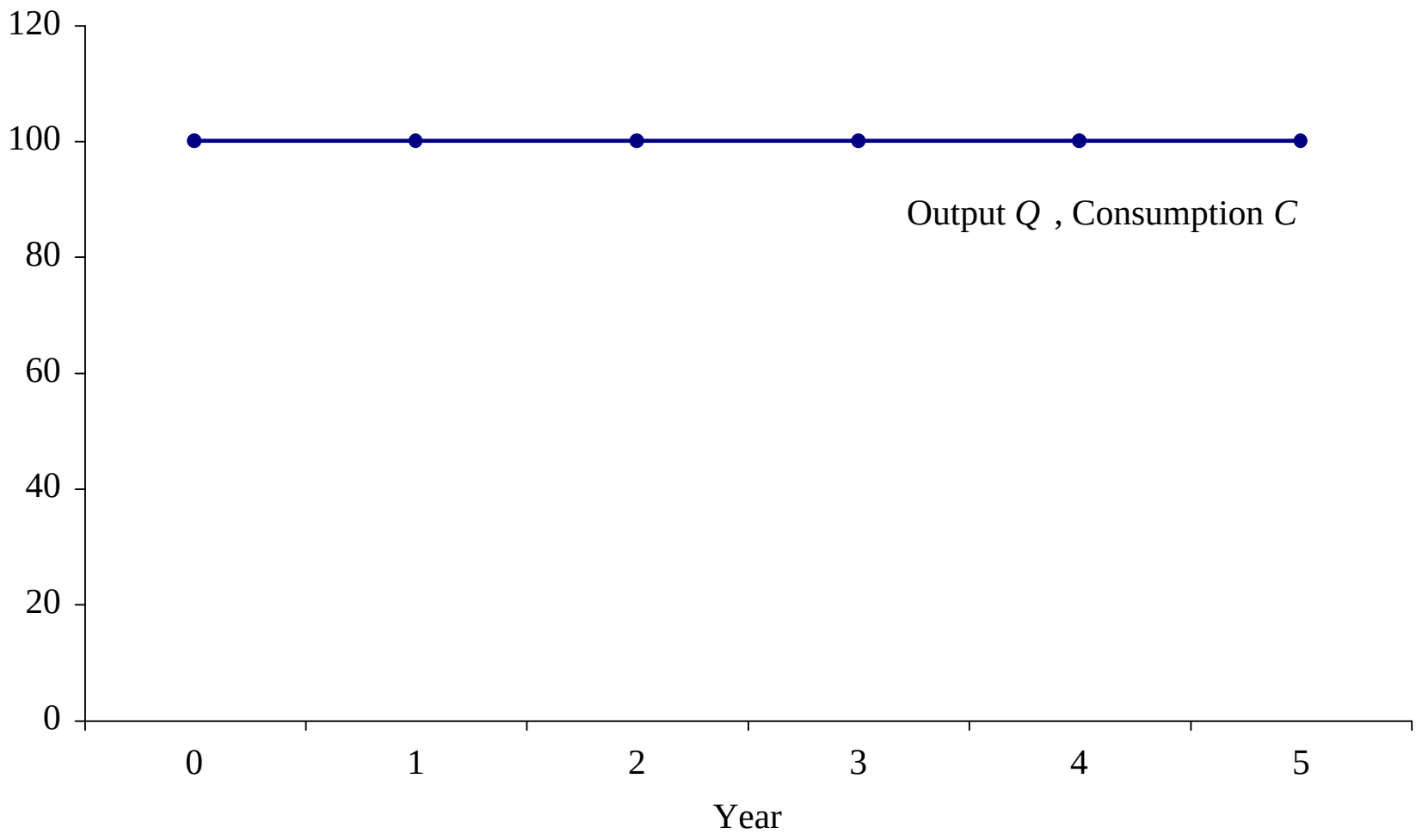
Closed versus Open, No Shocks

Table 17-1

A Closed or Open Economy with No Shocks Output equals consumption. Trade balance is zero. Consumption is smooth.

		Period							
		0	1	2	3	4	5	…	Present Value
GDP	Q	100	100	100	100	100	100	…	2100
GNE	C	100	100	100	100	100	100	…	2100
TB		0	0	0	0	0	0	…	0

Closed versus Open, No Shocks



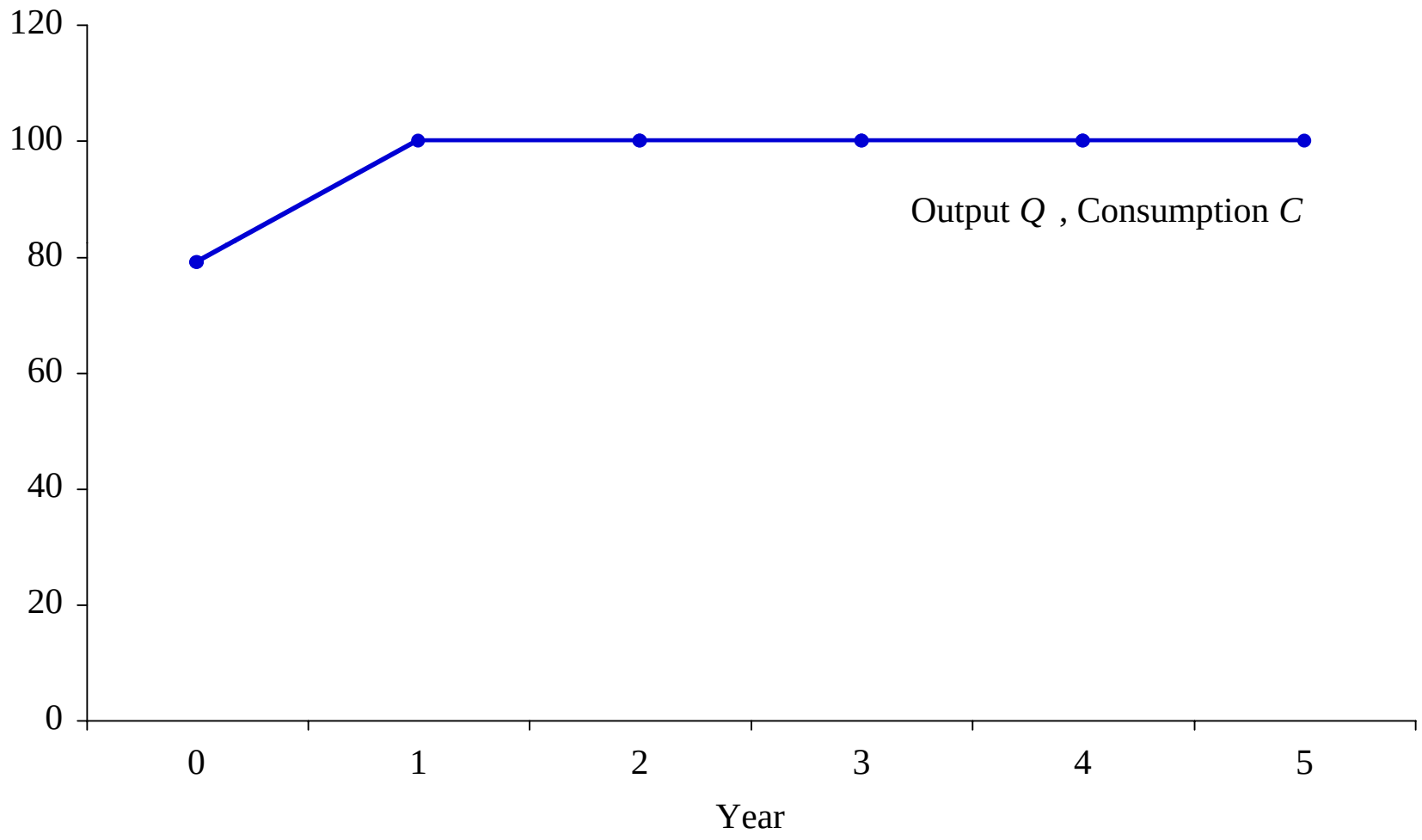
Closed, Shocks

Table 17-2

A Closed Economy with Temporary Shocks Output equals consumption. Trade balance is zero. Consumption is volatile.

		Period							
		0	1	2	3	4	5	…	Present Value
GDP	Q	79	100	100	100	100	100	…	2079
GNE	C	79	100	100	100	100	100	…	2079
TB		0	0	0	0	0	0	…	0

Closed, Shocks



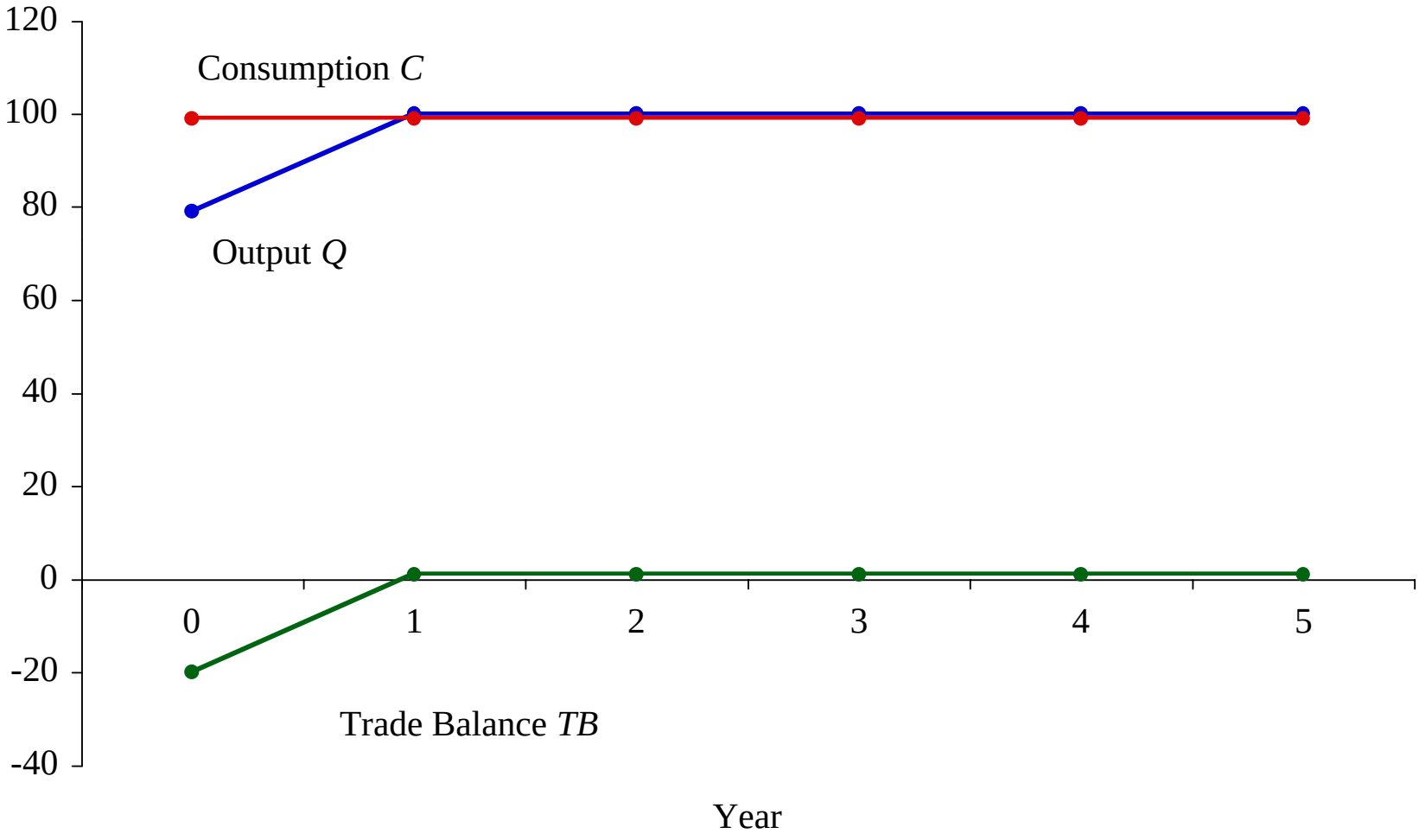
Open, Shocks

Table 17-3

An Open Economy with Temporary Shocks A trade deficit is run when output is temporarily low. Consumption is smooth.

		Period							
		0	1	2	3	4	5	…	Present Value
GDP	Q	79	100	100	100	100	100	…	2079
GNE	C	99	99	99	99	99	99	…	2079
TB		–20	+1	+1	+1	+1	+1	…	0
NFIA		0	–1	–1	–1	–1	–1	…	
CA		–20	0	0	0	0	0	…	
W		–20	–20	–20	–20	–20	–20	…	

Open, Shocks


120
100
80
60
40
20
0
-20
-40
Consumption C
Output Q
Trade Balance TB
0
1
2
3
4
5
Year

Gains from Consumption Smoothing

- BOTTOM LINE:
  - When output fluctuates a closed economy cannot smooth consumption, but an open one can.
- A general case (temporary shock):
  - Suppose output falls by ΔQ this period
  - Optimal response is to cut consumption by a smaller amount ΔC in this period and all future periods
  - What is ΔC? Must satisfy LRBC, where present value of C cut equals pres value of Q cut:

$$\Delta C = \frac{r^*}{1 + r^*} \Delta Q$$

Gains from Consumption Smoothing

- permanent shock:

  In the case of a permanent shock, the consumer has to cut consumption by $\Delta C = \Delta Q$ in all years to meet LRBC and keep consumption smooth.

  - Conclude: consumers can smooth out temporary shocks, but they must adjust to permanent shocks.
  - This makes sense. If your income drops by 50% just this month, you might borrow; if it is going to drop by 50% in every month, maybe you need to cut your spending.

- Summary:
  - In or a closed economy consumption equals output in every period, so output fluctuations immediately generate consumption fluctuations.
  - An open economy can smooth its consumption path by running a trade deficit in bad times (and a trade surplus in good times).

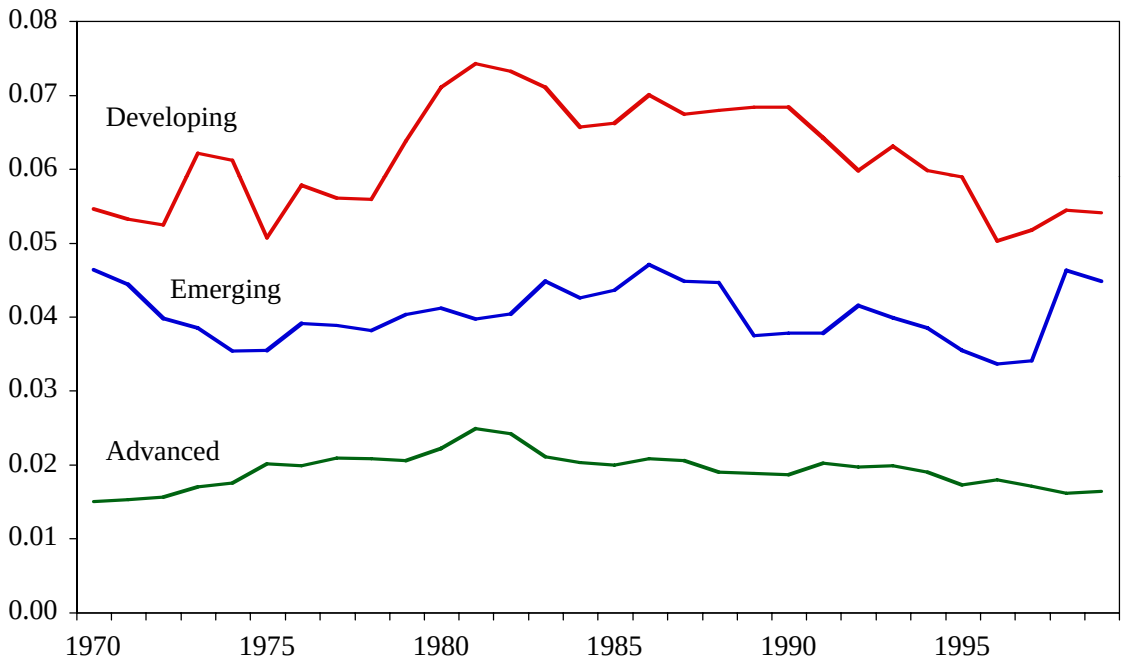
Gains from Consumption Smoothing

This lesson applies for many temporary shocks:

- Natural disaster lowers output
- Wars temporarily raise government claim to output. Can borrow to finance war and maintain smooth consumption. Implies TB<0.
- Historically wars have been funded by external borrowing, once this became possible: US civil War, WW1 and WWI

Evidence on Gains from Consumption Smoothing

Figure 17-5



Consumption Volatility In this chart consumption volatility is measured by the standard deviation of consumption growth. Advanced countries have high financial integration and low consumption volatility. Developing countries have low financial integration and high consumption volatility. Emerging markets are in between.

Gains from Efficient Investment

- A second type of benefit from openness is maintaining an efficient investment level despite low saving (important for US case).
- Assumptions:
  - Abandon the assumption that output arrives in the form of a randomly fluctuating endowment.
  - Assume output requires capital, which is created by making investments.
  - LRBC modified to include I as part of GNE:

    0= present value of TB

    0= (pv of Q) – (pv of C)– (pv of I).
  - Again, we examine two cases:
    - A closed economy, where TB=0 in all periods (and the LRBC is automatically satisfied).
    - An open economy, where TB can be nonzero in all periods (and we must verify that the LRBC is satisfied).

Gains from Efficient Investment

- Initially, production takes the form of 100 units of output Q each period. All of the output is devoted to consumption C each period.
  - This describes both closed and open economies in the case where there are no shocks.

Table 17-1

A Closed or Open Economy with No Shocks Output equals consumption. Trade balance is zero. Consumption is smooth.

		Period							
		0	1	2	3	4	5	…	Present Value
GDP	Q	100	100	100	100	100	100	…	2100
GNE	C	100	100	100	100	100	100	…	2100
TB		0	0	0	0	0	0	…	0

Gains from Efficient Investment

- Initially, production takes the form of 100 units of output Q each period. All of the output is devoted to consumption C each period.
  - This describes both closed and open economies in the case where there are no shocks.

- Experiment: Now we introduce a shock and examine how an open economy would respond.
  - The shock takes the form of an investment opportunity.
  - In year 0 the home economy discovers a new production activity that requires 16 units of capital to be invested.
  - However, this investment of 16 units of capital in year 0 will yield additional output of 5 units in year 1 and all future years.
  - Should it make these investments? Will it be better off? Does being open help?

Gains from Efficient Investment

- If no investment is made
  - GDP = Q = 100 all periods
  - What is PV(Q)?

    PV(Q) = 2100 (as before)
- If investment of 16 is made
  - GDP = Q = 100 in period 0, then 105 all periods
  - What is PV(Q)?

    PV(Q) = 100+(105/0.05) = 100+2100=2200
- Which is preferred? Use LRBC

  PV(C) = PV(Q)–PV(I)
- What is PV(C) in each case?

  PV(C) = 2100 if investment not made

  PV(C) = 2200–16 = 2184 if investment is made

  Which would you prefer?

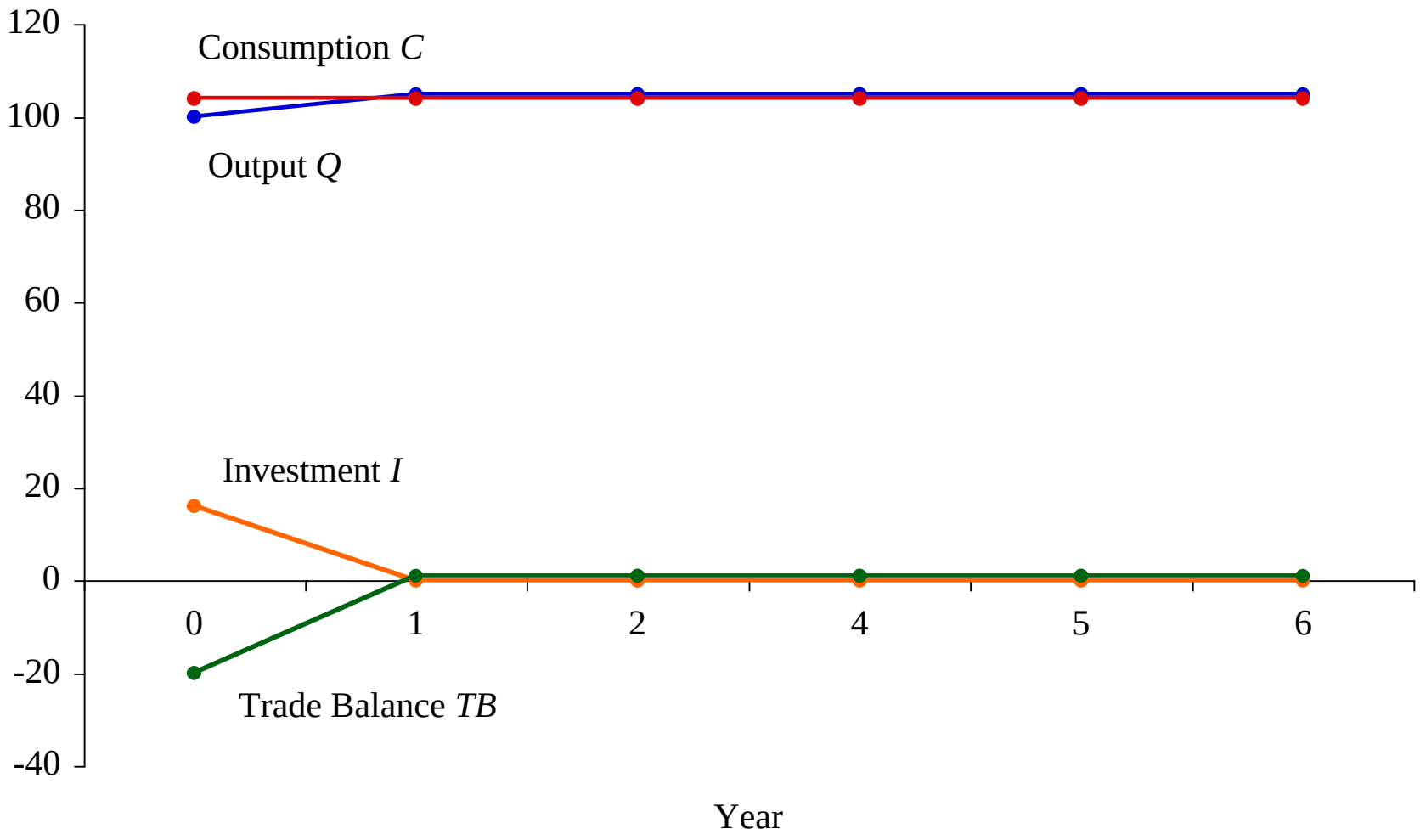
Gains from Efficient Investment

Table 17-4

An Open Economy with Investment and a Permanent Shock The economy runs a trade deficit to finance investment and consumption in period 0, and runs a trade surplus when output is higher in later periods. Consumption is smooth.

		Period							
		0	1	2	3	4	5	…	Present Value
GDP	Q	100	105	105	105	105	105	…	2200
GNE {	C	104	104	104	104	104	104	…	2184
	I	16	0	0	0	0	0	…	16
TB		–20	+1	+1	+1	+1	+1	…	0
NFIA		0	–1	–1	–1	–1	–1	…	
CA		–20	0	0	0	0	0	…	
W		–20	–20	–20	–20	–20	–20	…	

Gains from Efficient Investment



Gains from Efficient Investment

- BOTTOM LINE:
  - When a profitable investment opportunity arises an open economy can smooth consumption **and** make the investment.
  - A closed economy cannot do both these things.
  - The closed economy would have an unpleasant tradeoff
    - Sacrifice a lot of C in period 0 to invest, making consumption path unsmooth (like Q)
    - Or forego the investment opportunity

Gains from Efficient Investment

- GENERAL RESULT
  - A new project appears requiring ΔK units of capital in year 0, generating an extra units of ΔQ output in all later years.
  - What is change in PV(C) = PV(Q)–PV(I) if investment is undertaken?

$$\text{change in present value of output} = \frac{\Delta Q}{(1+r^*)} + \frac{\Delta Q}{(1+r^*)^2} + \frac{\Delta Q}{(1+r^*)^3} + \cdots = \frac{\Delta Q}{r^*}$$

$$\text{change in present value of investment} = \Delta K$$

  - Worth investing if PV(C) increases
  - PV(C) increases if and only ΔQ/r* > ΔK
  - That is: if and only if MPK = ΔQ/ΔK > r*
    - Sound familiar? **MPK = marginal product of capital**

Summary: Make Hay While the Sun Shines

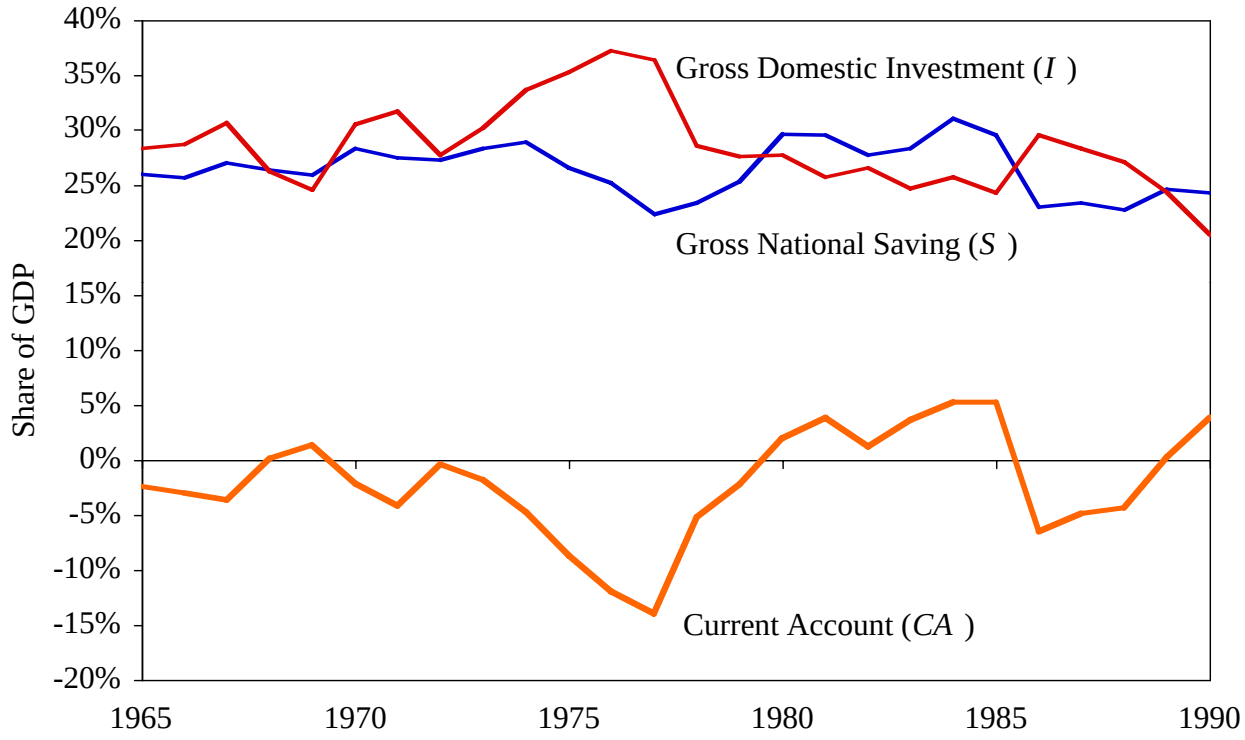
- BOTTOM LINE: Open economies solve the investment problem by setting MPK equal to the world real rate of interest, and they can then solve the consumption problem as a separate matter.
  - If conditions are unusually good (high productivity) it makes sense to invest more capital and produce more output.
  - Conversely, when conditions turn bad (low productivity) it makes sense to lower capital inputs and produce less output.
  - As we have seen, this strategy maximizes the present value of output minus investment, which equals the present value of consumption.
  - The economy can then address the separate problem of how to smooth the path of consumption.

Summary: Make Hay While the Sun Shines

- A closed economy has to be self-sufficient.
  - Any resources invested are resources not consumed.
  - All else equal, more investment implies less consumption.
  - This creates a nasty tradeoff. When investment opportunities are good, the country wants to invest to generate higher output in the future; also, anticipating that higher output, the country wants to consume more today. It cannot do both.

- Proverbially, financial openness helps countries to “make hay while the sun shines.”
  - The lesson here has a simple household analogy. If you found a great investment opportunity one day, you would like to take advantage of it. However, if you could not borrow, say, from your bank, you would face the problem of having to sacrifice consumption to finance the project from your own savings.

Case Study: Norway's Oil Boom



The Oil Boom in Norway Following a large increase in oil prices in the early 1970s, Norway invested heavily to exploit oil fields in the North Sea. Norway did not act like a closed economy and cut consumption (and increase saving) to finance this investment boom. Instead, Norway took advantage of openness to finance a temporary increase in investment by running a very large current account deficit, thus increasing her indebtedness to the rest of the world. At its peak, the current account deficit was over 10% of GDP.

3. Gains from Diversification of Risk

- In this section we show how another facet of financial globalization, international asset diversification and risk sharing.

Gains from Diversification of Risk

Example:

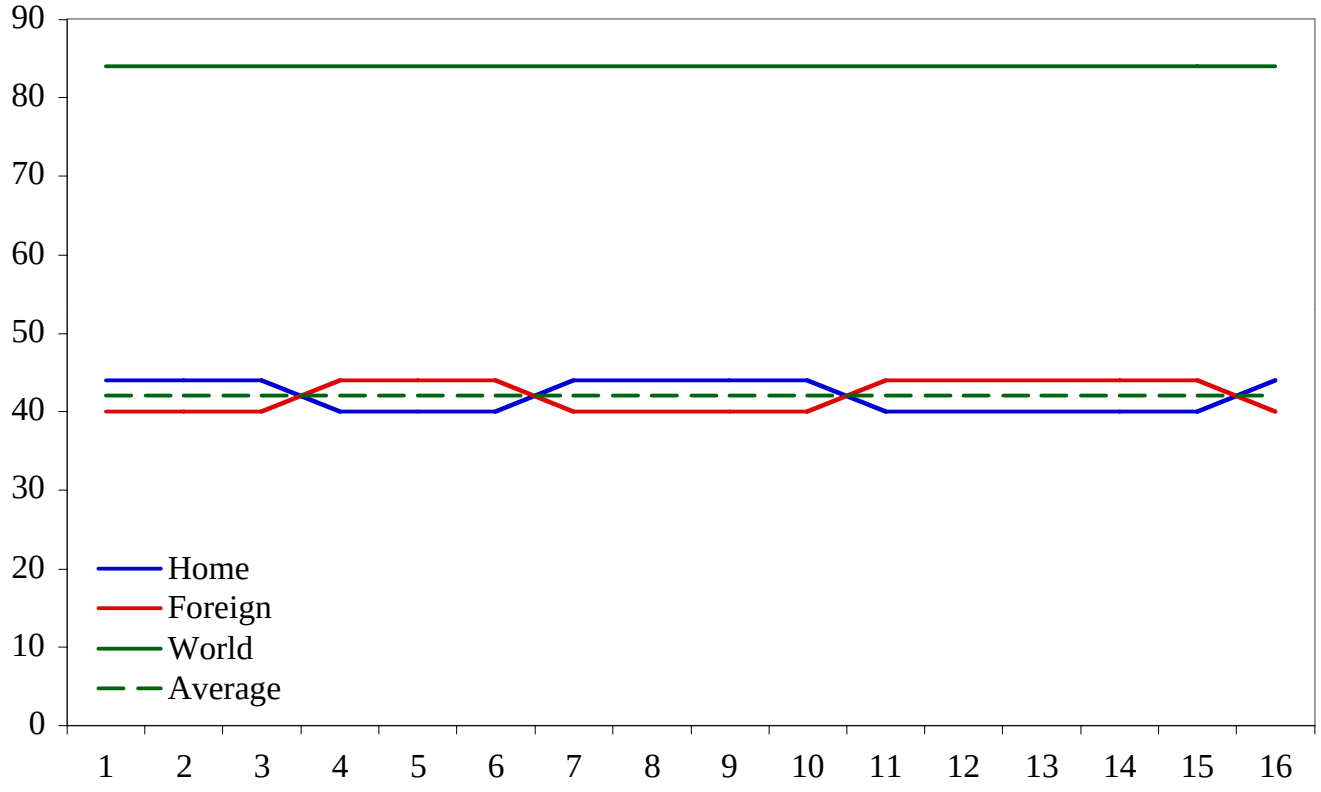
- 2 identical countries
- Two factors of production, capital and labor. Suppose 60% of GNI in the country is paid to labor, and 40% to capital.
- Assume claims to capital income can be traded (stocks)
- 2 states of the world (decided by a 50-50 coin flip)
  - 1: home output is 100, foreign 110
  - 2: home output is 110, home 100

- Suppose no asset trade takes place:

(a) Home Portfolios

State:	Home Income			Foreign Income			World Income		
	capital	labor	GNI	capital	labor	GNI	capital	labor	GNI
1	**40**	**60**	**100**	**44**	**66**	**110**	**84**	**126**	**210**
2	**44**	**66**	**110**	**40**	**60**	**100**	**84**	**126**	**210**

Gains from Diversification of Risk



- Let asset trade begin. Obviously, countries can do better than restrict their portfolio to domestic capital

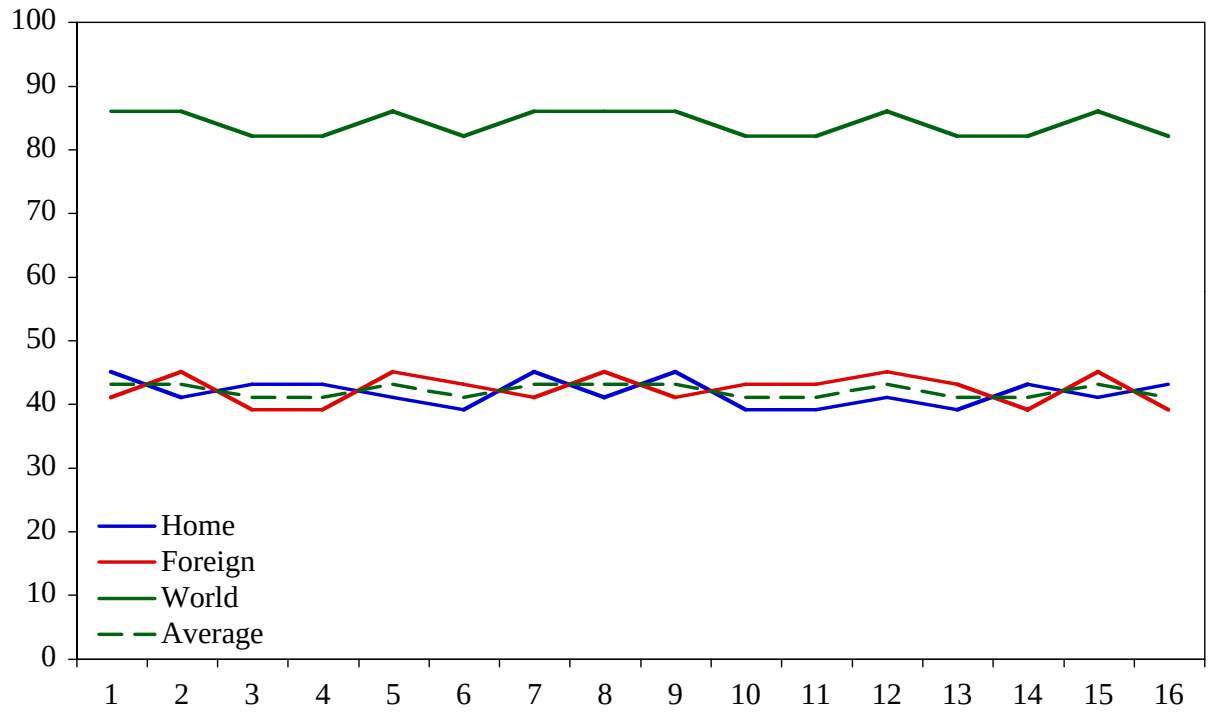
Gains from Diversification of Risk

- Let asset trade begin. Obviously, countries can do better than restrict their portfolio to domestic capital
  - Instead hold 50% home and 50% foreign capital
  - I.e. each country holds 50% of the world portfolio
  - Capital income is now smoothed (=42 in all periods)

(b) World Portfolios

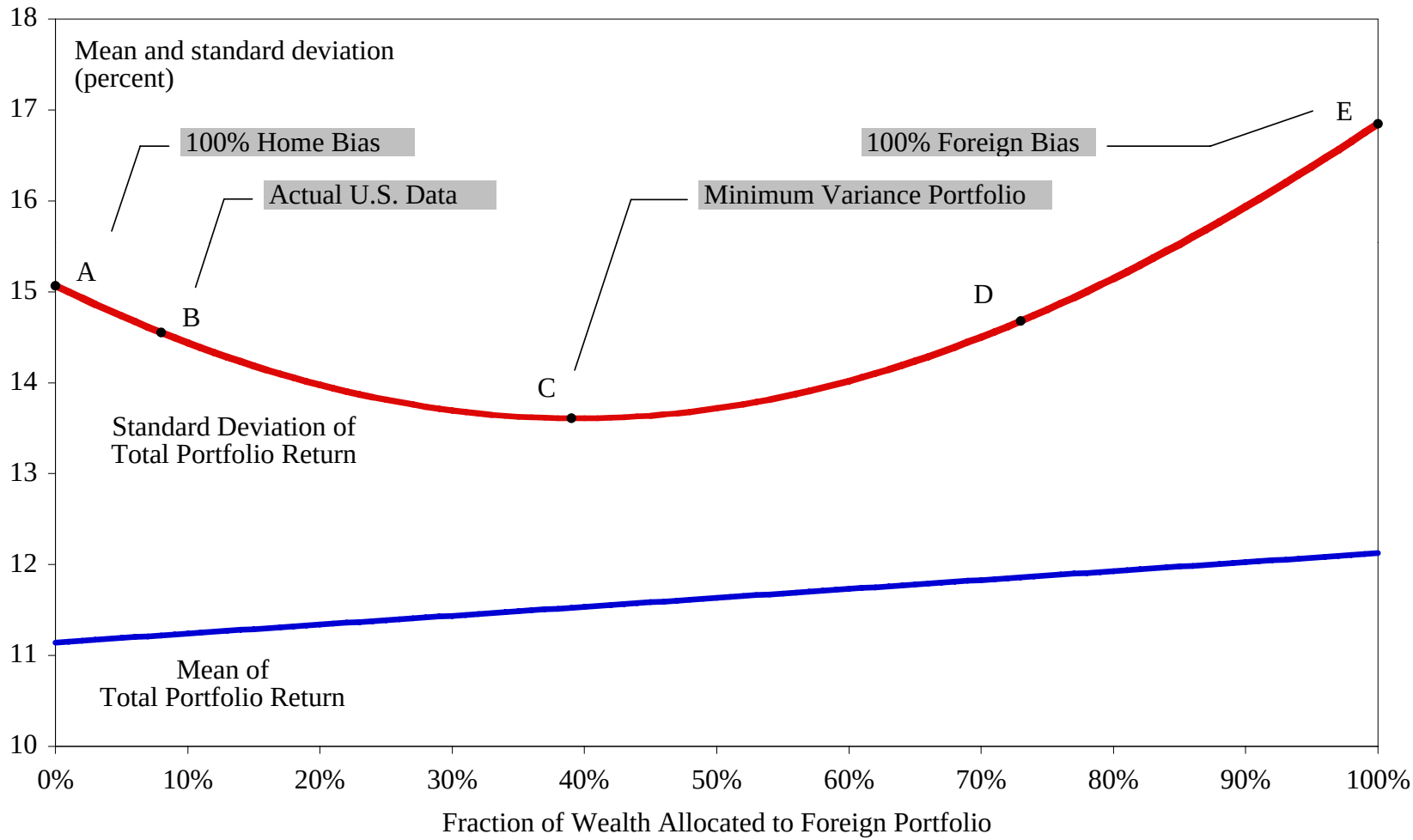
State:	Home Income			Foreign Income			World Income		
	capital	labor	GNI	capital	labor	GNI	capital	labor	GNI
1	**42**	**60**	**102**	**42**	**66**	**108**	**84**	**126**	**210**
2	**42**	**66**	**108**	**42**	**60**	**102**	**84**	**126**	**210**

Gains from Diversification of Risk



Portfolio Diversification and Capital Income: Undiversifiable Risks We take the example from Table 17-5 and Figure 17-9 and we add a common "global" shock to each country. With probability 50% each country experiences a 1 unit increase in capital income, and with probability 50% earns experiences a 1 unit decrease in capital income. Holding half of the world portfolio reduces *but does not eliminate* capital income risk entirely because the global shock is an undiversifiable risk for the world as a whole.

CASE STUDY
The Home Bias Puzzle



Summary: Don't Put All Your Eggs in One Basket

- International diversification can pool risk of country-specific shocks, and help smooth income and hence consumption.

- Note: risk sharing not help if all countries are experiencing the same global shock.

- In practice, however, risk sharing through asset trade is very limited.
  - The market is incomplete because not all capital assets are traded (many firms are privately held).
  - Trade in labor assets is legally prohibited.
  - Moreover, even with the traded assets available, investors place little wealth outside their home country.
  - Home bias in portfolios due to local information or lower domestic trading costs.