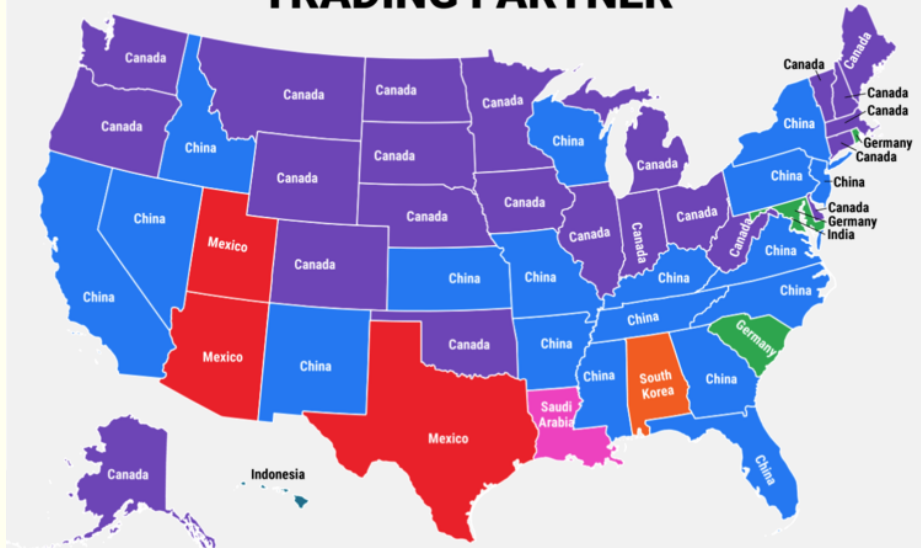# The Open Economy

Craig Sylvera

July 24, 2019

No nation was ever ruined by trade.

—Benjamin Franklin

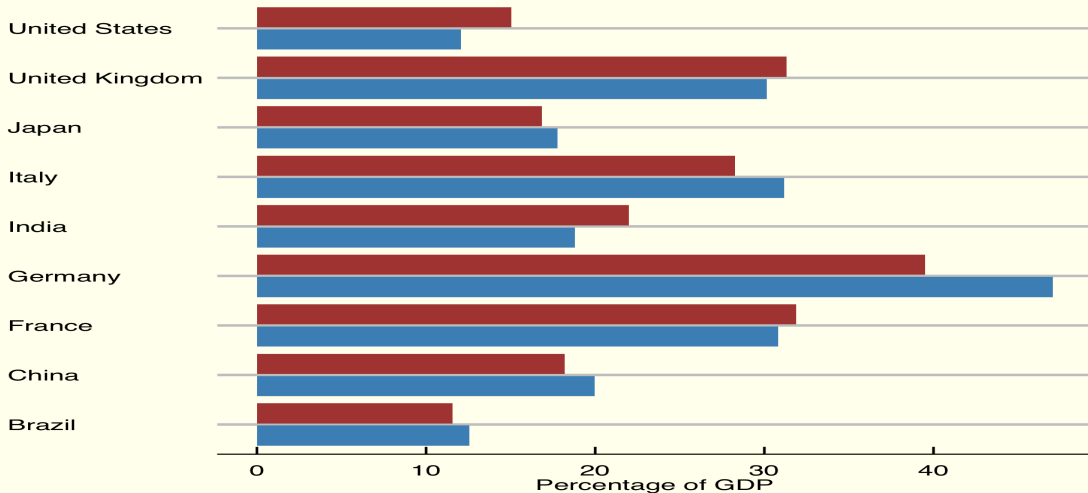# EACH STATE'S BIGGEST IMPORT TRADING PARTNER

Until now, we have assumed our economy is closed

Most economies, however, are open
- Export goods & services from abroad

- Import goods & services from abroad

- Borrow & lend in world financial markets

Imports and Exports as a Percentage of Output: 2017

Legend: Exports, Imports

Percentage of GDP

Countries (top to bottom): United States, United Kingdom, Japan, Italy, India, Germany, France, China, Brazil

The International Flow of Goods and Capital

The Role of Net Exports

In a closed economy, net exports $NX = 0$. Thus, expenditure is divided into three components: C, G, I. Expenditure in an open economy has one additional component.

- C^d, consumption of domestic goods and services

- I^d, investment in domestic goods and services

- G^d, government purchases of domestic goods and services

- X, exports of domestic goods and services

$$Y = C^d + I^d + G^d + X$$

$C^d + I^d + G^d$ is domestic spending on goods and services. X is foreign spending on domestic goods and services.

Domestic spending on all goods can be written as the sum between expenditure on domestic goods and expenditure on foreign goods.

$$C = C^f + C^d$$
$$I = I^f + I^d$$
$$G = G^f + C^d$$

We can substitute this into the national income accounts identity (NIAI)

$$Y = (C - C^f) + (I - I^f) + (G - G^f) + X$$
$$Y = C + I + G + X - (C^f + I^f + G^f)$$
$$Y = C + I + G + X - IM$$

We'll define **net exports** to be exports minus imports, and we can rewrite the NIAI

$$Y = C + I + G + NX$$

$$NX = Y - (C + I + G)$$
$$Net\ Exports = Output\ -\ Domestic\ Spending$$

If output exceeds domestic spending, we export the difference: net exports are positive. If output falls short of domestic spending, we import the difference: net exports are negative.

International Capital Flows and the Trade Balance

In an open economy —similar to what we saw in a closed economy —financial markets and goods markets are closely related. First, let's rewrite the NIAI in terms of savings and investment.

$$Y = C + I + G + NX$$

$$Y - C - G = I + NX$$

$$S = I + NX$$

$$S - I = NX$$

- We can alternatively call net exports the **trade balance** because it tells us how our trade in goods and services departs from the benchmark of equal imports and exports.

- $S - I$ is **net capital outflow** (net foreign investment)
    - $S > I$, excess lending to foreigners
    - $S < I$, financing extra investment from borrowing abroad

- Net capital outflow reflects international flow of funds to finance capital accumulation

The NIAI shows that the international flow of funds to finance capital accumulation and the international flow of goods and services are two sides of the same coin.

International Flow of Goods and Capital

Trade Surplus	Balanced Trade	Trade Deficit
Exports $>$ Imports	Exports $=$ Imports	Exports $<$ Imports
Net Exports > 0	Net Exports $= 0$	Net Exports < 0
$Y > C + I + G$	$Y = C + I + G$	$Y < C + I + G$
Saving $>$ Investment	Saving $=$ Investment	Saving $<$ Investment
Net Capital Outflow > 0	Net Capital Outflow $= 0$	Net Capital Outflow < 0

The international flow of capital can take many forms:

- Foreigners purchase domestic debt (e.g. The Chinese purchasing US treasuries)

- Foreigners purchasing a stake in domestic assets (e.g. German citizens buys corporate stock from an American)

The result of both cases is a foreigner having claim of future domestic production.

An Example

- Bill Gates sells Windows OS to a Japanese consumer for 10,000 yen

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- Bill Gates sells Windows OS to a Japanese consumer for 10,000 yen
- Net exports (NX) ↑, what happens to make the identity hold (S ↑?, I ↓?)?
    - Stuffs proceeds under his mattress —Similar to an investment in Japanese economy —Savings (S) go up

An Example

- Bill Gates sells Windows OS to a Japanese consumer for 10,000 yen
- Net exports (*NX*) ↑, what happens to make the identity hold (*S* ↑?, *I* ↓?)?

  - He buys a Japanese good, Imports (*M*) rise leaving the trade balance unchanged

An Example

- Bill Gates sells Windows OS to a Japanese consumer for 10,000 yen
- Net exports (*NX*) ↑, what happens to make the identity hold (*S* ↑?, *I* ↓?)?

    - What happens if he exchanges the yen for US dollars?

Irrelevance of Bilateral Trade

A *bilateral* trade balance is a nation's trade balance with *one* nation.

- The overall trade balance is connected to *S* and *I*. This is not true for bilateral trade.

Consider a world with three countries: U.S., China, and Australia.
- U.S. sells $100B in machinery to AUS

- AUS sells $100B in wheat to CHN

- CHN sells $100B in toys to U.S.

- Overall trade is balanced but not bilaterally

Saving and Investment in a Small Open Economy

Capital Mobility and the World Interest Rate

In the model from chapter 3, the real interest rate equilibrated saving and investment. In the model to come nations can accrue trade balances, surplus or deficit.

Here we'll consider a **small open economy** with perfect capital mobility.

Because of perfect capital mobility, the interest rate of the economy, r, must equal the **world interest rate**, r^*, the real interest rate prevailing in world financial markets.

The Model

We need to make three assumptions
  - The economy's output, Y is fixed

$$Y = \overline{Y} = F(\overline{K}, \overline{L})$$

  - Consumption, C, positively depends on disposable income, $Y - T$

$$C = C(Y - T)$$

  - Investment, I, negatively depends on the real interest rate, r

$$I = I(r)$$

First, we'll write the accounting identity
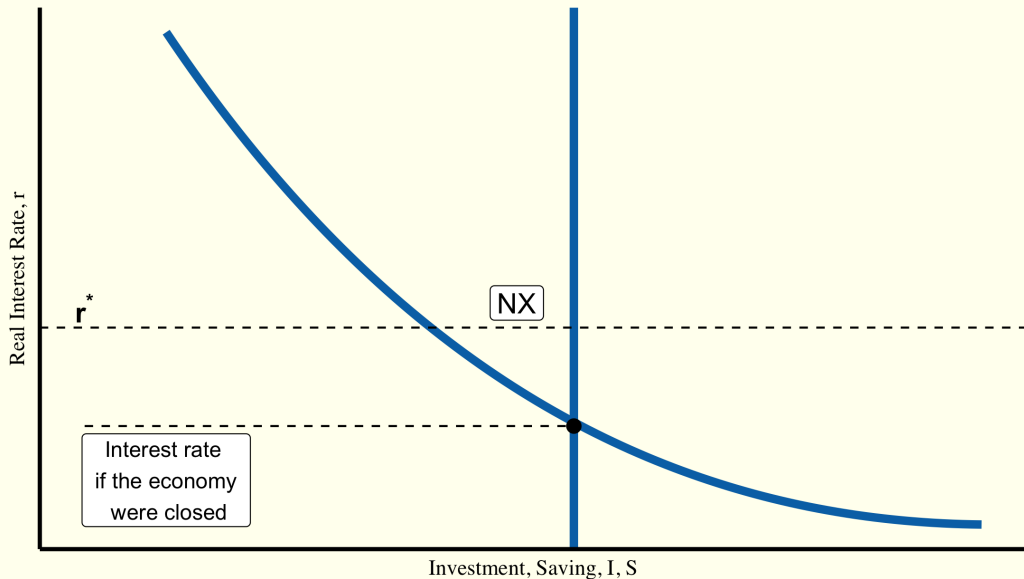
$$NX = (Y - C - G) - I$$
$$NX = S - I$$

Let's use the assumptions we've made to make the model tractable

$$NX = [\overline{Y} - C(\overline{Y} - T) - G] - I(r^*)$$
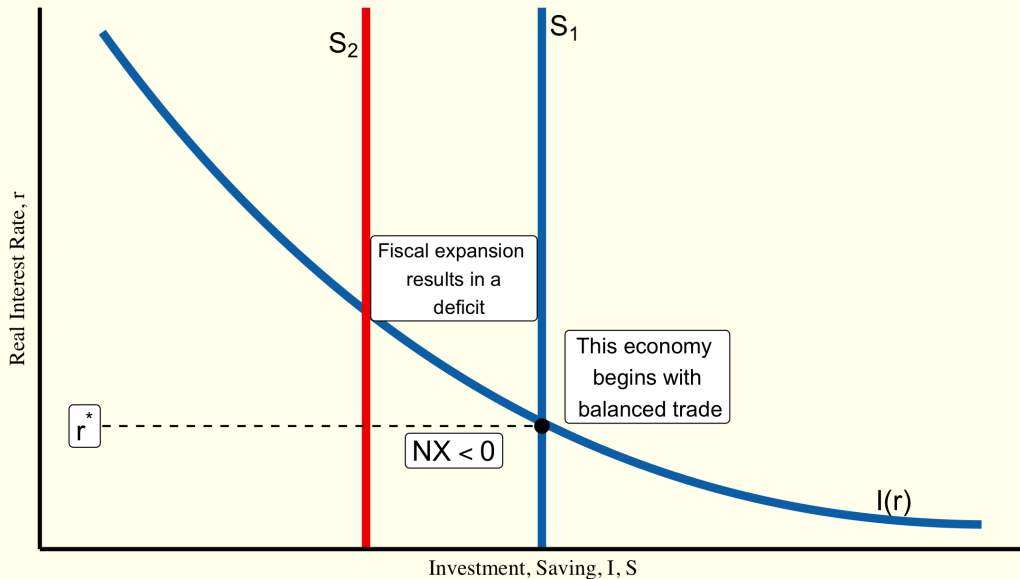$$= \overline{S} - I(r^*)$$

The trade balance is determined by the difference between saving and investment at the world interest rate.

Saving and Investment in a Small Open Economy

Real Interest Rate, r

r*

NX

Interest rate if the economy were closed
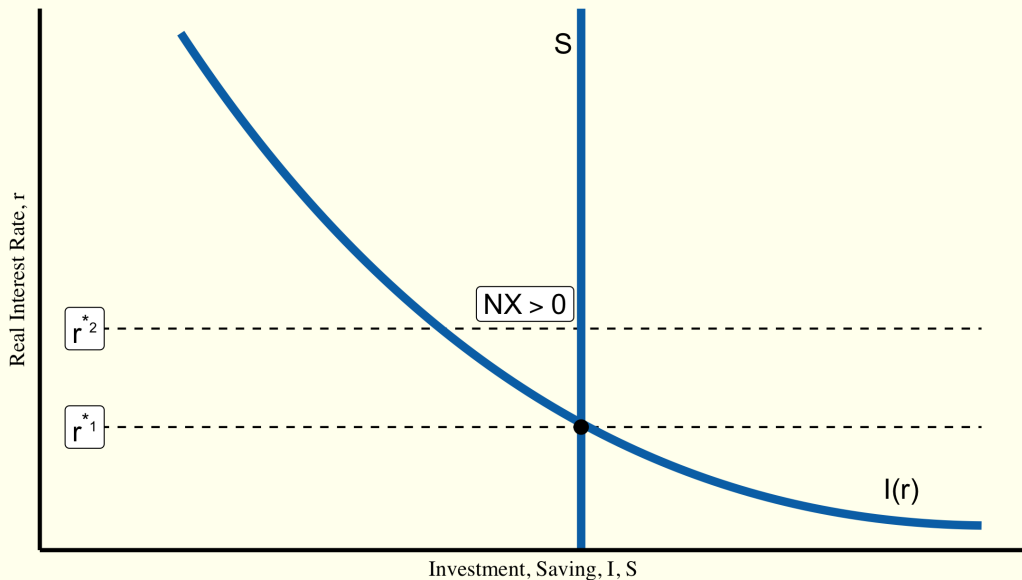
Investment, Saving, I, S
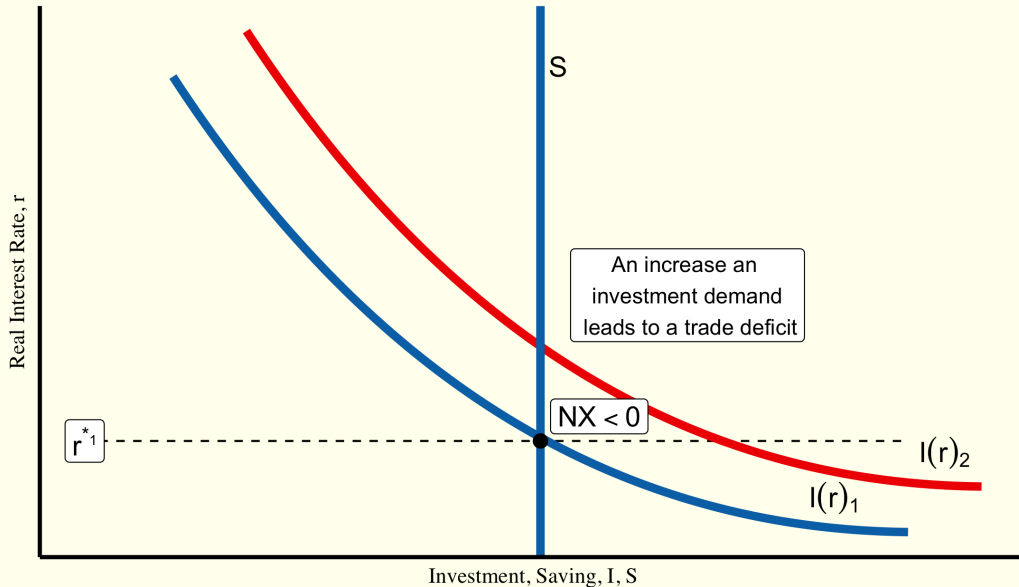
How Policies Influence the Trade Balance

A Fiscal Expansion at Home in a Small Open Economy

A Fiscal Expansion Abroad in a Small Open Economy

A Shift in the Investment Schedule in a Small Open Economy

An increase an investment demand leads to a trade deficit

$NX < 0$

r^{*1}

S

$I(r)_2$

$I(r)_1$

Real Interest Rate, r

Investment, Saving, I, S

Evaluating Economic Policy

- Policies that increase investment or decrease saving tend to cause a trade deficit

- Policies that decrease investment or increase saving tend to cause a trade surplus

- When countries run trade deficits, policymakers must determine if it is a national problem

Evaluating Economic Policy

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Evaluating Economic Policy

- Policies that increase investment or decrease saving tend to cause a trade deficit

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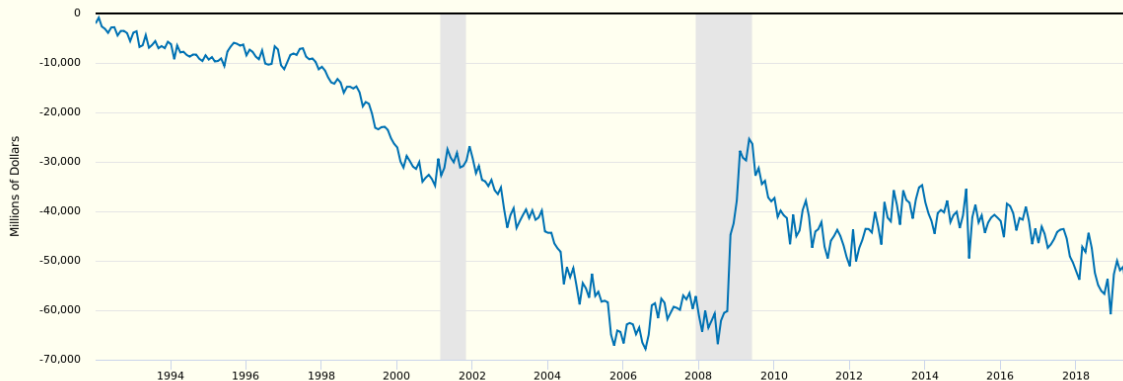   - Financing capital accumulation for technological development

U.S. Trade Deficit

What caused the U.S. trade deficit?

- National saving began to fall

- Personal income tax cuts with no change in government expenditures that began in the '80s

FRED — Trade Balance: Goods and Services, Balance of Payments Basis

Millions of Dollars

Shaded areas indicate U.S. recessions

Source: U.S. Bureau of Economic Analysis

fred.stlouisfed.org

Exchange Rates

The exchange rate between two countries is the price at which residents of those countries trade with each other.

Nominal and Real Exchange Rates

The **nominal exchange rate** is the relative price of the currencies of two countries.

Suppose the exchange rate between the U.S. dollar and the Japanes yen is 80 yen per dollar. This means that if I were to go to a currency exchange I would get 80 yen for each dollar I paid (ignoring any fees).

- We can quote an exchange rate in two ways
    - ¥80/USD
    - .0125 USD / ¥

- We'll opt quote them as foreign currency per USD

- An *appreciation* (strengthening) of the exchange rate is then an increase in the numerator

- A fall in the exchange rate, *depreciation* (weakening), is a decrease in the numerator

The Real Exchange Rate

The **real exchange rate** is the relative price of the goods of two countries. Let's consider the following example to illustrate the concept.

$$Real\ Exchange\ Rate = \frac{(80\,Yen/Dollar) \times (25{,}000\ Dollars/American\ Car)}{(4{,}000{,}000\ Yen/Japanese\ Car)}$$

$$= 0.5\frac{Japanese\ Car}{American\ Car}$$

$$Real\ Exchange\ Rate = \frac{Nominal\ Exchange\ Rate \times Price\ of\ Domestic\ Good}{Price\ of\ Foreign\ Good}$$

The Real Exchange Rate

The calculation of the real exchange rate for a single good suggests how we should define the real exchange rate for a broader basket of goods. Let e be the nominal exchange rate, P be the price level in the U.S. and P^* be the price level in Japan. Then the real exchange rate, ϵ is

$$Real\ Exchange\ Rate = Nominal\ Exchange\ Rate \times Ratio\ of\ Price\ Levels$$
$$\epsilon = e \times (P/P^*)$$

- If ϵ is high, foreign goods are relatively cheap, domestic goods are relatively expensive

- If ϵ is low foreign goods are relatively expensive, domestic goods are relatively cheap

The Real Exchange Rate and the Trade Balance

Suppose that the real exchange rate is relatively low, then domestic residents will want to purchase relatively fewer imported goods, and quantity of net exports demanded wil be high.

- $NX = NX(\epsilon)$

Net Exports and the Real Exchange Rate
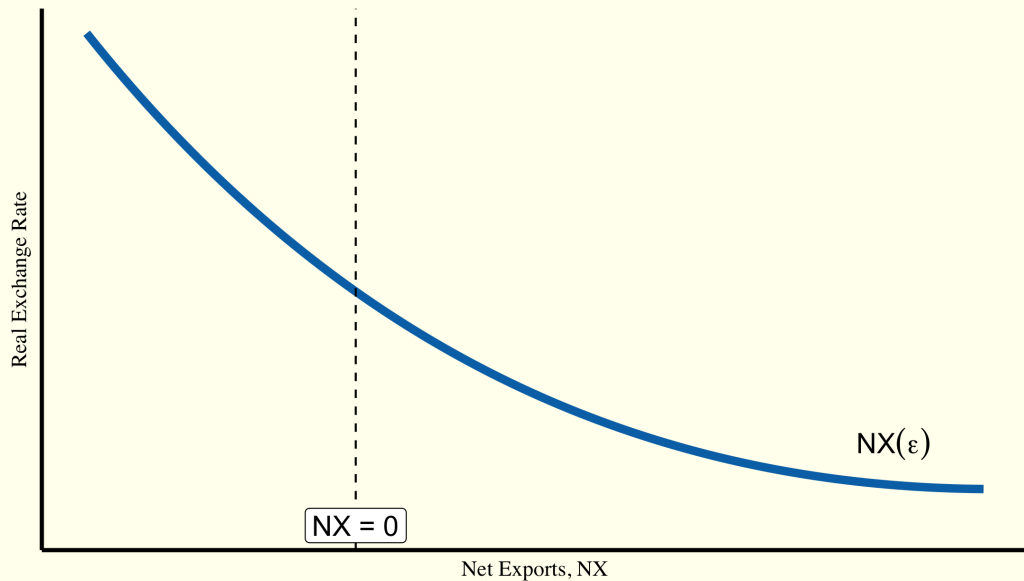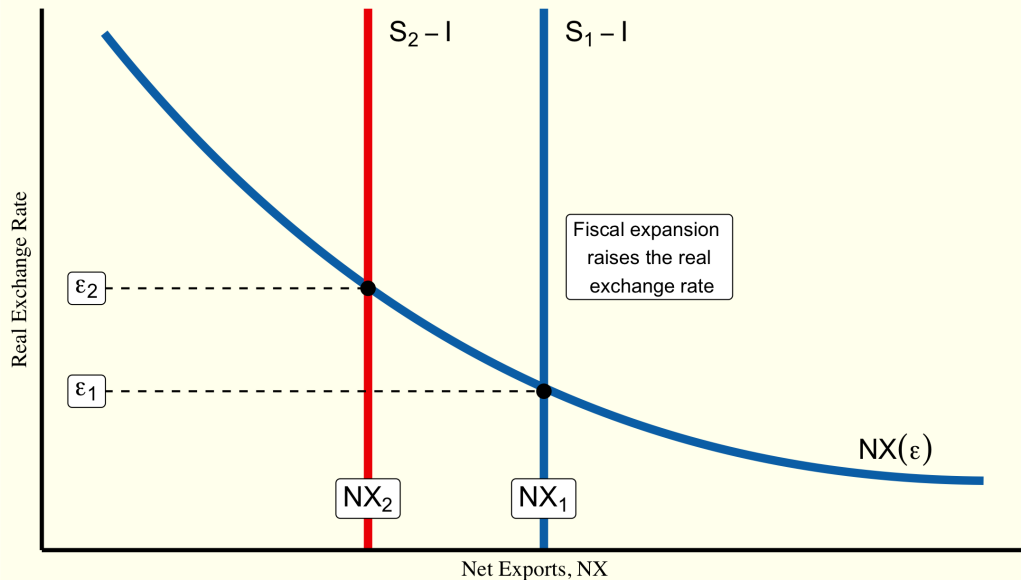
Determinants of the Real Exchange Rate

- The real value of a currency is inversely related to net exports

- The trade balance (net exports) must equal the net capital outflow which in turn equals saving minus investment.
  - Saving is fixed by the consumption function
  - Investment is fixed by the investment function and the world interest rate

How the Real Exchange Rate is Determined

S - I

Real Exchange Rate

Equilibrium
real exchange
rate

NX

Net Exports, NX
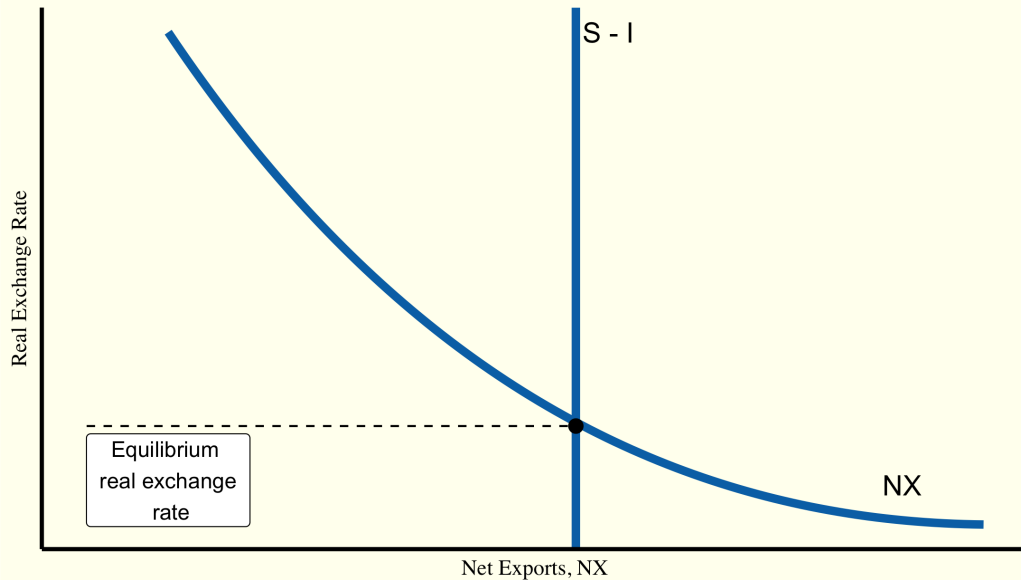
How Policies Influence the Real Exchange Rate

The Impact of Expansionary Fiscal Policy

Real Exchange Rate (y-axis)

Net Exports, NX (x-axis)

$S_2 - I$

$S_1 - I$

ε_2

ε_1

Fiscal expansion raises the real exchange rate

NX_2

NX_1

$NX(\varepsilon)$

The Impact of Expansionary Fiscal Policy Abroad

$S - I(r_1^*)$

$S - I(r_2^*)$

A rise in the world interest rate decreases the real exchange rate

ε_1

ε_2

NX_1

NX_2

$NX(\varepsilon)$

Real Exchange Rate

Net Exports, NX
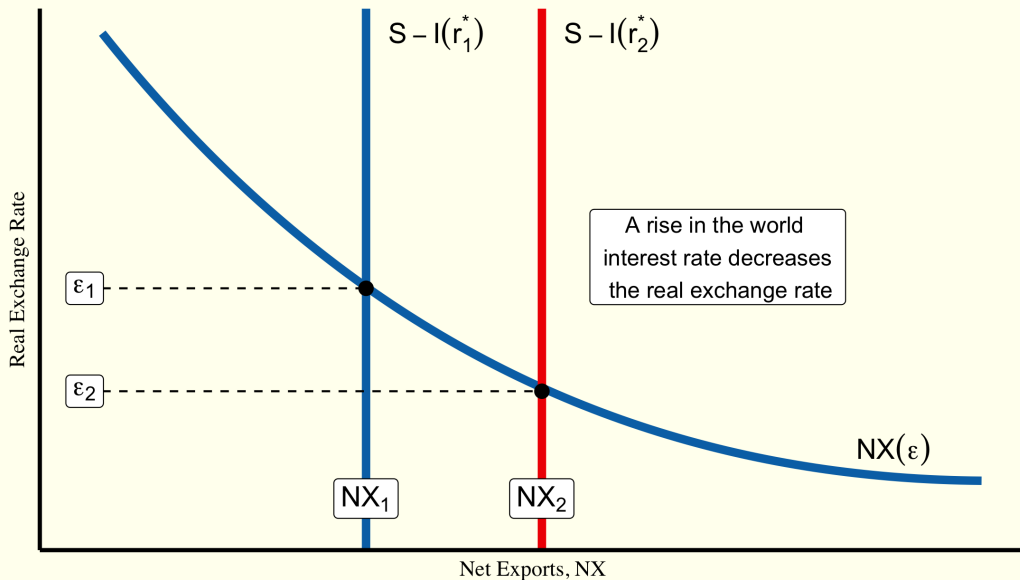
The Impact of an Increase in Investment Demand
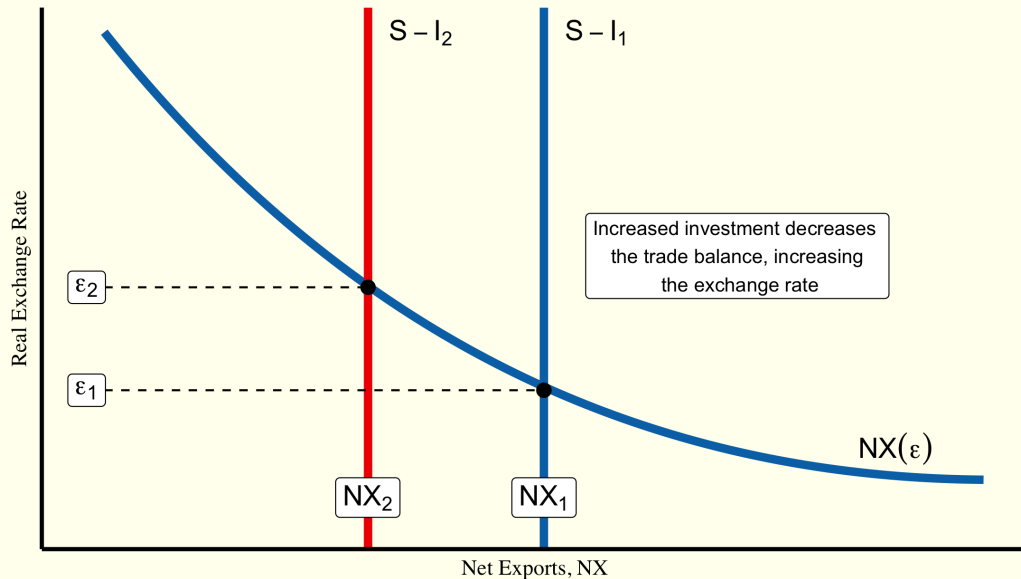
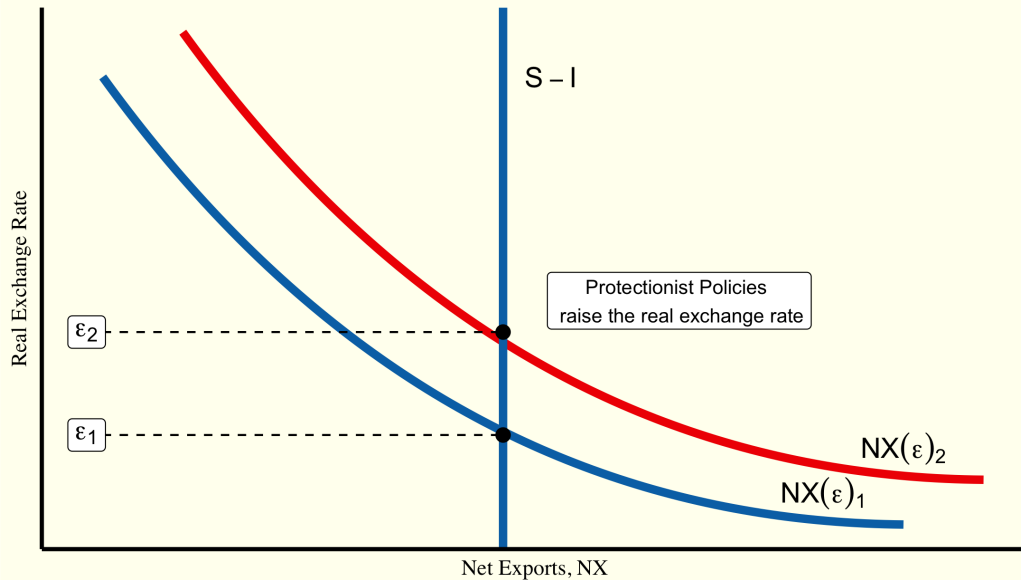# The Effects of Trade Policies

- Trade policies are policies designed to directly influence the amount of goods and services exported or imported

- In general, trade policy is *protectionist*, it protects domestic industries from foreign ones
    - A *tariff* is a tax on foreign imports
    - A *quota* is a restriction on the quantity of imports

- Protectionist policies do *not* affect the trade balance
    - Reduce quantity of exports
    - Reduce the quantity of imports

On your own: What were the results of the Smoot-Hawley Tariff Act?

The Impact of Protectionist Trade Policies

Real Exchange Rate

S – I

Protectionist Policies
raise the real exchange rate

ε_2

ε_1

$NX(\varepsilon)_2$

$NX(\varepsilon)_1$

Net Exports, NX

The Determinants of the Nominal Exchange Rate

Recall the relationship between the real and the nominal exchange rate:

Real Exchange Rate = Nominal Exchange Rate × Ratio of Price Levels

$$\epsilon = e \times (P/P^*)$$

We can write the nominal exchange rate as

$$e = \epsilon \times (P^*/P)$$

- If the domestic price level rises, $P \uparrow$, then the nominal exchange rate falls, i.e. a dollar is worth less

- If the foreign price level rise, $P^* \uparrow$, then the nominal exchange rate rise, i.e. a dollar buys more

We can learn from considering the change in *e* over time. The exchange rate equation in percentage changes is

$$\%Change\ in\ e = \%Change\ in\ \epsilon + \%Change\ in\ P^* - \%Change\ in\ P$$

$$\%Change\ in\ e = \%Change\ in\ \epsilon + (\pi^* - \pi)$$

If a country has a high rate of inflation relative to the U.S., a dollar will buy an increasing amount of the foregin currency time. If a country has a low rate of inflation relative to the U.S., a dollar will buy a decreasing amount of the foreign currency over time.

The Special Case of Purchasing Power

The *law of one price* states that the same good cannot sell for different prices in different locations at the same time. The law of one price applied to the international marketplace is called **purchasing power parity**.

How Realistic is Purchasing Power Parity?

- Not entirely accurate

- Many goods cannot be easily traded

- Tradeable goods are not perfect substitutes

An Example: Big Macs Around the World

Country	Currency	Price of a Big Mac	Exchange Rate (per U.S. dollar) Predicted	Actual
Colombia	Peso	8600	1794	1848
South Korea	Won	4100	855	1024
Euro Area	Euro	3.68	0.77	0.74
Britain	Pound	2.89	0.60	0.59
China	Yuan	16.9	3.52	6.20

The U.S. as a Large Open Economy

- In a closed economy, the real interest rate equilibrates saving and investment

- In an open economy, the world interest rate affects the trade baalnce

- The U.S. is a mixture of the two models
  - Large trade deficits show importance of world financial markets
  - U.S. large enough to influence world financial markets
  - Capital may not be perfectly mobile