

# Open economy

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# Introduction

- ▶ closed economy:

$$Y = C + I + G$$

- ▶ *open economy*:

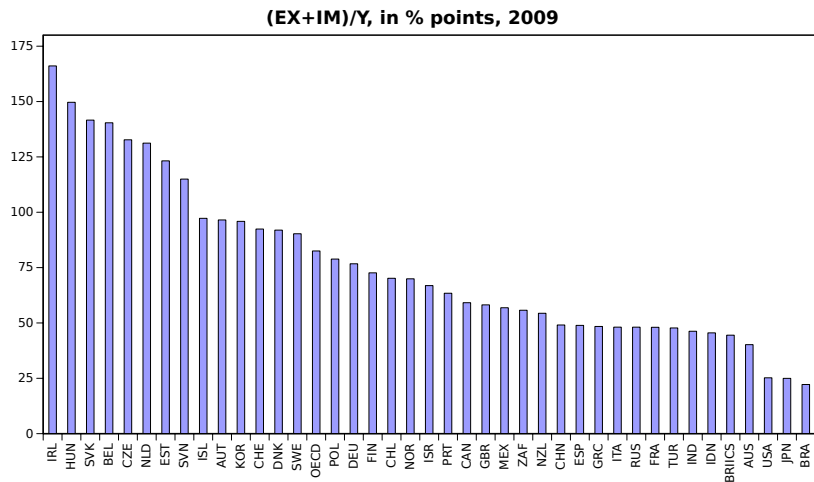
$$Y = C + I + G + EX - IM$$

- ▶ EX - exports; IM - imports
- ▶ why?  $C, I, G$  now measure total spending on both domestic and foreign stuff:

$$C = C_d + C_f, \quad I = I_d + I_f, \quad G = G_d + G_f$$

- ▶ so we have  $Y = C_d + I_d + G_d + EX$ , and  $IM = C_f + I_f + G_f$ ;  
rearrange to obtain accounting identity above
- ▶ trade with foreign countries is an integral part of the economy
- ▶ rough measure of *openness*:  $\frac{EX+IM}{Y}$

# Trade openness



Source: OECD, <http://dx.doi.org/10.1787/888932487818>

# Why trade?

Because specialization is more efficient.

- ▶ country A can produce 4 apples, or 8 oranges (or some combination)
- ▶ country B can instead produce 8 apples or 4 oranges (or some combination)
- ▶ no trade: for example,
  - ▶ A produces 2 apples and 4 oranges
  - ▶ B produces 4 apples and 2 oranges
- ▶ trade: each country can specialize, and total production is higher
  - ▶ A produces 8 oranges, exports 4 to B
  - ▶ B produces 8 apples, exports 4 to A
  - ▶ both countries are better off

## Comparative advantage

That was obvious. But the same principle holds even if one country doesn't have absolute advantage in either sector (Ricardo, 1817).

- ▶ country A can produce 2 apple, or 4 oranges (or some combination)
- ▶ country B can produce 8 apples or 4 oranges (or some combination)
- ▶ no trade:
  - ▶ A produces 1 apples and 2 oranges
  - ▶ B produces 4 apples and 2 oranges
  - ▶ total production: 5 apples, 4 oranges
- ▶ trade: each country specializes
  - ▶ A produces 4 oranges
  - ▶ B produces 8 apples
  - ▶ total production: 8 apples, 4 oranges
  - ▶ room for trade

## Other reasons for trade

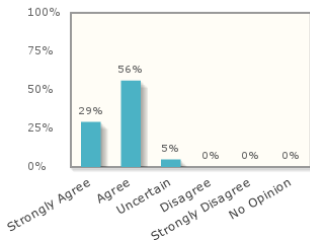
- ▶ in previous example, trade was balanced
- ▶ trade deficits and surpluses can be used for risk sharing
  - ▶ when country A has bad harvest, it imports wheat from country B (paid for by debt), and vice versa
  - ▶ over time, country A will sometimes have trade surplus, sometimes deficit, but overall it's better than facing all the risk alone
- ▶ there's also lot of trade that's hard to explain with comparative advantage
  - ▶ often countries both import and export same goods, why?
  - ▶ Paul Krugman (+others): increasing returns and taste for variety

# Is trade good?

Most economists say yes.

Question A: Freer trade improves productive efficiency and offers consumers better choices, and in the long run these gains are much larger than any effects on employment.

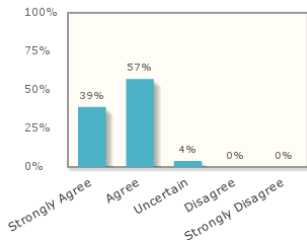
## Responses



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Source: IGM Economic Experts Panel  
[www.igmchicago.org/igm-economic-experts-panel](http://www.igmchicago.org/igm-economic-experts-panel)

## Responses weighted by each expert's confidence



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Source: IGM Economic Experts Panel  
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# Is trade good?

- ▶ international trade typically leads to more efficient outcomes
- ▶ however, there are winners and losers, especially in the short-run
  - ▶ e.g. workers who lost jobs to outsourcing
- ▶ in theory, efficiency gains should be large enough so that winners could (hypothetically) compensate losers (Kaldor-Hicks efficiency criterion)
  - ▶ but of course, actual outcomes are more complicated
- ▶ still, free trade with well-functioning social safety net and requalification programs likely preferable to protectionism



# Trade balance

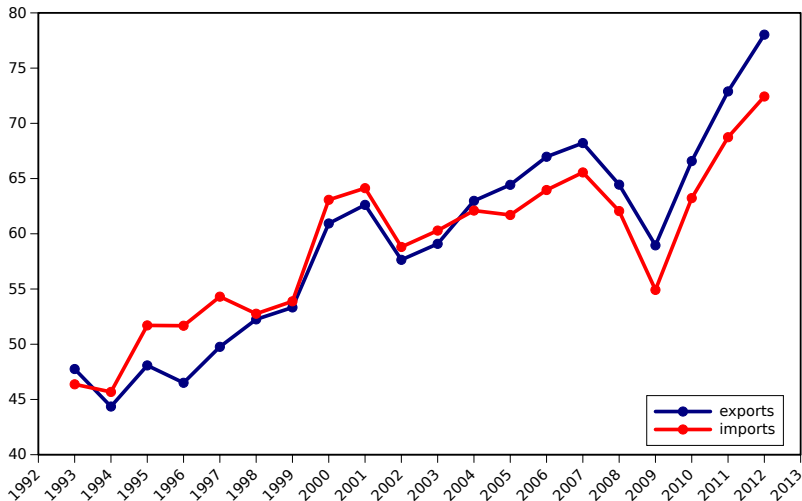
- ▶ net exports, or *trade balance*:

$$NX = EX - IM$$

- ▶  $NX > 0$ : country exports more than it imports - trade *surplus*
  - ▶  $NX < 0$ : the opposite - trade *deficit*
- ▶ in practice, countries often run trade deficits or surpluses
- ▶ what does that imply?

# Trade Balance - Czech Republic

## Exports, Imports as % of GDP, Czech Republic



Source: World Bank, World Development Indicators

## Saving vs. spending

Go back to  $Y = C + I + G + NX$

- ▶ subtract consumption from income to obtain domestic saving on left side:

$$\underbrace{Y - C - G}_S = I + NX$$

- ▶ thus  $NX = S - I$ 
  - ▶ if domestic saving less than spending on investment, country runs trade deficit, and vice versa
  - ▶ this holds by definition
- ▶ at the same time,  $NX$  must be paid for
  - ▶ if  $NX < 0$ , you must pay foreigners
  - ▶ if  $NX > 0$ , foreigners pay you

# Capital flows

- ▶ but recall that we also have 
$$\underbrace{Y}_{\text{income}} - \underbrace{(C + I + G)}_{\text{spending}} = NX$$
  - ▶ thus if  $NX < 0$ , your spending exceeds your income - you must borrow from abroad, or sell off some of your assets to foreigners
  - ▶ and if  $NX > 0$ , your income exceeds your spending, so you accumulate foreign assets (or repay debts)
- ▶ trade deficits or surpluses are thus mirrored in changes of country *net foreign asset position*
- ▶ net capital outflow = trade balance

## Some examples

- ▶ government borrows 500M CZK from foreign lenders and buys new (foreign) airplanes
  - ▶ NX goes down by 100M, NFAP goes down by 100M (value of debt)
- ▶ you buy 500 CZK worth of music online from Itunes
  - ▶ NX goes down by 500; your bank converts crowns into dollars; either the bank sells dollars that it owns, or it finds a foreign counterparty who buys crowns; in any case, NFPA goes down by 500
- ▶ Skoda exports 100M CZK worth of cars to Germany, gets paid in euros
  - ▶ NX goes up by 100M; NFPA goes up by 100M (Skoda now owns foreign asset - euros)

# Balance of payments

If you look at real data, terminology is bit more complicated.

- ▶ it's still true that  $Y = C + I + G + NX$
- ▶ but change in net foreign assets depends also on some other things
- ▶ balance of payments: overall summary of transactions between country and rest of the world
- ▶ BoP has two main components: current account, and financial/capital account

# Balance of payments

- ▶ current account: consists of
  - ▶ trade balance - transactions in goods and services, what we talked about ( $NX$ )
  - ▶ net factor income - records factor payments (profits/wages) paid to or from abroad
  - ▶ net cash transfers - records other transfers (aid, remittances, . . . )
- ▶ financial account: records flows of assets
  - ▶ some definitions distinguish separate capital account for intangible assets (small)
  - ▶ central bank reserves sometimes reported separately
- ▶ double-entry accounting: each transaction enters at two places with differing signs
- ▶ accounts sum to zero

# Determinants of trade balance

- ▶ in closed economy, investment = saving because real interest rate adjusts
- ▶ in open economy, this may not necessarily hold
- ▶ assume perfect *capital mobility* - loanable funds can freely move between countries
  - ▶ thus there is single real interest rate for all countries
  - ▶ determined by equilibrium in “world” loanable fund market
- ▶ to keep things simple, assume *small open economy*
  - ▶ world interest rate is effectively exogenous



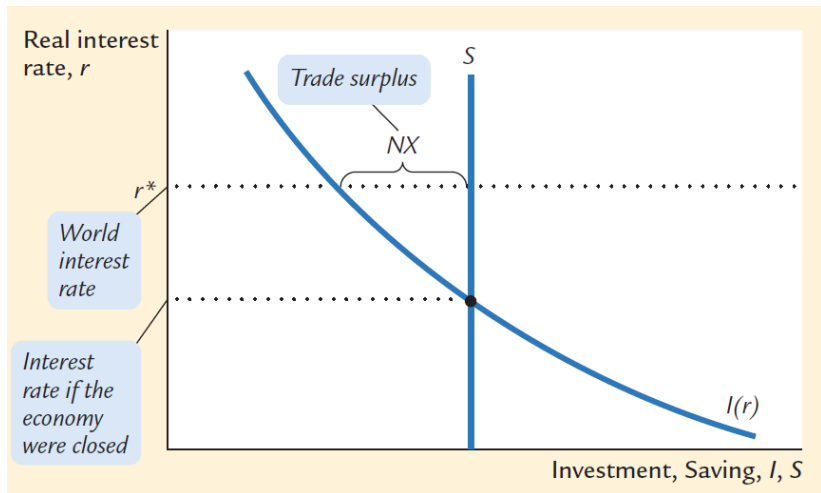
# Determinants of trade balance

- ▶ recall the simple macroeconomic model few lectures ago:
  - ▶ output given by production function  $Y = F(K, L)$
  - ▶ consumption is function of disposable income  $C = C(Y - T)$
  - ▶ investment depends on interest rate  $I = I(r)$
- ▶ domestic saving:  $S = \underbrace{((Y - T) - C)}_{\text{private}} + \underbrace{(T - G)}_{\text{public}}$
- ▶ trade balance:

$$NX = S - I = Y - C(Y - T) - G - I(r)$$

- ▶ since  $r$  is now exogenous, this may be nonzero
- ▶ trade balance depends on:
  - ▶ world interest rate  $r$
  - ▶ domestic output  $F(K, L)$
  - ▶ consumption and investment functions  $C(), I()$
  - ▶ fiscal policy  $G, T$
- ▶ in the short run, we take all of the above as exogenous

# Determinants of trade balance



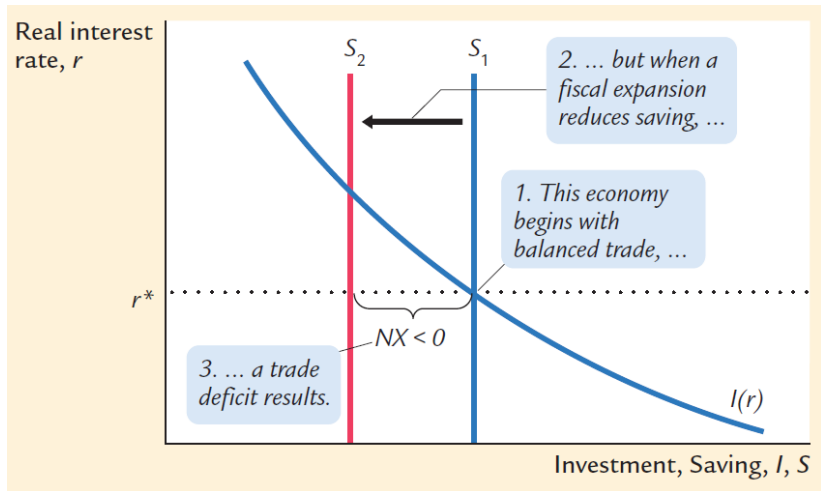
Source: Mankiw

## Comparative statics

Say that world interest rate is such that  $NX = 0$ . Then government raises  $G$  (keeping taxes as before).

- ▶ output and disposable income stays same - no change in private saving
- ▶ government runs deficit - decrease in public saving
- ▶ world interest rate stays same
- ▶ thus the country starts to run trade deficit,  $NX < 0$

# Determinants of trade balance



Source: Mankiw

# Exchange rates

- ▶ how does trade balance (exports and imports) actually adjust to match changes in domestic saving?
- ▶ previous model had only real variables. What about prices?
- ▶ prices in international setting related to exchange rates

Nominal exchange rate  $e$  - two ways to write:

- ▶  $1 \text{ EUR} = 27.45 \text{ CZK}$
- ▶  $1 \text{ CZK} = 0.036 \text{ EUR}$
- ▶ here we will put domestic currency on the left (second way)
  - ▶ rate goes up - CZK appreciates (more valuable)
  - ▶ rate goes down - CZK depreciates (less valuable)

# Real exchange rate

- ▶ what should matter for trade is exchange rate adjusted for price levels in both countries

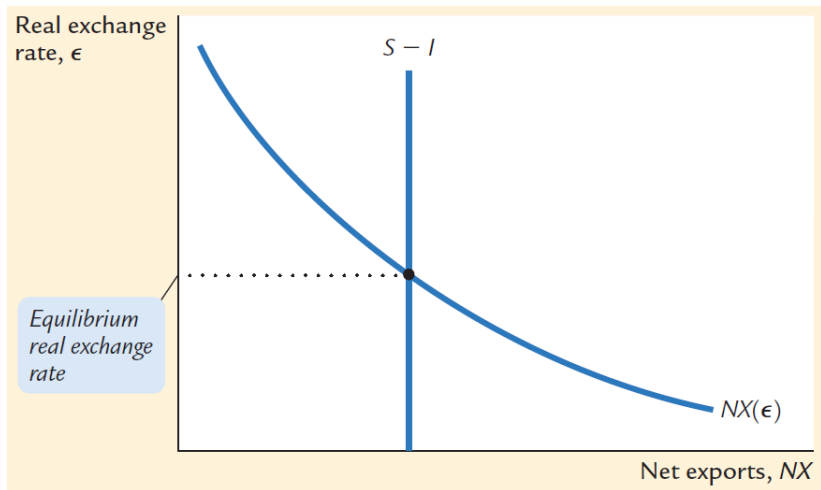
$$\text{real rate} = \frac{\text{nominal rate} \times \text{domestic price}}{\text{foreign price}}, \text{ or } \epsilon = e \frac{P}{P^*}$$

- ▶ it's relative price of domestic goods in terms of foreign goods
  - ▶ start with one unit of domestic good
  - ▶ sell it for  $P$
  - ▶ convert your money to get  $eP$  units of foreign currency
  - ▶ buy  $\epsilon = eP/P^*$  units of foreign good
- ▶ what is price?
  - ▶ in our model, it's just the price of single model good
  - ▶ in real world, price index computed from some basket

# Determinants of real exchange rate

- ▶ exports and imports should depend on  $\epsilon$ 
  - ▶ if  $\epsilon$  is higher, domestic goods are more expensive relative to foreign goods
  - ▶ this will discourage exports, but encourage imports
- ▶ thus we have  $NX = NX(\epsilon)$ , a decreasing function
- ▶ but didn't we already derive that  $NX = S - I$ ?
- ▶ right, so then  $\epsilon$  must adjust so that  $NX(\epsilon) = S - I$

# Determinants of real exchange rate



Source: Mankiw



## Comparative statics

Again: start with  $NX = 0$ . Then government raises  $G$  (keeping taxes as before).

- ▶ we showed this will lower domestic saving, and thus  $S - I$  shifts left
- ▶ thus equilibrium real exchange rate must rise
- ▶ intuition
  - ▶ domestic spending exceeds income/output - the difference must be covered by more imports, or less exports
  - ▶ this will happen if domestic goods become more expensive relative to foreign goods

# Nominal exchange rate

- ▶ we have explained real exchange rate
- ▶ but to explain nominal rate, we'd need to explain inflation first

$$e = \epsilon \frac{P^*}{P}$$

- ▶ rewrite in terms of growth rates:

$$g_e = g_\epsilon + \underbrace{\pi^* - \pi}_{\text{inflation differential}}$$

- ▶ if real rate is stable, but our country has higher inflation than foreigners, nominal rate goes down over time (our currency depreciates)

# PPP

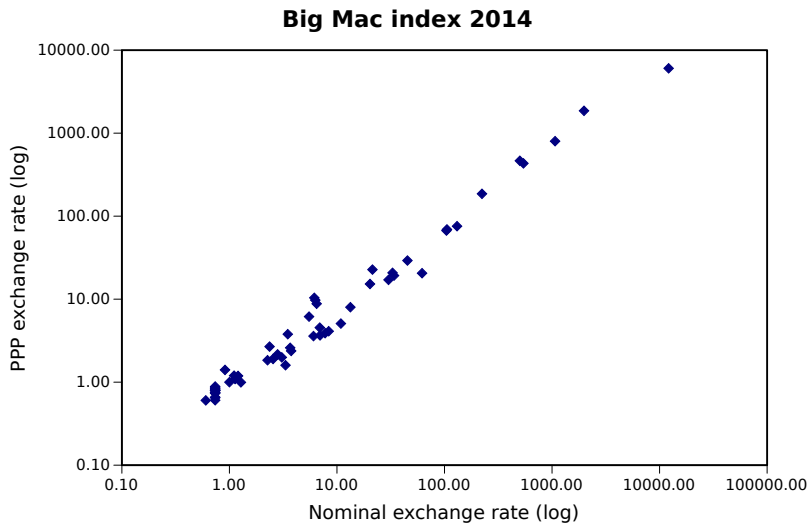
- ▶ imagine that goods could be easily and costlessly traded across borders
- ▶ then real exchange rate should be one, and nominal exchange rate should depend only on price differential across countries
  - ▶ why? consider two trades: 1) buy the good home directly, 2) buy foreign currency, buy the good abroad, import it home
  - ▶ if one of these options was cheaper, one could make profit by arbitrage
- ▶ this is called *purchasing power parity*
  - ▶ example: if one beer costs 30 CZK here, and  $1 \text{ EUR} = 30 \text{ CZK}$ , one beer in Germany should cost 1 EUR under PPP
- ▶ PPP doesn't hold in the short term, but perhaps is more reasonable hypothesis in long run
- ▶ PPP-implied exchange rates are sometimes used in international statistics

# Big Mac index

An illustration of PPP compiled by The Economist.

- ▶ say Big Mac costs 70.45 CZK here, and 4.62 USD in USA (2014 index edition)
- ▶ implied Big Mac PPP exchange rate:  $1 \text{ USD} = 70.45 / 4.62 = 15.24 \text{ CZK}$
- ▶ actual market exchange rate is  $1 \text{ USD} = 20.28 \text{ CZK}$
- ▶ so CZK seems undervalued relative to the dollar

# Big Mac index



Source: <http://www.economist.com/content/big-mac-index>

