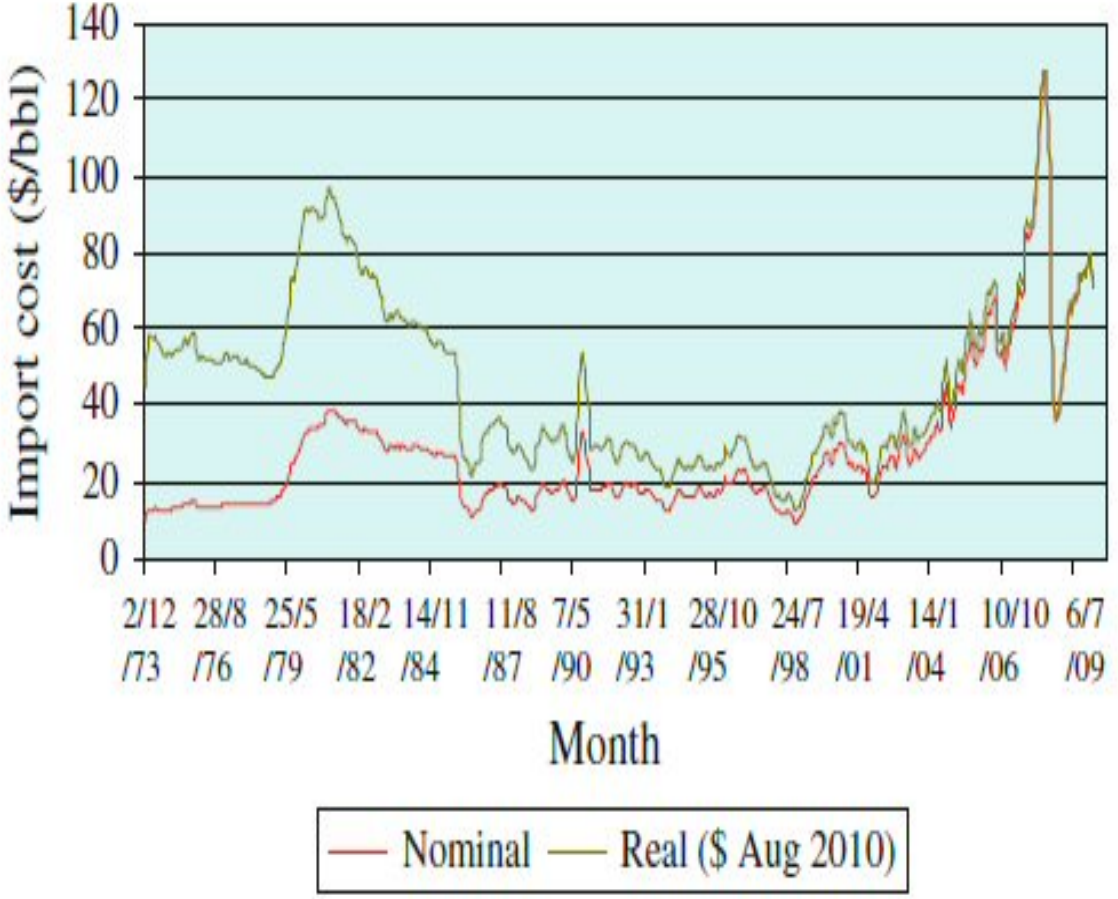
Econ 366

Fall 2012

Energy Prices, Energy Booms, and the Macro Economy

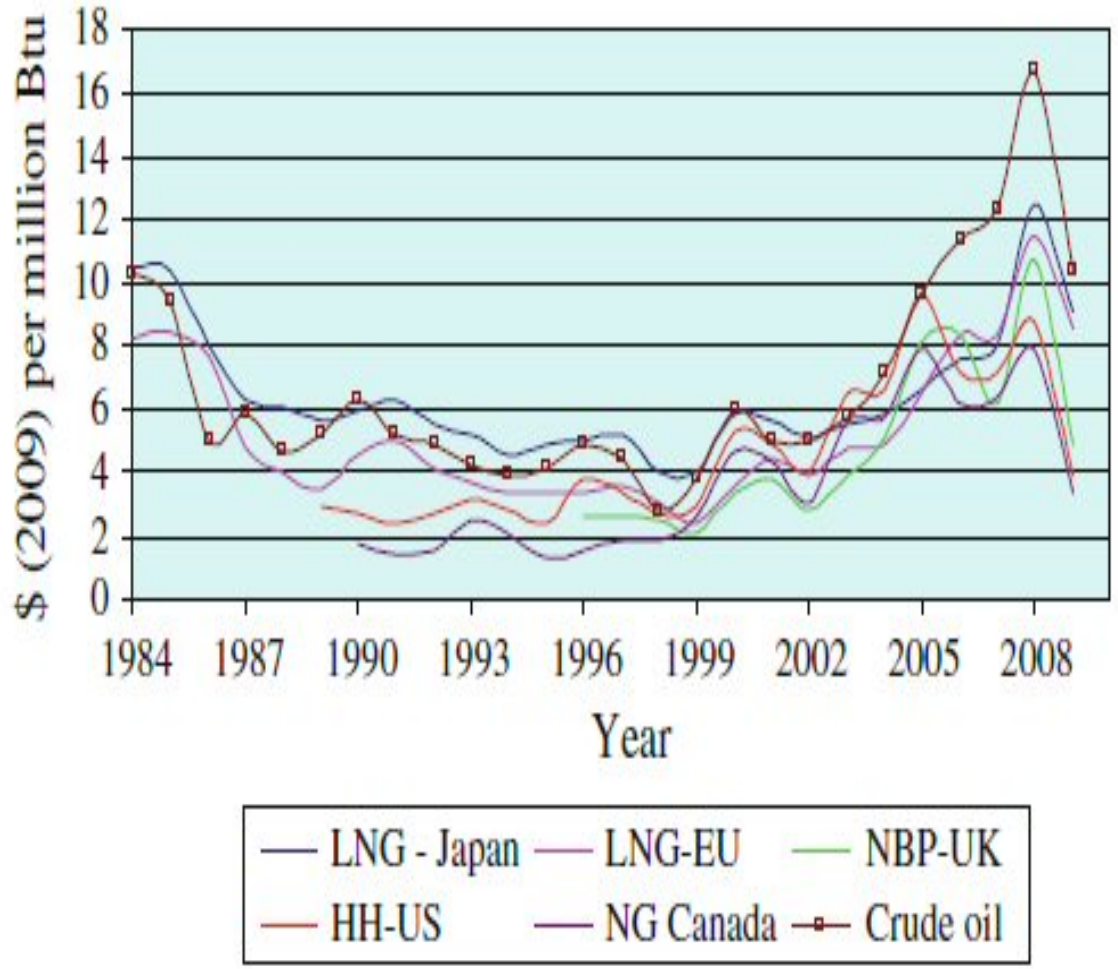
Energy Prices: Oil

Fig. 19.1 Oil price trend in nominal and real terms (2007, CPI adjusted). *Source* EIA website



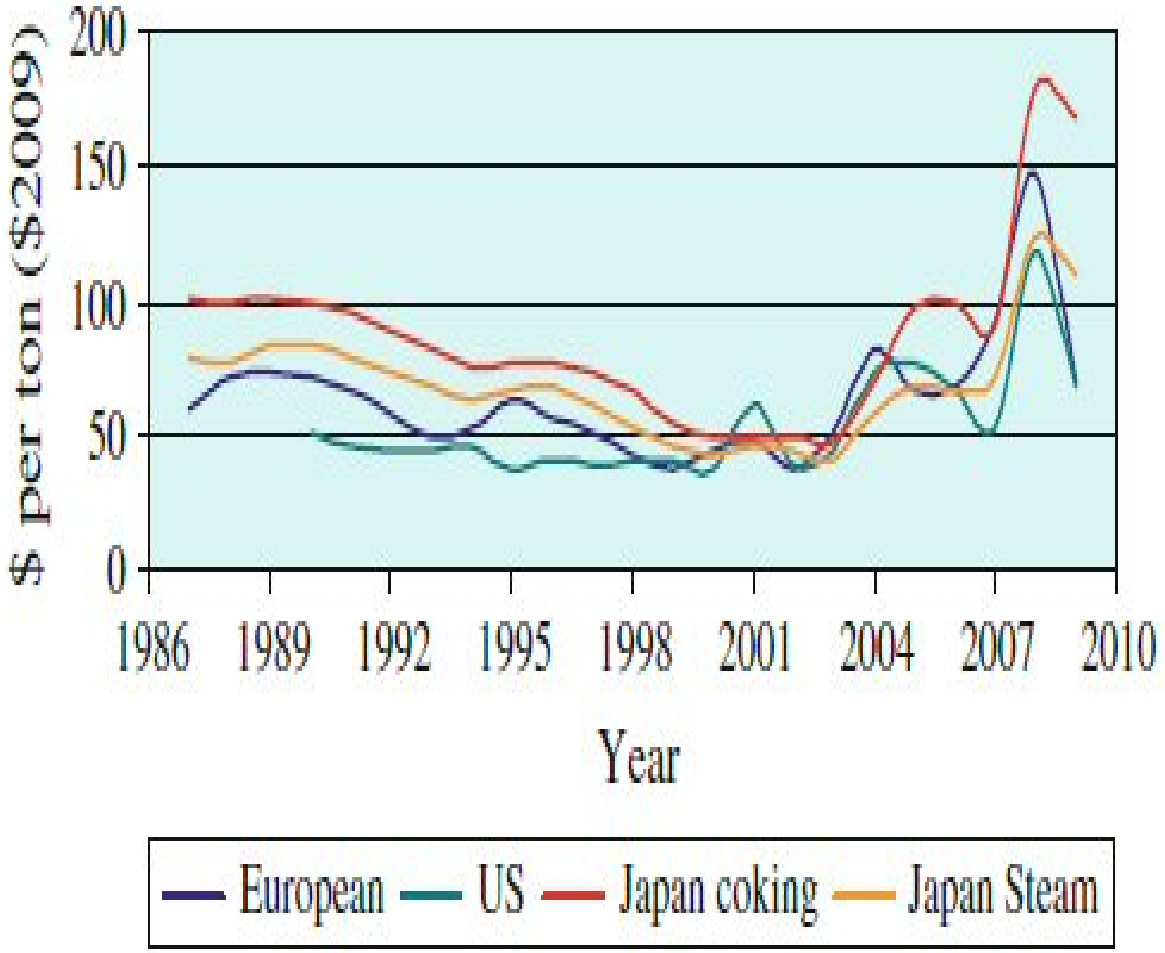
Energy Prices: Natural Gas

Fig. 19.2 Natural gas price trend. *Data source* BP Statistical Review of World Energy 2010 and EIA website



Energy Prices: Coal

Fig. 19.3 Coal price trend. *Data source* BP Statistical Review of World Energy 2010 and EIA website



Energy Price Trends

- From the preceding slides, we see that there have been large swings in the prices of ‘conventional’ fossil fuels
- Depending on the fuel, these price swings may affect some regions more than others
- In general, but not always, oil price increases are also accompanied by increases in the prices of other fossil fuels

(Oil) Price Shocks

- High (oil) prices provide additional revenues for (oil) exporters and increase costs for (oil) importers
- In some countries like Canada, the impacts of (oil) price shocks vary across regions (Alberta [exporter] vs Ontario [importer], for example)

  → programs in the 1970s and 1980s such as price/export controls and the National Energy Program (NEP) were divisive

Impacts of High Prices on Importers: Residential Sector

- Macroeconomic impacts depend on the reactions of all of the 'micro' agents in the economy (households, firms)
- For consumers in energy importing countries, energy prices go up but consumer (nominal) incomes remain the same* → budget line 'rotates' and consumers move to a lower indifference curve
- Since energy demand is generally inelastic in the short-term, the aggregate quantity of energy consumed may not change by much initially

* Real incomes fall: fewer goods and services can be purchased for any given nominal income

Impacts of High Prices on Importers: Industrial Sector

- Budget constraint shifts, leading to substitution away from energy for any given level of output

- Since energy is used as an input into most production processes, firms are also impacted
  - Variable costs increase → fall in profits
  - Local demand for products may fall (as real incomes have fallen for consumers due to higher energy prices), especially for 'non-essential' items → firm profitability falls
  - Labour may demand higher wages in order to maintain standards of living → variable costs increase (if successful)
  - some firms may exit or scale back operations (leading to higher unemployment rates)

- Impacts will be greater for countries with energy-intensive manufacturing and/or service sectors

Impacts of High Prices on Importers: Transportation Sector

- Negative impacts on both households and firms
- Higher oil prices affect the cost of operating cars and trucks fuelled by gasoline
- Cost of transporting goods increases → additional squeeze on profit margins of firms

Overview of Macroeconomic Impacts

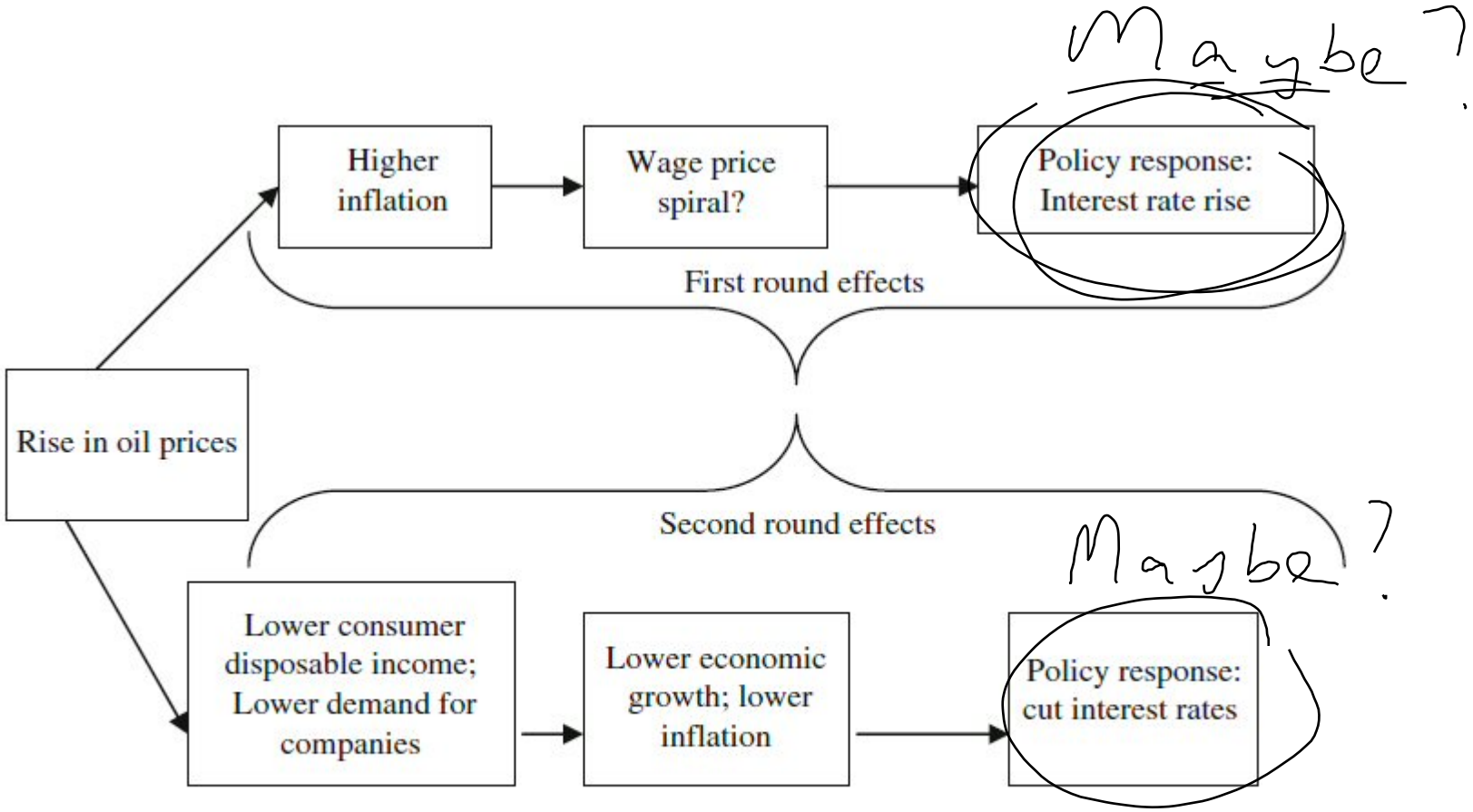


Fig. 19.6 Oil price rise and monetary policy interactions. *Source* RBS (2004)

Trade-related Impacts

- Trade balance (current account = exports – imports) negatively impacted by the more expensive oil imports
- Demand for exports falls since other oil-importing countries are facing the same problems (their lower real incomes lead to lower demand for goods produced elsewhere)
- Imports (of manufactured goods) require the purchase of foreign currency; fewer countries wanting to import goods affects demand for local currency → exchange rate effects

The Magnitudes of Oil Price Impacts for Importing Countries

- Depends on how elastic demand is and the types of macroeconomic interventions undertaken (fiscal, monetary policies)
- If elasticity is zero, rule of thumb:

  % change in GDP = (% increase in oil price) x (share of oil imports in GDP)
- Impacts tend to be more severe for low-income countries, less severe in industrialized countries

Impacts of High Prices on Exporters

- Booming oil sector → "windfall" gain of oil-related revenues for exporting countries
- CASE A: For some countries (many OPEC members, for example), these are the main sources of government revenue and economic activity;
- CASE B: For others, while oil revenues may be important, there is also a well-developed manufacturing sector which may be (adversely?) affected by the "boom"

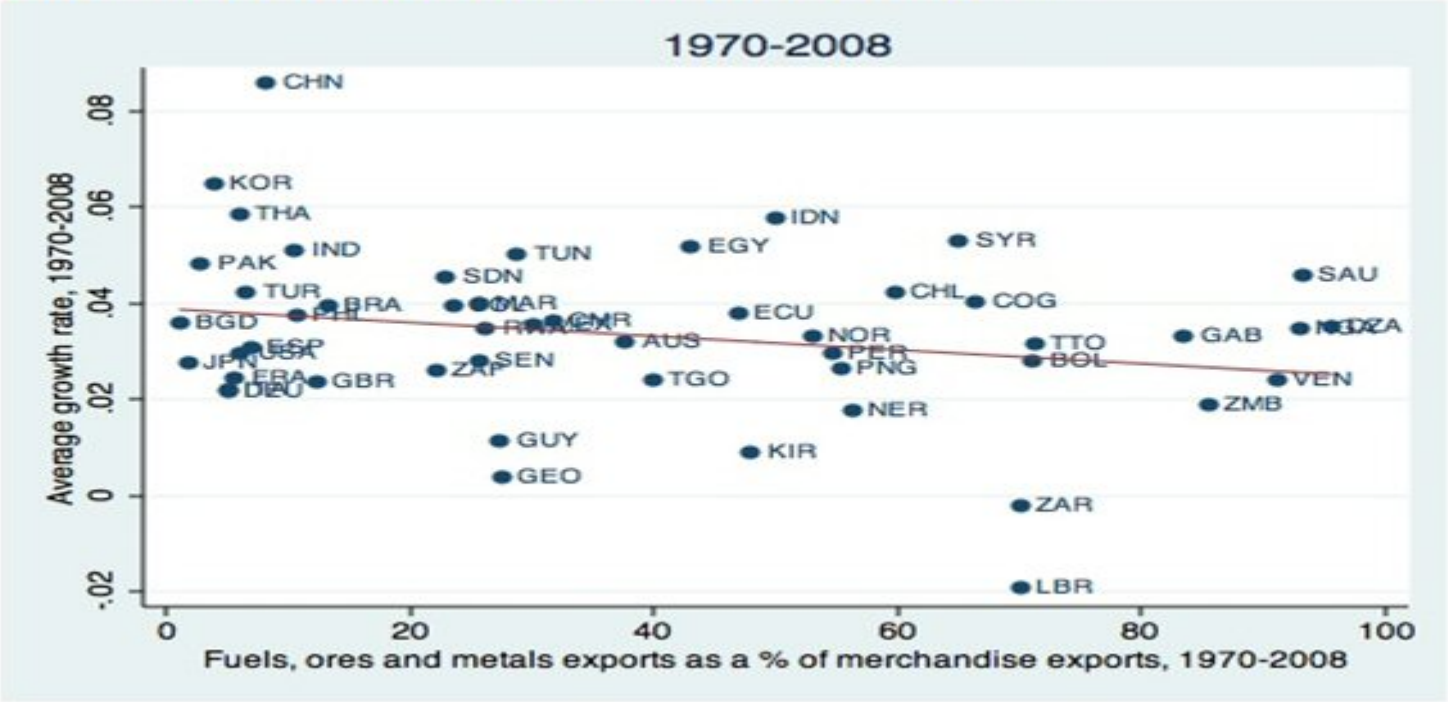
CASE A: Oil-based Economies

- Challenges:
  - Volatility of oil prices → volatility of revenues → difficult to plan investments / programs (can use 'heritage funds' to smooth revenues across years)
  - Absorptive capacity (labour shortages; transportation bottlenecks; etc.) may limit how much revenue can be productively invested in any given year
  - Abundance of energy and high incomes → energy may not be used efficiently in local industries
  - Vulnerable to "Resource curse"? www.hks.harvard.edu/fs/jfrankel/AzerNatural**ResourceCurse**.doc

Resource Curse

- Empirical observation that countries with large resource endowments *tend to* have lower growth rates than other countries (Figure 1: Frankel)

Figure 1: Statistical relationship between mineral exports and growth.



Data source: *World Development Indicators*, World Bank

Resource Curse: Some Proposed Theories

- This 'tendency'* for lower rates of economic growth in resource rich countries is counter-intuitive

  * Whether or not this tendency appears depends on time period considered and measure of resource abundance

- Potential pitfalls of extensive resource wealth:

  (1) Most resource rich countries are 'small open economies' → price-takers (Saudi Arabia, for example, wouldn't fit this mold)

  If prices fall over time, this will have a negative impact on revenues and development possibilities; also price volatility may be harmful (disruptions in economic plans / programs)

Resource Curse: Some Proposed Theories

(2) Institutions: Countries with poor governance may not grow as quickly.

- if property rights aren't protected and/or policies are unpredictable → fewer people are willing to invest in the country; wealth may be plundered by politicians / elite (rent-seekers)

Why might resource-rich countries have poor governance? (i) historical accident; (ii) Can tax the resource and not the people → people may not care as much about who is in power

Resource Curse: Some Proposed Theories

(3) Reduced incentives for investing in education

abundance of 'natural capital' (Gylfason)

→ lack of investment in the development of human capital (may rely on an influx of foreign skilled labour)

→ negative impact on long-term growth

(4) Reduced incentives to diversify the economy, or failed 'cherry-picking' in terms of diversification efforts

CASE B: Oil Exporters with Major Non-Oil Industrial Sectors

- **Dutch Disease:**
- During the 1960s, significant amounts of natural gas were discovered by the Netherlands in the North Sea
  → Increase in wealth / resource boom

- While an increase in wealth for an individual (such as Jed in the Beverly Hillbillies scenario), is expected to be unambiguously beneficial in terms of economic well-being, is this necessarily the case for all sectors in a national economy?

- Not necessarily: For example, not all segments of the Dutch economy benefited from the 1960s resource boom

*See Ebrahim-zadeh, C. (2003) "Back to Basics - Dutch Disease: Too much wealth managed unwisely" *Finance and Development* 40 http://www.imf.org/external/pubs/ft/fandd/2003/03/ebra.htm

Impacts of Natural Gas Boom on the Guilder

- Discovery of natural gas
  → sell both domestically and on international market
  → international buyers need Dutch Guilders (local currency) to pay for the natural gas
  → demand for Dutch Guilders increases
  → currency appreciates (Guilders cost more than they used to)
  → manufacturing exports become more expensive to buyers as it costs them more to buy the Guilders needed buy the manufactured products

Dutch Disease Aspects / Symptoms

- Exchange rate effects are only one aspect of "Dutch Disease"
- There are several short- and medium-run adjustments in the energy (booming), manufacturing (lagging) and service sectors
- Major 'symptom': co-existence of booming and lagging sub-sectors of the economy

Dutch Disease: Main Features

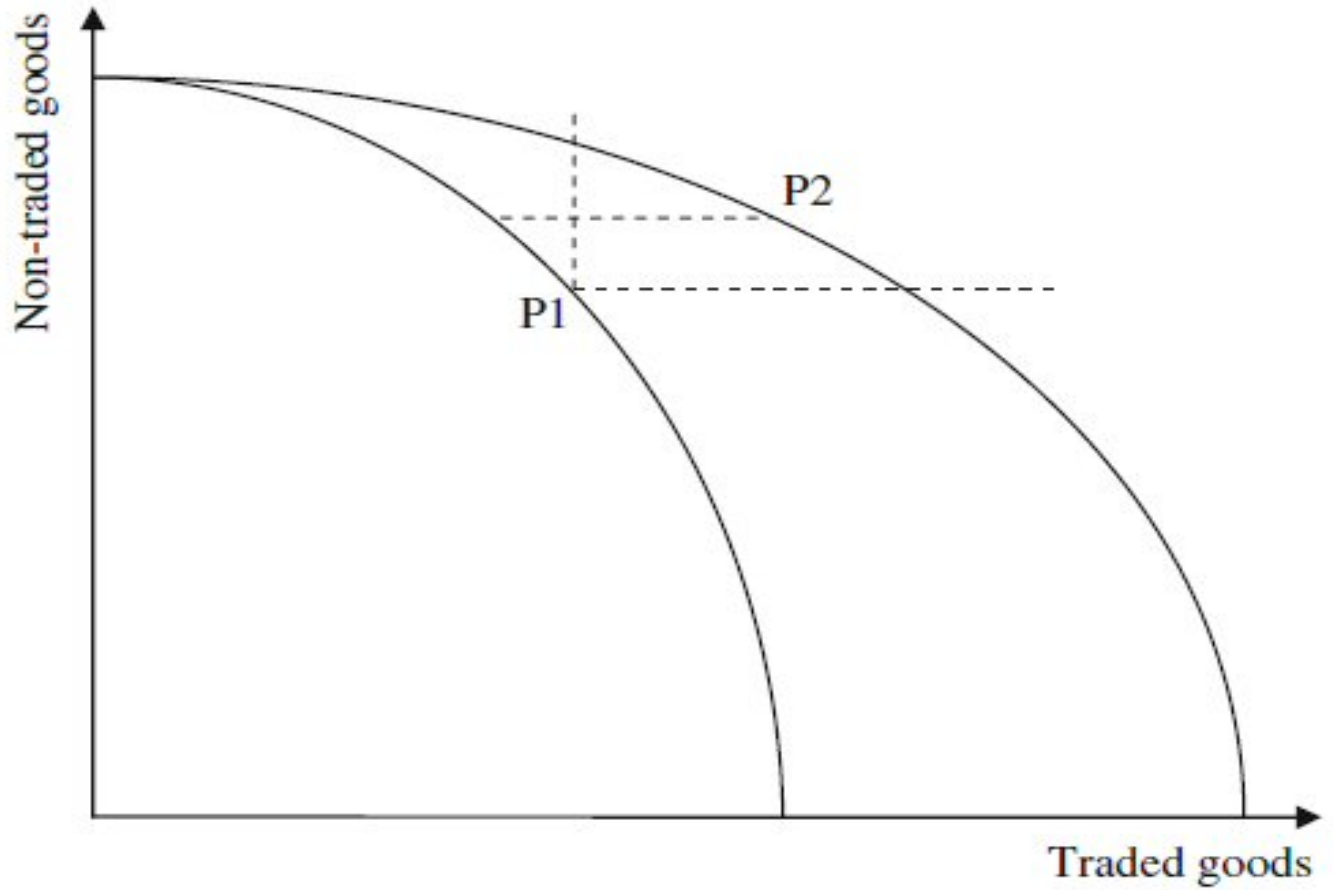
(1) Resource Movement Effect (RME)

- Boom raises the productivity of labour (and capital) in the energy sector → changes the Production Possibilities Frontier
- Hiring in the energy sector leads to adjustments in the labour market (demand for labour increases in the energy sector, pushing wages up)
- Adjustments in the labour market lead to changes in all sectors of the economy

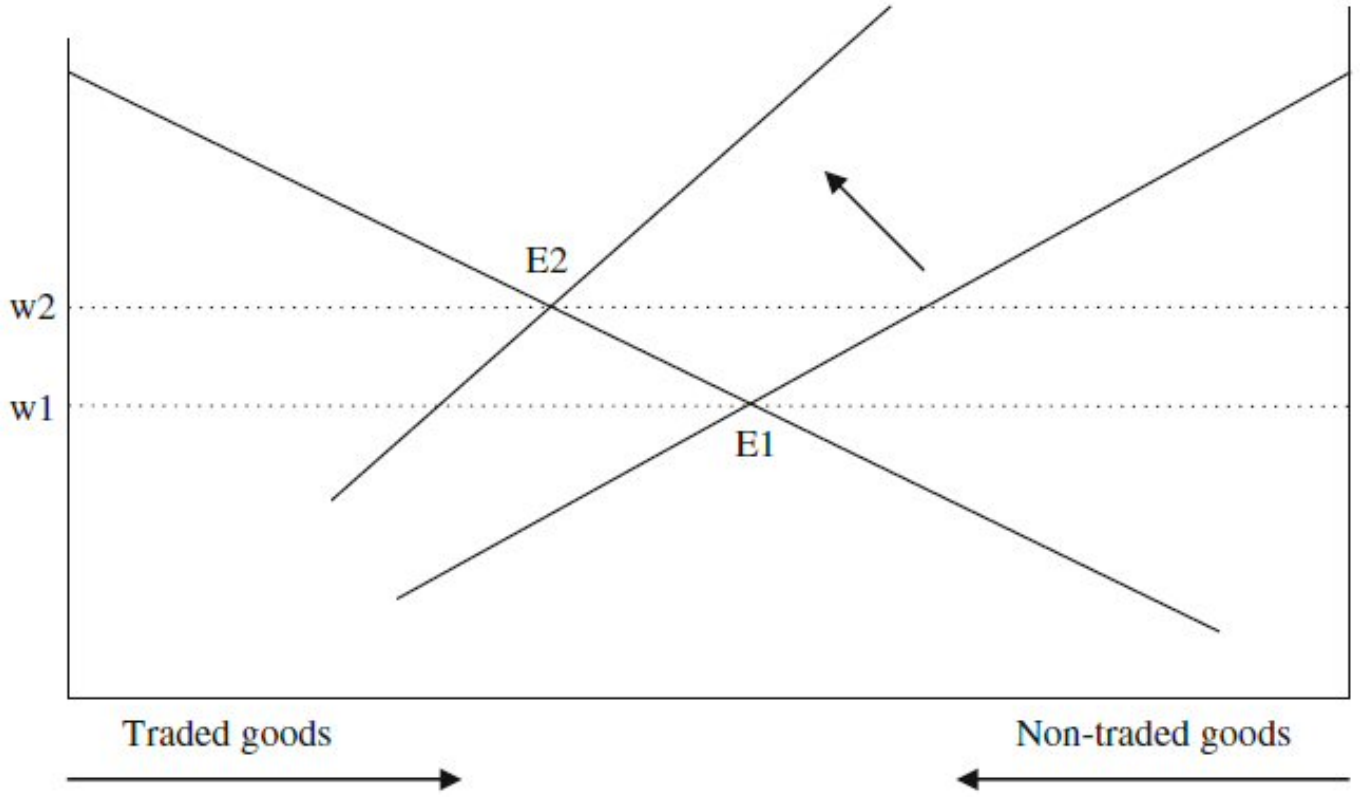
Production Possibilities

- Pre-boom production possibilities → pre-boom organization of the economy in terms of traded (manufacturing and energy) and non-traded (service sector)
- P1 in Figure 19.12 is pre-boom equilibrium where slope of PPF is equal to the initial "exchange" rate (defined as the ratio of the price of services to an index of the price of traded goods)
- Boom → can now produce more traded goods → PPF moves "outward" (except where it hits the non-traded axis)

Production Possibilities Frontiers (Figure 19.12)



Labour Market Adjustments
Figure 19.13



Exchange Rate Impacts

- As we saw earlier, exported goods are now more expensive
- As a result, the demand for exports from the booming country fall
- This fall in demand exacerbates the impact on profitability in the manufacturing sector: input prices (labour and energy) have gone up, foreign demand has fallen

Dutch Disease: Main Features

(2) Spending Effect (SE)

- Boom leads to increased incomes and increased spending
- Increased local demand in the service sector leads to higher service prices
- World prices for traded goods are not impacted by changes in local demand
- Can use a simple supply-demand for services diagram (provided in class)

Combined RME and SE

- Decline in the manufacturing sector
  (de-industrialization)
- Service sector may decline or expand (hurt by RME, helped by SE)
- Services become more expensive
- Nominal wages rise
- Real wages may rise or fall
- Balance of trade affected

Extensions / Variations of Dutch Disease Models

(1) Initial unemployment in the economy: manufacturing sector may be insulated from de-industrialization → instead of wages rising, unemployment rates may fall

(2) Foreign investment in the energy sector: repatriation of profits will tend to dampen the spending effect

(3) Energy as an input in production sector: decreased profitability in energy intensive sectors → if manufacturing is energy-intensive, de-industrialization will be more severe

Extensions / Variations of Dutch Disease Models

(4) Labour mobility across regions / countries

(a) Gold-rush effect

- increased real wages attract workers (increased the supply of labour); these additional workers will demand services → increased upward pressure on the price of services

Extensions / Variations of Dutch Disease Models

(4) Labour mobility across regions / countries

(b) Alberta effect

- government collects revenues from the energy sector (royalties, bonus bidding)

- revenues may be redistributed through tax cuts (lower income taxes, no PST) and/or the provision of public facilities (health, education, recreation, etc.)

- this may lead to increased migration, even if 'pre-tax' real wages fall

Designing Energy Policies in Canada

- Complicating factors
  - Regional differences in consumption and production
    - importing and exporting regions;
    - bulk of the manufacturing sector not located in same region as energy sector operations
    - Population patterns lead to regional differences in political clout
  - Constitutional divisions of power

- Examples of previous policies*:
  - Price and export controls in mid- to late- 1970s
  - NEP
    - energy security;
    - redistribution of resource wealth;
    - decrease in foreign ownership in the oil sector

* http://economics.ca/cgi/jab?journal=cpp&view=v09n3/CPPv09n3p284.pdf (Plourde)
http://economics.ca/cgi/jab?journal=cpp&view=v07n1/CPPv07n1p001.pdf (Scarfe)