



Perspectives on International Coal Markets and Prices

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Agenda

1. Introduction

- Historical Development
- Coal as an Energy Source
- Security of Supply

2. Price Development

3. Trade and Market Integration

4. Conclusions

- Prices and Market Integration





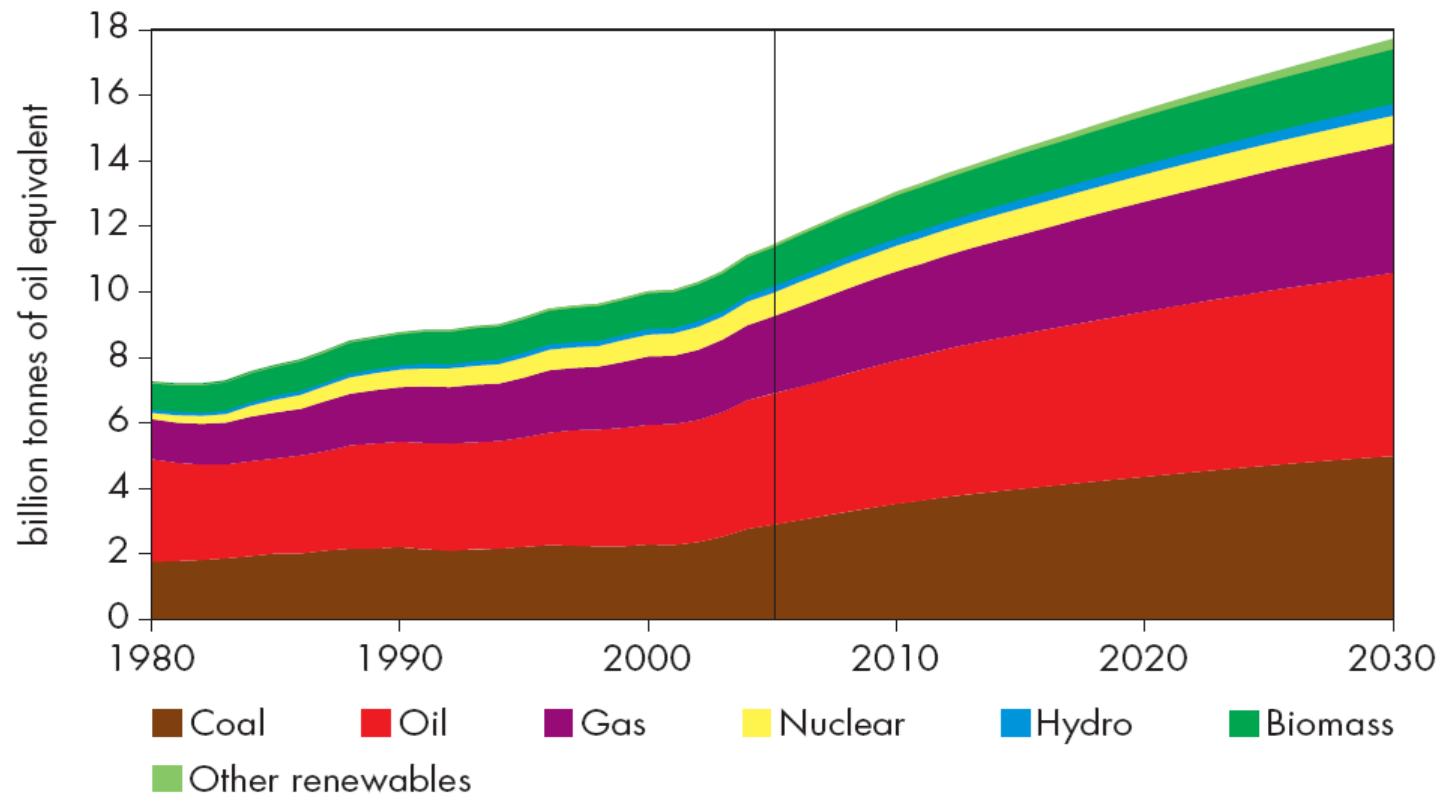
1. Introduction: Historical Development

- Before the 1960s coal markets were mainly national.
- Substantial decreases in transportation costs opened up a market.
- The oil crisis 1973:
 - Coal prices became more favorable.
 - Security of supply emerged as a key policy issue.
 - focus shifted towards coal as an important energy source.
- Today coal is considered an international/global market (Note: most coal consumption is still produced in the same country).



1. Introduction: Coal in Energy

Figure 1.1: World Primary Energy Demand in the Reference Scenario



Source: World Energy Outlook, 2007





1. Introduction: Coal in Energy

- **Negative Aspects:**
 - Coal is a solid fuel – more expensive to transport and handle.
 - Coal has 70% or less heat content per ton than oil.
 - Environmental impacts.
- **Positive Aspects:**
 - Coal reserves are abundant and widely spread – coal can be seen as a reliable source of energy.

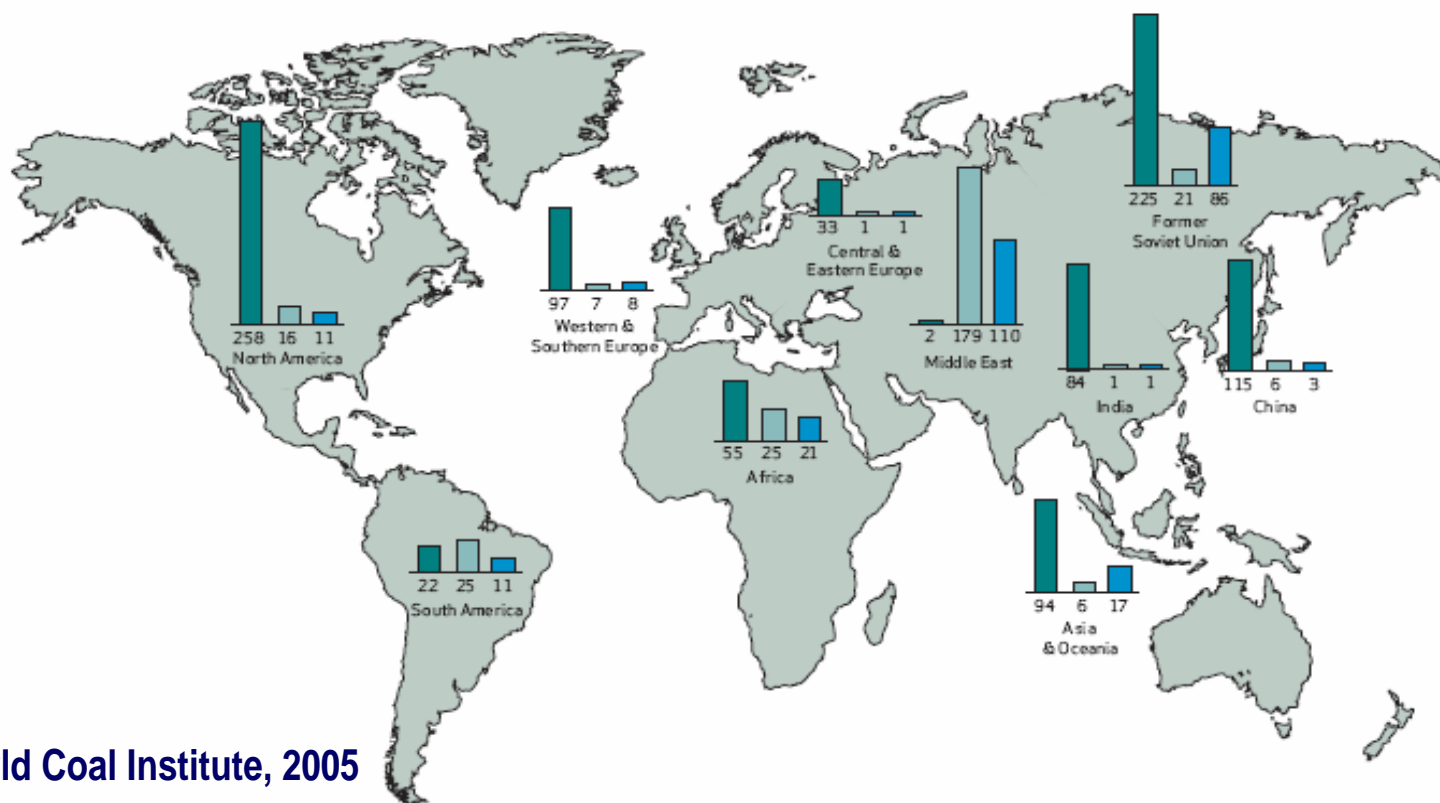


1. Introduction: Coal in Energy

Location of the World's Main Fossil Fuel Reserves (Gigatonnes of coal equivalent⁵)

- Coal
- Oil
- Gas

Source: Optima 2005



Source: World Coal Institute, 2005



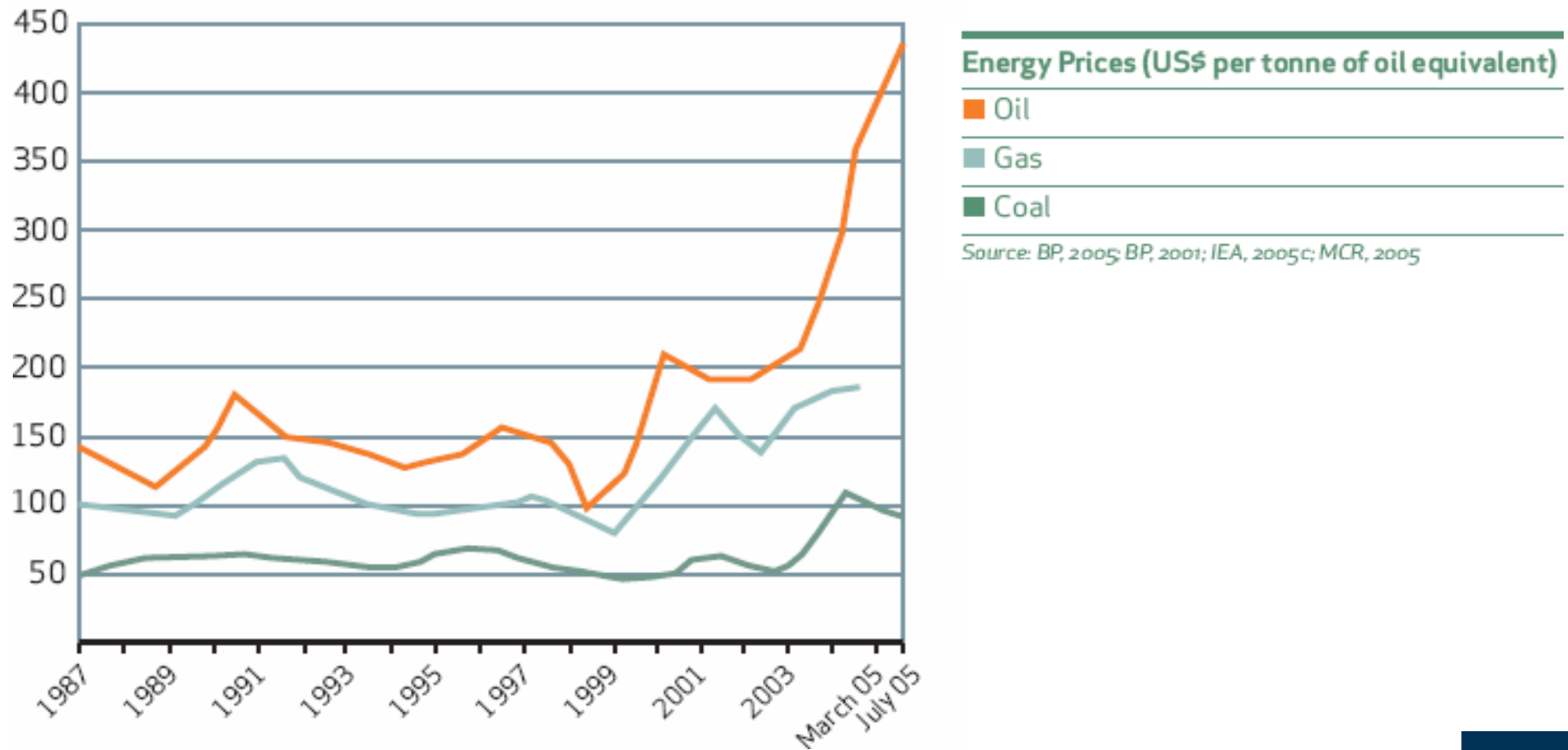


1. Introduction: Summary

- Coal's share in energy has been stable, and rising, during the last decades.
- 'Security of supply' not as important regarding coal – reserves are abundant globally.
- Q: Why has coal's share been rising despite many negative aspects?
- A: Prices and international trade. Reminder of presentation devoted to these issues.



2. Price Development: Energy Prices

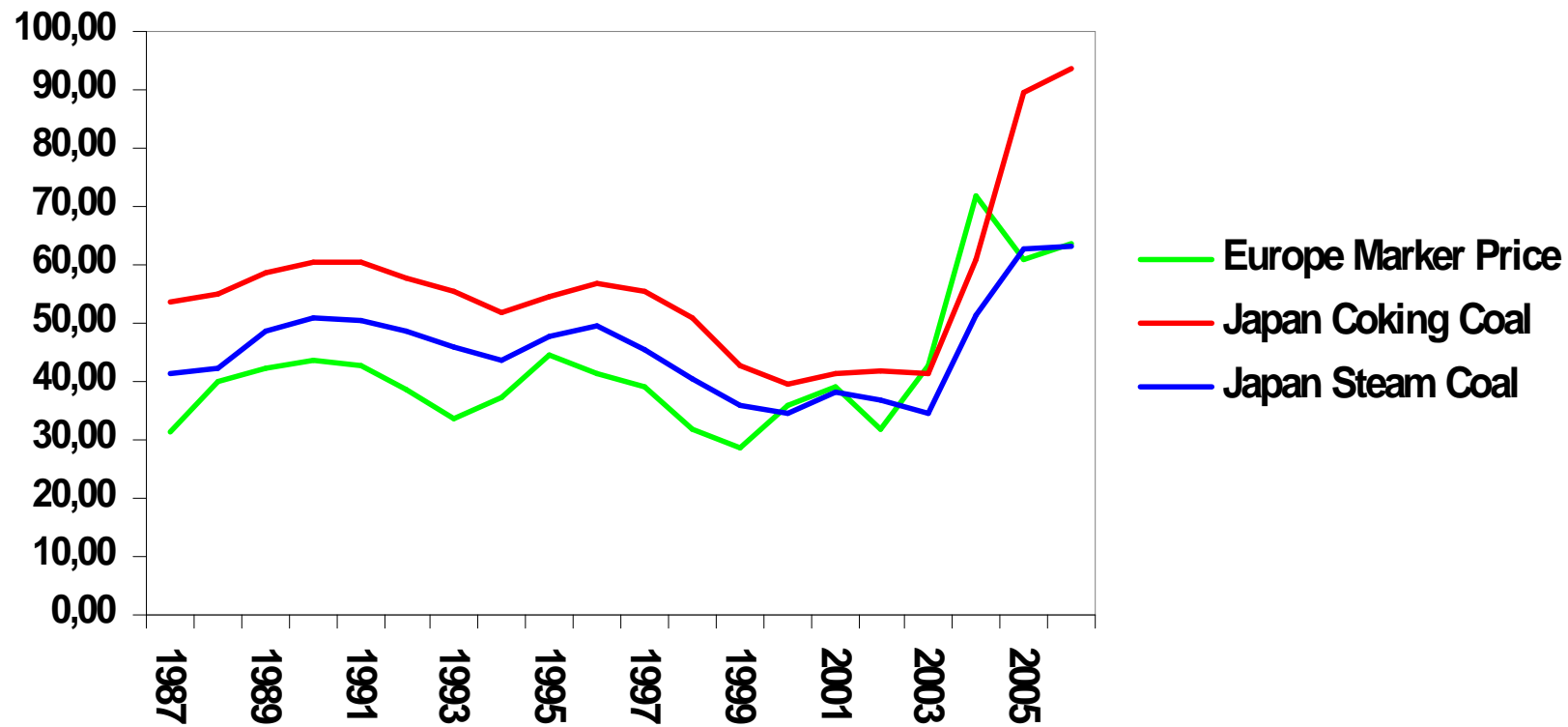


Source: World Coal Institute, 2005



2. Price Development: Coal Prices

Coal Prices in US \$ per tonnes



Source: BP Statistics, 2007





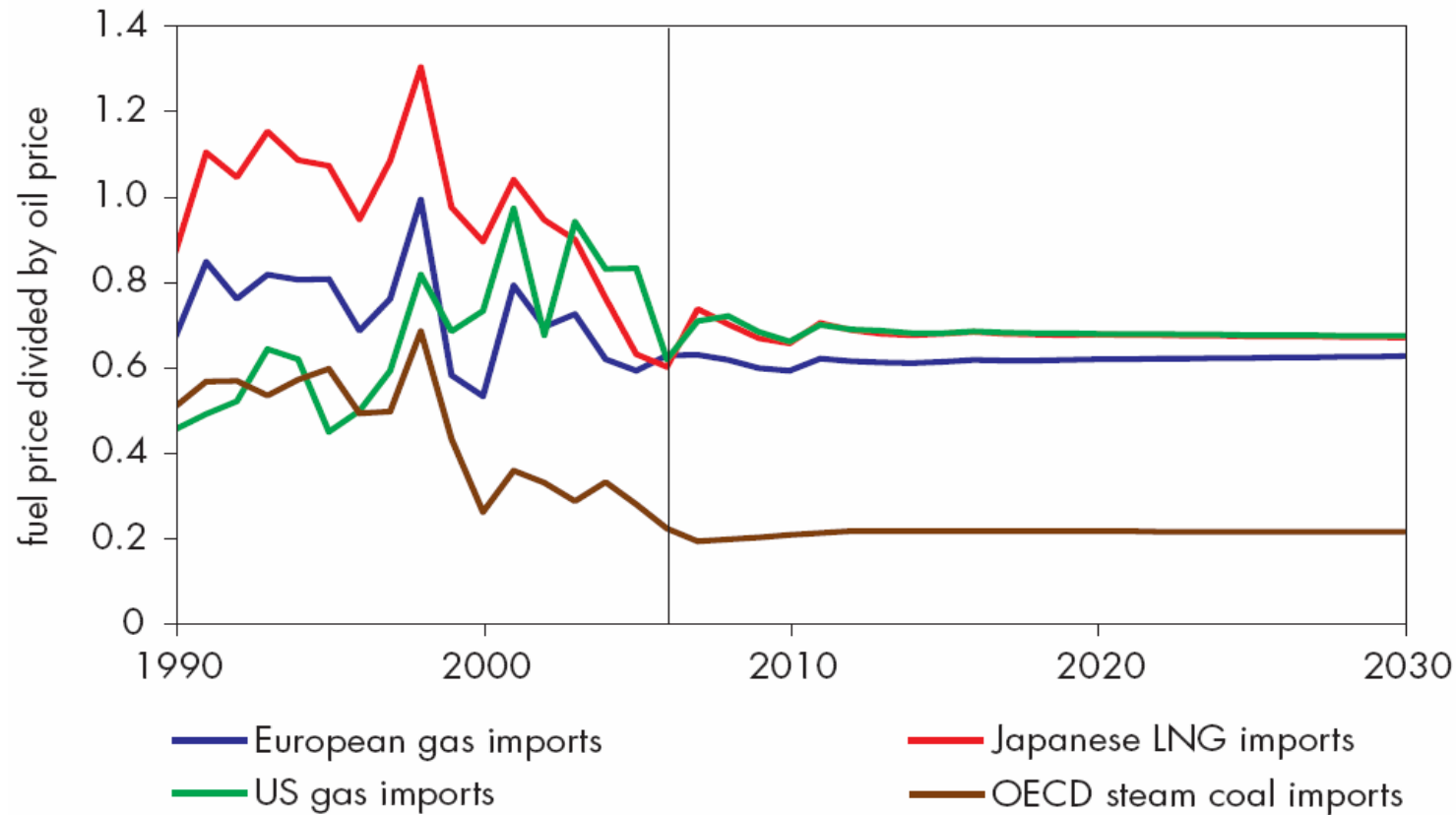
2. Price Development: Analysis

- **Why higher prices since 2002?**
 - Substantial increase of energy demand in China and India.
 - A period of lower market prices between 1991-2002 → low investments in exporting countries.
 - Although these investments are now being made, the rapid increase in coal demand is higher – upward pressure on prices.
 - Transportation costs have increased due to the general higher demand for transported bulk goods.



2. Price Development: Future

Figure 2: Assumed Ratio of Natural Gas and Implied Relation of Coal Prices to Oil Prices in the Reference Scenario



Source: World Energy Outlook, 2007





2. Price Development: Future

- High prices will continue if the strong demand continues (dependent on China & India).
- Prices will level out when supply catches up with demand.
- Price development in the future also depends on:
 - Policies: higher CO₂ emission prices will have a negative impact on coal demand and thus on coal prices.
 - Technology: new coal-fired power stations are more efficient, emit less CO₂.





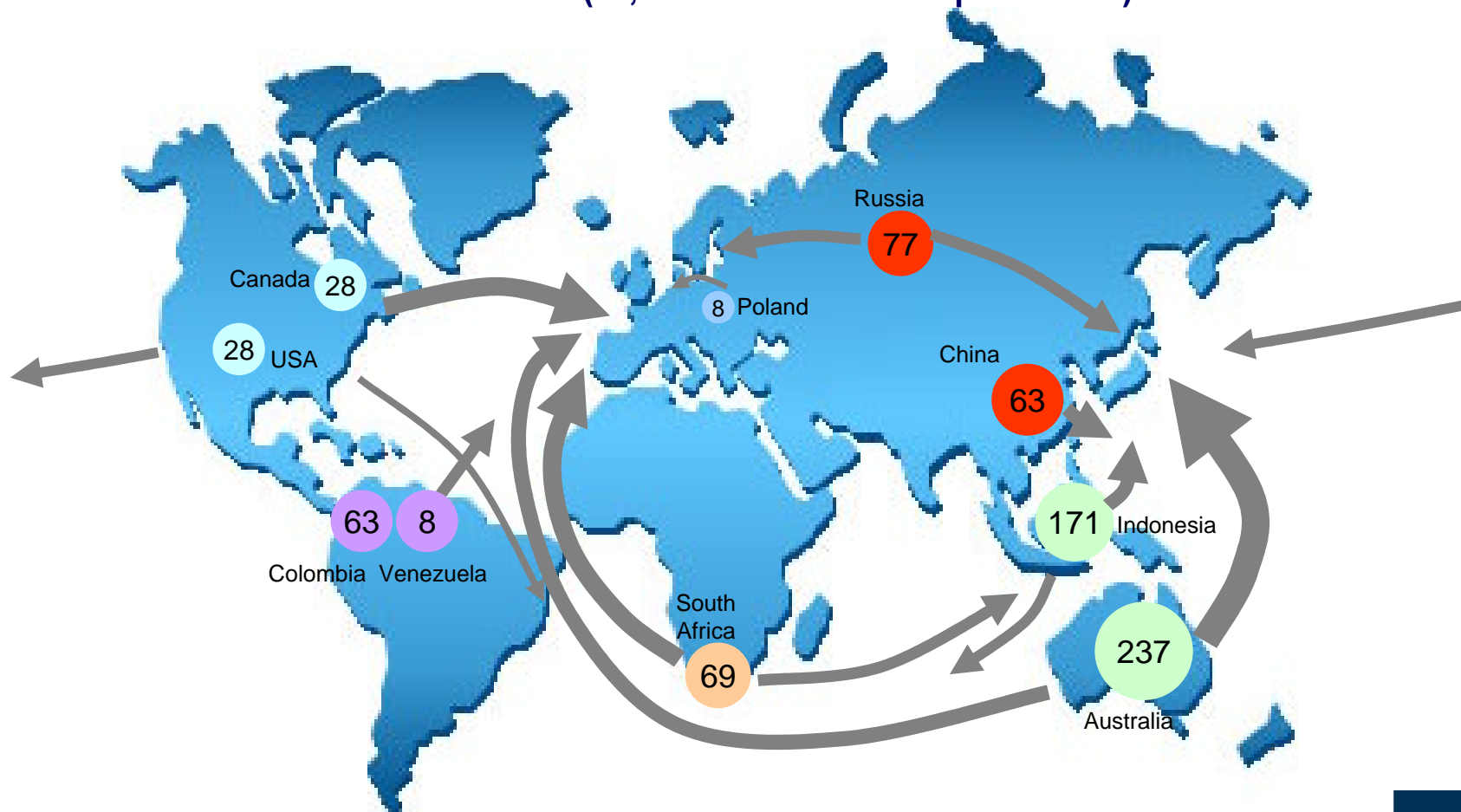
3. Trade and Market Integration

- **Development of Trade:**
 - Coal is today considered an international market – supplies are shipped all over the world.
 - During last 20 years seaborne trade of steam coal has increased 8% per year (coking coal 2 %).
 - Transportation costs account for a large share of the delivered price.



3. Hard Coal Seaborne Trade

Seaborne traded coal 2005: 782 Mt (14,6% of 5351 Mt world production)



Source: Verein der Kohlenimporteure
(German Association of Coal Importers), Yearly Report 2006





3. Trade and Market Integration

Market integration in the international coal industry:

A cointegration approach

The Energy Journal, Vol. 27, No. 1 (2006)

- Motivation:
 - Development towards a unified international coal market.
 - Paralleled with an increasing number of M&A's.





3. Trade and Market Integration

Purpose:

- To test the hypothesis of a world market for coal – and to investigate market integration over time.
- Main focus is international trade and price relationships in spatially separated coal markets.
- The concept of 'law of one price' is thus used for defining the presence of a single market.





3. Trade and Market Integration

Method and Data:

- The method applied for defining the relevant market is cointegration and error-correction models.
- Price series that are cointegrated cannot drift apart without limit. The error-correction model further analyses short-run responses to price shocks.

$$\Delta p_{j,t} = \alpha + \beta_j \Delta p_{j,t-k} + \beta_i \Delta p_{i,t-k} + \delta EC_{t-1} + \varepsilon_t$$

- Data: European and Japanese quarterly import prices (CIF) for coking and steam coal from 1980 and 2000.





3. Trade and Market Integration

Results:

$$P_E = 0.30 + 0.91P_J \quad P_J = 0.21 + 0.95P_E$$

(2.00) (23.39) (1.35) (23.39)

- Indicate a strong link between the prices paid in Europe and Japan.
- This finding implies that the correct definition of the coal market is international rather than regional.





3. Trade and Market Integration

Market Integration over Time:

- To investigate whether the price series have become more integrated over time, the price series data is separated in two time periods (1980s + 1990s).
- The results regarding steam coal show that cointegration cannot be confirmed in the 1990s. This result is reproduced using spot prices as well.
- It thus seems as steam coal has become less integrated over time. Surprising?





3. Trade and Market Integration

Possible Explanations:

- Trade of steam coal has a stronger regional tendency – indicated by trade routes.
- Demand for steam coal more price sensitive:
 - Has more substitutes in production
- During the 1980s more coal in energy than in the 1990s.



3. Steam Coal Trade Routes 2000

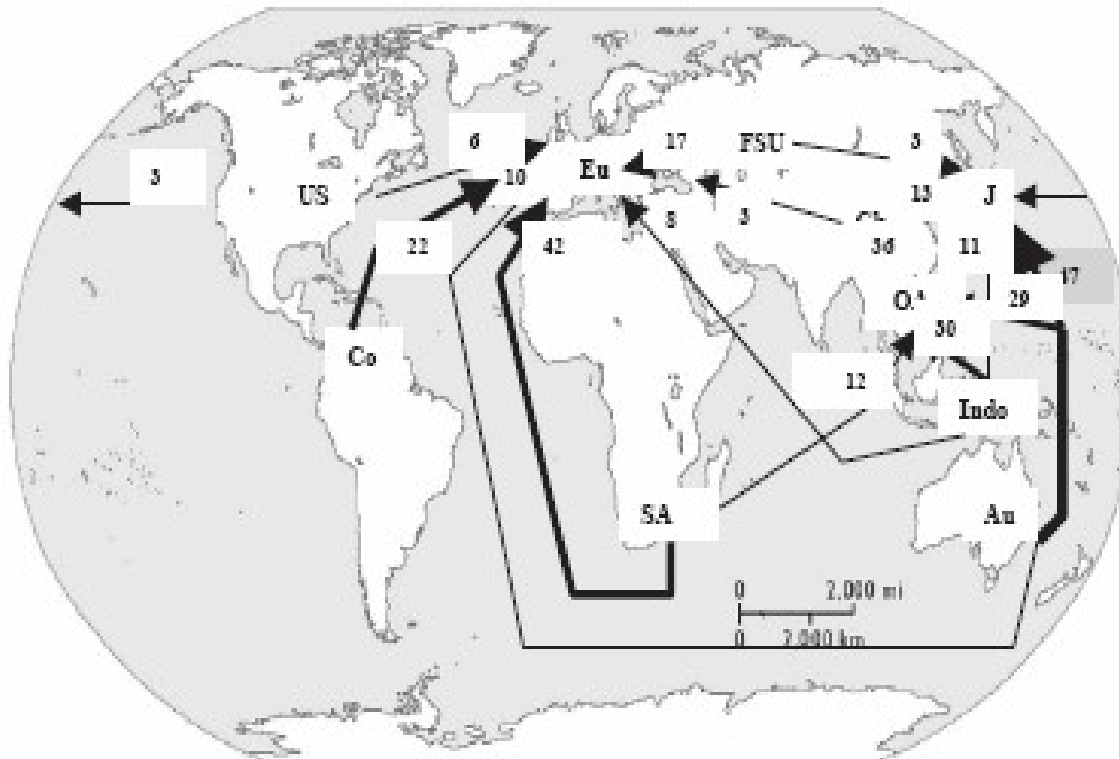


Fig. 3. World steam coal trade routes 2000 (Mt). *Source:* Own construction based on IEA (2001).



3. Coking Coal Trade Routes 2000

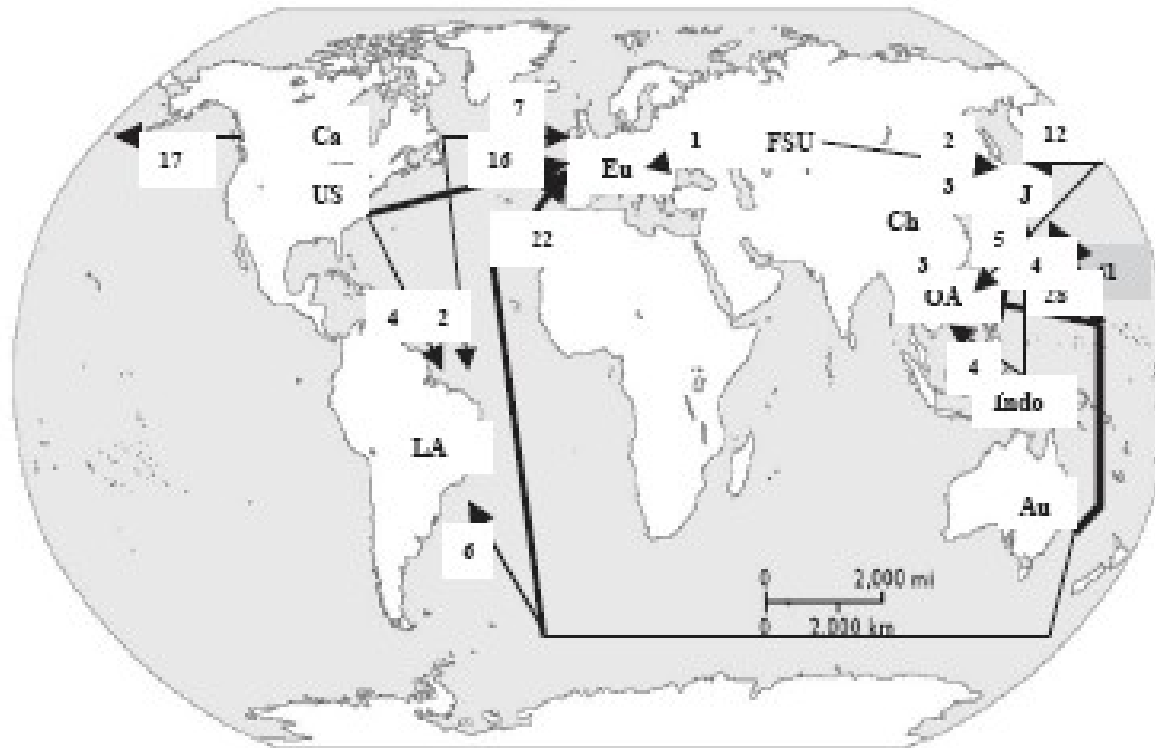


Fig. 1. World coking coal trade routes 2000 (Mt). Source: Own construction based on IEA (2001).



4. Conclusions

- **Prices and Market Integration**
 - High coal prices likely to prevail during periods of high demand.
 - Compared to other fuels – coal is still a cheap option.
 - Coal reliable source of energy as long as the reserves are large and abundant.





4. Outlook

- **Coal's Role in Energy Supply**
 - Positive – an abundant source of energy in a world of high and increasing energy use – and need for 'security of supply'.
 - Negative – environmental impacts – future of coal depends on whether clean-coal possibilities continue to develop into cost efficient alternatives

