

UPEI

Union Pétrolière Européenne Indépendante

DOES DEPENDENCY EQUAL VULNERABILITY? ENERGY IMPORTS IN GERMANY AND EUROPE

ABBREVIATED VERSION

The full version of the study in German is available online at:

<http://www.upei.org/release/index.html>

UPEI (The Union of European Petroleum Independents) is the umbrella organisation of the European independent oil trade, representing both national associations and individual companies. UPEI members are all independent from major oil companies and are active in all aspects of the oil trade, and throughout Europe:

- **Importing**
- **Wholesaling**
- **Retailing**
- **Distribution**
- **Logistics**
- **Refining**
- **Contracting**

Within Europe, the independent oil sector covers approximately 45 % of the oil trade.

UPEI and its members stand for:

- Reliability, security and diversity of current and future supply
- Vibrant competition
- Efficiency in the logistics of energy supply
- Alternatives in times of crisis
- An independent and liberalised market
- Protection and sustainability of the environment



Does Dependency Equal Vulnerability? Energy imports in Germany and Europe

Abbreviated version

A study on behalf of
AFM+E Aussenhandelsverband für Mineralöl und Energie e. V.
BFT Bundesverband Freier Tankstellen e. V.
MEW Mittelständische Energiewirtschaft Deutschland e. V.
UPEI Union Pétrolière Européenne Indépendante
UTV Unabhängiger Tanklagerverband e. V.

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1 Summary

It is commonly believed that importing more energy poses a threat to the security of our energy supply, and that the related costs are a burden on the economy. Neither fear is well founded. In fact, the energy supply functions best when markets are highly internationalised and interconnected. What's more, Germany benefits from the revenues earned by the oil-producing countries.

With energy resources scarce and becoming scarcer in Europe and Germany, large amounts of oil, gas and coal have to be imported from third countries. But the percentage of imports tells us little about the security of our energy supply. It is also important to look at the role of imports in our energy mix and diversification structure.

Crude oil and petroleum products are the most important sources of energy in Germany and Europe, accounting for roughly one-third of the energy that is consumed. In recent years, there has been an increase in the percentage of imports from third countries (outside of the European Free Trade Area). Today they make up 66 percent and 81 percent of the total in Germany and Europe, respectively, and those figures are increasing. However, there is a relatively low level of market concentration, and at least in the EU it does not appear to be rising. Even if energy resources were no longer available from certain countries, switching to other suppliers is easier because of the liquidity of the market for oil and the flexibility of transport options.

Moreover, higher oil revenues have led to significant investments by the oil-producing countries. This has benefited Europe and particularly the German economy, with its focus on the production of capital goods. Over the past few years, roughly 7.5 percent of German capital goods exports have gone to the oil-producing countries, compared with only about 3.5 percent at the turn of the millennium.

With its open economy, Germany is in an exceptionally good position to benefit from international trade. This has proved true for industrial goods and services, and it may well be true for energy as well. The energy supply is at greater risk when markets are isolated and supply routes are limited.

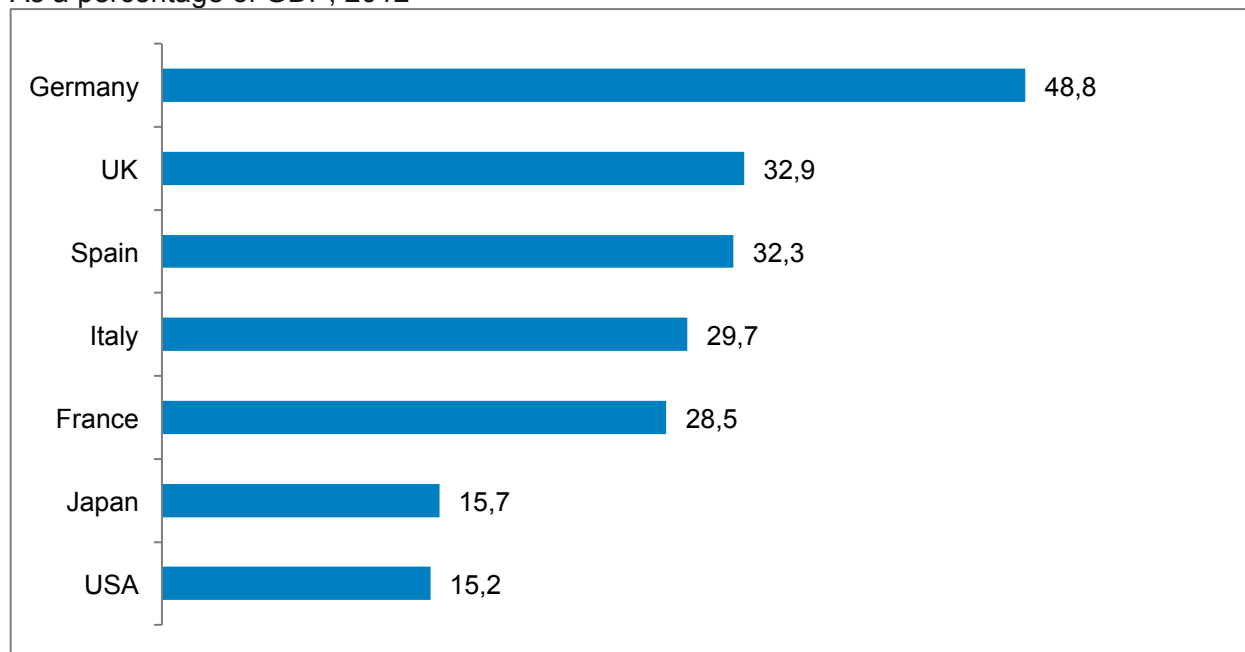
Furthermore, the transition to greater energy efficiency and increased use of renewables is more likely to be achieved through international networking than by attempts at self-sufficiency.

2 Europe and Germany need open markets

Germany and Europe have demonstrated that open markets lead to success – in the post-war era, in the period of accelerated globalisation that began in the mid-1980s, and in the era of the EU's eastward enlargement.

Figure 2-1: Level of openness of selected large industrialised countries

As a percentage of GDP, 2012



Level of openness: Mean value of exports and imports as a percentage of GDP

Sources: OECD; Cologne Institute for Economic Research (IW)

Relative to other countries, Germany's economy is highly internationalised. Exports and imports account for nearly 49 percent of GDP – which far exceeds the corresponding figure for other industrialised countries of a similar size (Figure 2-1).

This is one reason why Germany has been much more successful in the global markets than many of its major competitors (Figure 2-2). Factors that account for Germany's impressive success as an exporting country include not only the high quality of its products, but also considerable use of global sourcing and offshoring as well as favorable positioning in the growth markets of the emerging economies.

The basic idea behind open markets is obvious: Capital movements and trade with foreign countries open up more opportunities for action, which can, in turn, promote social welfare – since those opportunities are utilised only when they promise to provide additional benefits. Economic theory has shown that free trade, whether between sectors or within a single industry, has certain advantages: an increase in energy efficiency and social welfare, whether because of comparative advantages, economies of scale or greater product diversity. Consumers, for their part, benefit from lower prices.

Because of the many benefits Germany derives from globalisation, the German economy is more dependent than other countries on open markets. As a result, the WTO, the internal market and the euro are essential to Germany's international orientation. If the global economy

were to retreat into protectionism – and there have, indeed, been recent warning signs that this might happen – the effects would be extremely harmful. The mere discussion of possible restrictions on energy imports has contributed to a climate favorable to protectionism.

3 Dependence on imports needn't mean vulnerability

The availability of energy resources essentially depends on access. Since energy resources are scarce and becoming scarcer in Europe and Germany, substantial amounts have to be imported. But that fact alone doesn't mean that our energy supply is at risk. To assess our dependence on third countries, we need to look at the following:

- 1) Third-country imports as a share of total consumption
- 2) Market concentration
- 3) The importance of each energy resource in the energy mix
- 4) Infrastructure-related transport risks

Imports from non-EFTA countries

Since it can safely be assumed that trade movements between countries in the EU, or the European Free Trade Association (EFTA)¹, are reliable, we focus here on imports into the EU from outside that internal market (Löschel et al., 2014; Flues et al., 2012)². For Germany, we calculate that imports of crude oil and petroleum products account for 66 per cent, the remainder coming largely from Norway. The EFTA countries are also significant suppliers of natural gas. EU imports from non EFTA countries represent approximately 39 percent of the total. Over the past few years, at least for Germany, there has been no noticeable trend toward importing more natural gas from countries outside the internal market. Coal is a different story. Imports from non-EFTA countries are increasingly replacing domestic coal; since 2002, the share of imports has grown dramatically, to its current level of 75 percent. This is not primarily because domestic sources are being exhausted, but rather because it is cheaper to purchase coal on the global markets and because coal is easy to transport. In the case of oil, too, the trend is toward more imports from non-EFTA countries.

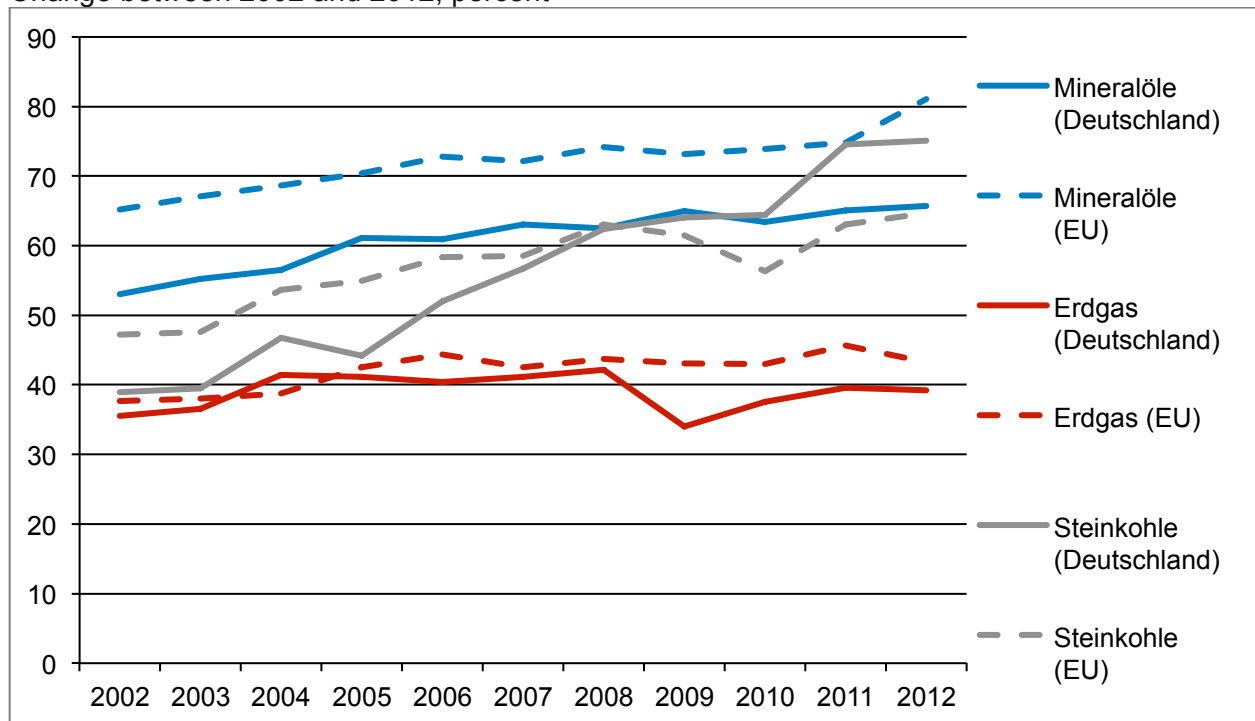
For the EU, too, there are differences compared with an analysis that includes trade among the member states. In the case of oil, imports from third countries account for 81 percent of the total, a larger percentage than for any other energy resource, and that share is growing. The EU is therefore strongly affected by trends in the global market for petroleum products as well as crude oil. However, the market for oil is relatively liquid. The EU currently imports more than 43 percent of its natural gas from third countries, an increase of five percentage points compared with ten years ago, and a further decline in European production is expected. As for coal, the percentage of imports has risen much more dramatically, from roughly 47 percent in 2002 to nearly 65 percent in 2012. Coal, like natural gas, is readily available in the global market.

1 Norway, Liechtenstein, Switzerland and Iceland

2 For certain quantities of imported or exported energy, it is impossible to determine the origin or destination country. In such cases we assume that oil and coal are being imported from third countries and that natural gas is being imported from the EU. Unspecified export amounts are assumed to be destined for the EU.

Figure 3-1: Imports from non-EFTA countries

Change between 2002 and 2012, percent



Sources: Eurostat; Cologne Institute for Economic Research (IW)

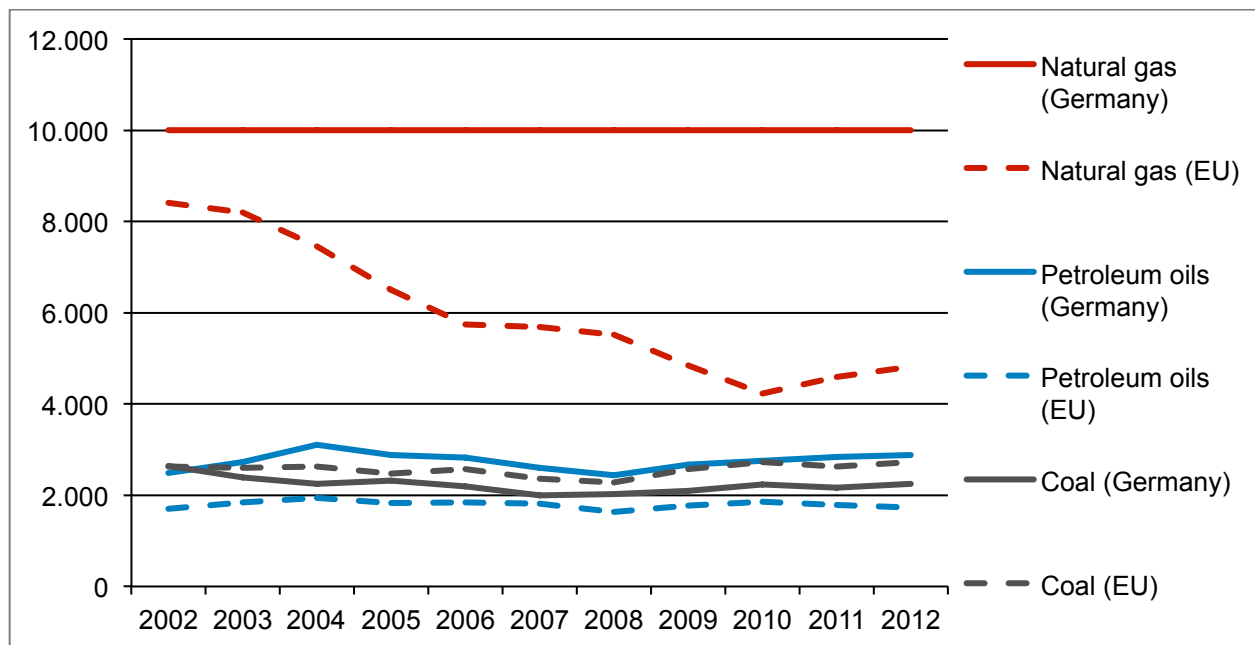
Concentration of imports from non-EFTA countries

When large percentages of energy resources are imported from non-EFTA countries, import risks and dependence are significantly affected by the diversification of supplier countries, as well as, conversely, by the concentration of these imports. In the economic literature, coefficients of concentration are often used to calculate market power, and they can be applied to the import structures of energy resources as well. Based on the Herfindahl-Hirschman Index (HHI), in the following section we square each country's share of the imports of a given energy source and then sum the resulting numbers.

The results (Figure 3–2) for imports from outside the EFTA zone show areas in which Germany is dependent, particularly on imports of natural gas. A single country – Russia – is responsible for all non-EFTA imports. Market concentration is much lower for oil and coal. Coal imports in particular are well diversified, although market concentration has increased slightly since 2002. The market for oil has seen the largest increase in concentration relative to 2002, although that level is still below the corresponding level in 2003.

The most dramatic changes have occurred in the concentration of the EU's suppliers of natural gas outside the EFTA; by 2012, the HHI had dropped from over 8,000 to less than 5,000. This reflects the EU's success in diversifying natural gas imports. For both oil and coal, the level of market concentration is less than 3,000; those numbers have recently been rising.

Figure 3-2: Market concentration for imports from non-EFTA countries
Change between 2002 and 2012, percent



Sources: Eurostat; Cologne Institute for Economic Research (IW)

Infrastructure risks

The current supply structure is not the only significant factor, however. The security of energy supply also depends on the availability of alternatives if the need should arise – not only raw materials, a subject we will not discuss in detail here, but also transport options.

The transport of crude oil and petroleum products is for the most part unproblematic. Over 90 percent of crude oil imports are shipped by tanker to Europe, and costs are quite low relative to the value of the product (European Commission, 2014). It is therefore possible to import large quantities over long distances, as well as to switch suppliers relatively quickly if necessary. Pipelines are used primarily to connect seaports with domestic refineries, but may also serve as an alternative to sea routes that might be disrupted by political upheaval (European Parliament, 2009; Nies, 2008). The fact that many refineries are designed only for certain types of crude oil might also limit flexibility. Problems with transport routes, however, are unlikely to lead to significant shortages, not least because oil consumption is expected to decline. Transport issues therefore pose only a low to medium risk to imports.

In part because of current transport structures, Russia is a major exporter of natural gas to Europe, and particularly Germany³. Natural gas, unlike oil and coal, is delivered to Europe mainly by pipeline. Importing energy resources from new countries is possible in principle, particularly LNG (liquefied natural gas) – provided that these energy resources can be transported without restriction to the destination countries in Europe. This means that the flexible exchange of natural gas within the EU must be assured, which is not always true at

³ For an overview of the role Gazprom plays in Europe's natural gas supply, see Holz et al. 2014.

present. To further diversify the supply of natural gas, traditional procurement channels will therefore undergo more extensive change than in the case of other energy sources. Over the medium term, therefore, the transport-side risk to the natural gas supply will be at a medium to high level (Engerer et al., 2014), although the individual EU countries differ significantly in their vulnerability. While the EU countries have the capacity to store significant quantities of energy so that they can respond to short-term supply disruptions, they are not required by law to maintain stocks of natural gas.

Coal is generally transported to Europe by ship, but in some cases also by rail freight, particularly from Russia, Poland and Ukraine. The supply of coal, unlike oil and natural gas, has not been disrupted by political events. Weather tends to pose the greatest threat; flooding and low water levels can interfere with inland shipping, for instance. But such problems are temporary, and the coal market is structured to allow for various responses. Europe has substantial domestic coal reserves, for example – which is why no compulsory reserves have been established (European Commission, 2014). Risk to coal imports from the transport side is minimal.

Conclusions

We conclude by summarizing the study's results. To produce, for each energy source, a unit figure that can be compared across all dimensions, we multiply and then scale the values we have calculated. Import risks can range between 1 and 100. All of the values we have calculated are below 10, which indicates that the risk to imports is not particularly high. In a comparative assessment, however, we have assigned different levels of risk to those values, ranging from low to high (see key, Figure 3-3). The latter ratings correspond to the qualitative evaluation of transport risk shown in Figure 3-3.

In Germany and Europe, import risks are highest for natural gas, primarily because of a relatively high level of concentration on certain supplier countries. Natural gas accounts for more than one-fifth of the energy supply in Germany and Europe, and that share is likely to remain at least constant in the future. Since its recoverable reserves are dwindling, Europe is increasingly dependent on importing natural gas from third countries (imports currently make up approximately 40 percent of the total), mostly – and in the case of Germany entirely – from Russia. Thus a great deal of money has been invested in the European pipeline, LNG and storage capacities for natural gas over the past few years, which may reduce the level of concentration on Russian imports, at least for the EU as a whole. There are two reasons why Europe continues to import large quantities of natural gas from Russia by pipeline: The first is higher natural gas prices in certain regions (LNG is often shipped to other markets) and the second is that Europe's pipeline system is not adequately integrated. This prevents the flow of pipeline gas, as well as LNG, to all regions of the EU. Particularly Eastern European countries like Bulgaria, Romania and Hungary, but also Greece, would hardly be able to make up for a loss of Russian natural gas. As LNG penetrates a larger share of the market and long-term agreements expire, markets will become more integrated. This will lead to changes in current transport routes and supply structures.

Table 3–1: Import risks for Germany and the EU, 2012

	Significance in the energy mix (percentage)		Dependence on imports from non-EFTA countries (percentage)		Market concentration for imports from non-EFTA countries (HHI)	
	Germany	EU	Germany	EU	Germany	EU
Natural gas	21.7	23.3	39.2	43.2	10,000	4,820
Oil	33.7	33.8	65.7	81.0	2,884	1,729
Coal	12.8	11.9	75.1	64.7	2,252	2,729

Source: Cologne Institute for Economic Research (IW)

Figure 3–3: Import and transport risks

Energy sources	Germany		European Union	
	Dependence	Transport risks	Dependence	Transport risks
Natural gas	8.5	medium/high	4.9	medium/high
Oil	6.4	low/medium	4.7	low/medium
Coal	2.2	low	2.1	low

Key:

up to 2.5	up to 5	up to 7.5	up to 10
Low	low/medium	medium/high	high

Source: Cologne Institute for Economic Research (IW)

Oil is the most important single component of the energy mix, accounting for about one-third of the total, and there are no real replacements for it, particularly in the transport and petrochemical sectors. The level of Germany's dependence on third countries has increased to nearly 66 percent and the EU's to 81 percent; both figures are expected to rise in the coming years. Supply structures are well diversified. In the past, political tensions in certain important oil-exporting countries have often had an effect on the global oil markets. Now, however, with liquid markets and good transport options, it is theoretically possible to switch to other suppliers. Existing infrastructure is capable of ensuring the supply of oil to the EU and Germany. Issues with transport routes are unlikely to be the cause of significant shortages, not least because the consumption of oil is expected to decline. Moreover, trade in petroleum products offers a certain amount of flexibility. New players like the United States are particularly important in this context.

Coal accounts for a smaller percentage of the energy mix than the other energy resources considered here. Owing to a shift away from domestic extraction, the EU is dependent on imports from third countries for 65 percent of its coal; the corresponding figure for Germany is 75 percent. Because so many transport options are available, however, supply structures are both extremely well diversified and highly flexible.

4 Europe and Germany benefit from the revenues earned by the oil-producing countries.

Overall, oil prices have increased significantly in the past 15 years. The price of oil remained more or less consistently below 20 US dollars per barrel from the mid-1980s to the end of the 1990s, but rose dramatically around the turn of the millennium. It reached an initial peak in 2008, at an annual average of nearly 100 dollars per barrel. Oil prices dropped briefly but significantly as a result of the global financial and economic crisis, only to reach a new high of well over 100 dollars in 2010. For the most part, they have remained at that level ever since.

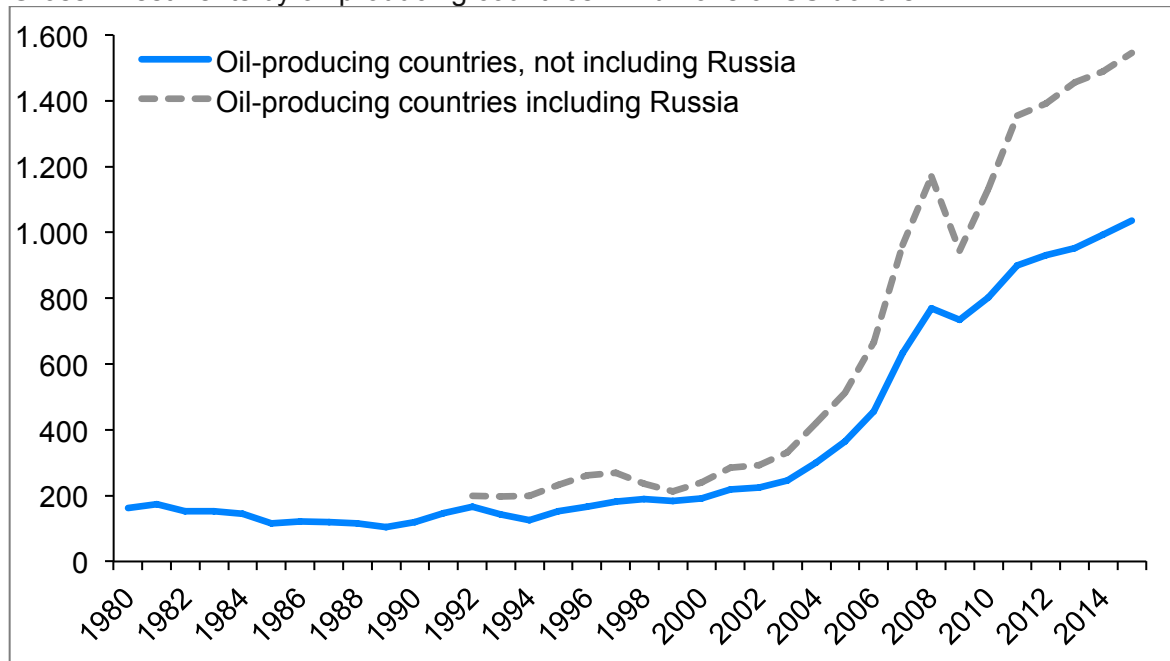
Although higher oil prices are generally viewed as a drag on the overall economy, the so-called trade effect can produce a positive counter-effect (Beck/Kamps, 2009). To support that conclusion, it is useful to consider the following questions (see Grömling, 2008a; 2013):

1. Rising oil prices generate higher oil revenues for oil-rich countries. The question, then, is whether the revenues are used to increase investments in those countries. Is the oil boom generating an investment boom in the oil-producing countries?
2. If so, then the next question is whether the Germany economy benefits from an increase in demand for capital goods in the oil-producing countries. Does the recycling of petrodollars have a favorable effect on Germany's foreign trade and the German economy?

The present study shows that rising oil prices, combined with growing demand for oil worldwide, have led to an enormous increase in revenues for the oil-producing countries. The oil boom has triggered an equally dramatic investment boom. Nominal gross investments in the oil-producing countries have increased six-fold, from just under 240 billion US dollars in 2000 to over 1,450 billion dollars in 2013. With rising oil revenues and significant growth in investments, the oil-producing countries now account for an even larger share of gross investments worldwide – approximately eight percent, corresponding to their share of global economic output.

Figure 4-1: Investments by oil-producing countries

Gross investments by oil-producing countries¹⁾ in billions of US dollars

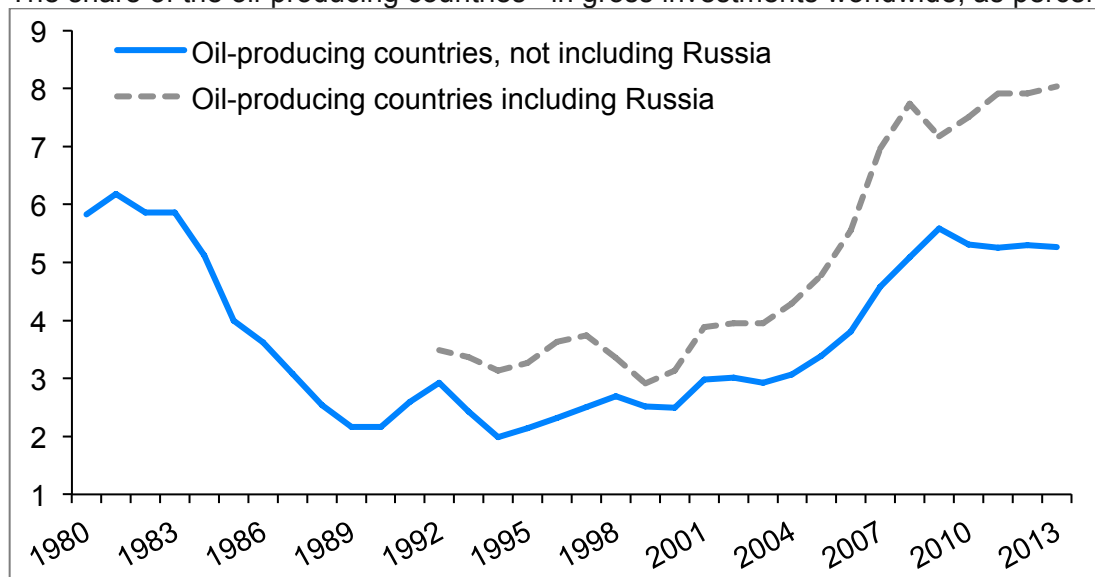


1) OPEC countries (not including Iraq), Russia und Norway. Data for Russia prior to 1992 are not available.

Sources: IMF; Cologne Institute for Economic Research (IW)

Figure 4-2: The oil-producing countries as an investment site

The share of the oil-producing countries¹⁾ in gross investments worldwide, as percentage



1) OPEC countries (not including Iraq), Russia und Norway. Data for Russia prior to 1992 are not available.

Sources: IMF; Cologne Institute for Economic Research (IW)

The question, for Germany, is whether the investment boom in the oil-producing countries has had a favorable effect on foreign trade and the overall economy.

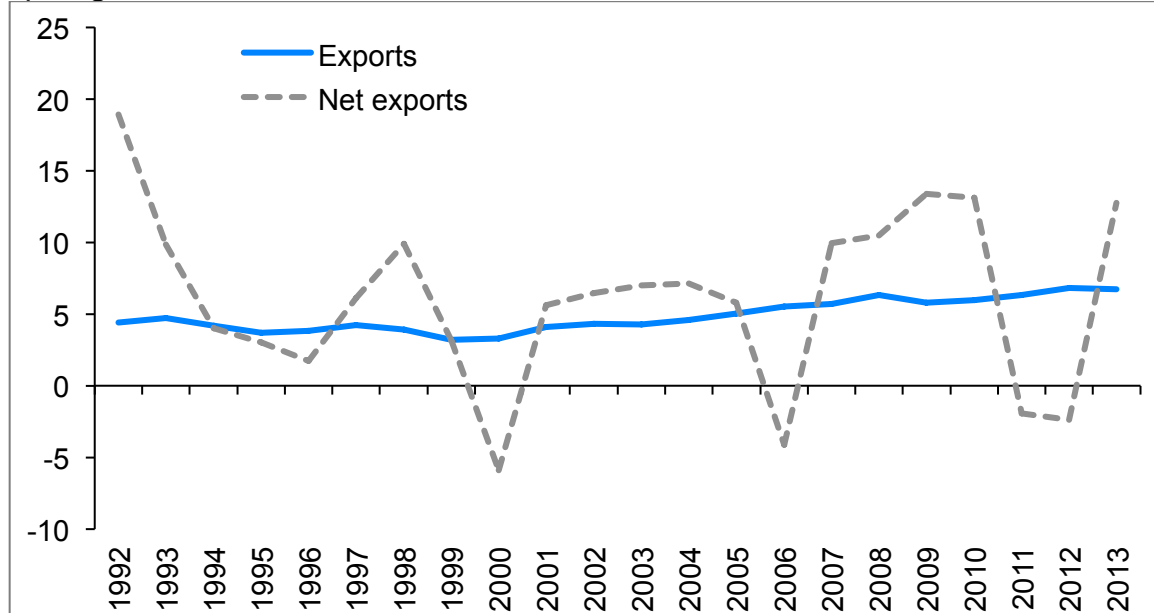
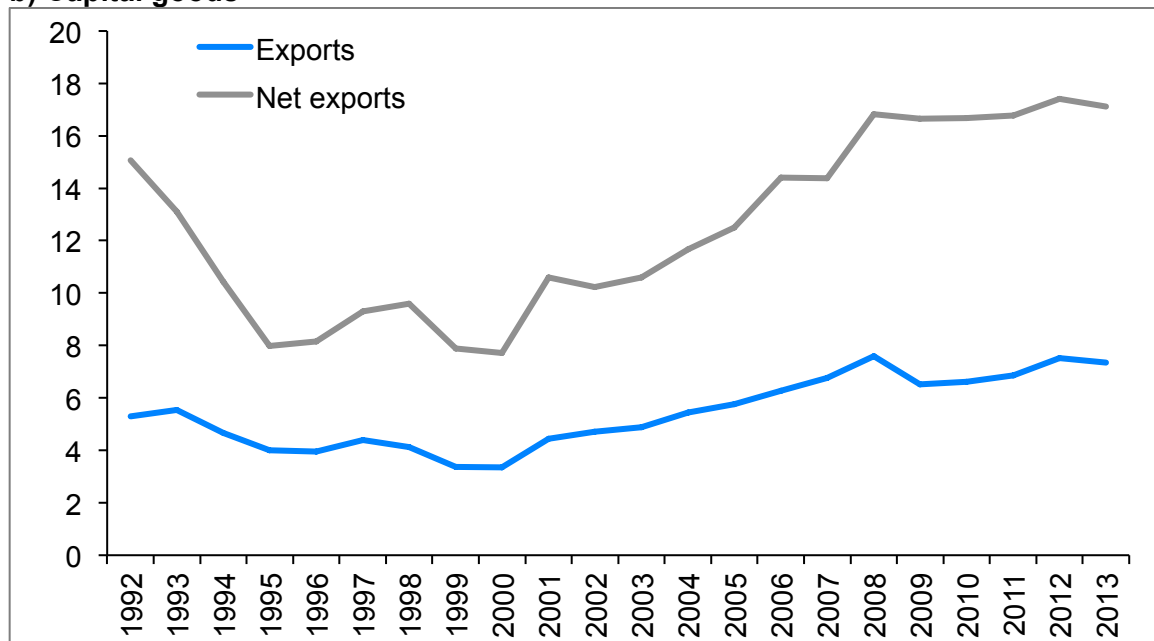
The study shows that rising oil prices have resulted in a substantial increase in Germany's overall trade with the oil-producing countries. During the 1990s, German exports to those countries remained stagnant at approximately 20 billion US dollars annually. By 2008, exports had grown to over 90 billion dollars, and that figure had risen to nearly 100 billion by 2013. Between 2007 and 2010, Germany's annual surpluses amounted to about 25 billion dollars, and its surplus was considerably in excess of 30 billion dollars in 2013.

Figure 4–3a shows Germany's exports to the oil-producing countries as a percentage of total exports. According to the most recent data, nearly seven percent of German exports went to the oil-producing countries. In the 1990s, the corresponding figure dropped from just under five to slightly over three percent. With the increase in oil prices, that fraction more than doubled. It is particularly notable that in the years since 2008, the oil-producing countries accounted for more than twice as much of Germany's capital-goods trade surplus as they did in the 1990s. Most recently, these countries were responsible for about 17 percent of that surplus. Despite the fact that the oil-producing countries, taken together, have the world's largest current-account surplus – about 600 billion US dollars – Germany has been able to record a surplus in its trade with those countries.

Figure 4-3b shows the significance of the oil-producing countries in Germany's capital-goods exports and trade surplus. According to the most recent data, as well as in 2008, roughly 7.5 percent of German capital-goods exports went to the oil-producing countries, compared with only about 3.5 percent at the turn of the millennium. The share of Germany's capital-goods trade surplus accounted for by the oil-producing countries also more than doubled between the 1990s and the years since 2008. Since 2008, about 17 percent of that surplus can be attributed to those countries. The German economy, and particularly manufacturers of capital goods, have benefited greatly from the investment boom in the oil-rich countries over the past 15 years. The recycling of petrodollars through the movement of capital plays a much less significant role than trade in goods.

Figure 4-3: The oil-producing countries and Germany's foreign trade

The share of the oil-producing countries¹⁾ in Germany's exports and net exports²⁾ of goods³⁾ and capital goods⁴⁾, as a percentage

a) All goods**b) Capital goods**

1) Norway, Russia und OPEC (not including Irak, Angola, Libya).

2) Exports minus imports.

3) Foreign trade, not including services.

4) Production of metals, metal products, machines, equipment and vehicles.

Sources: OECD; Cologne Institute for Economic Research (IW)

5 The energy transition requires open markets

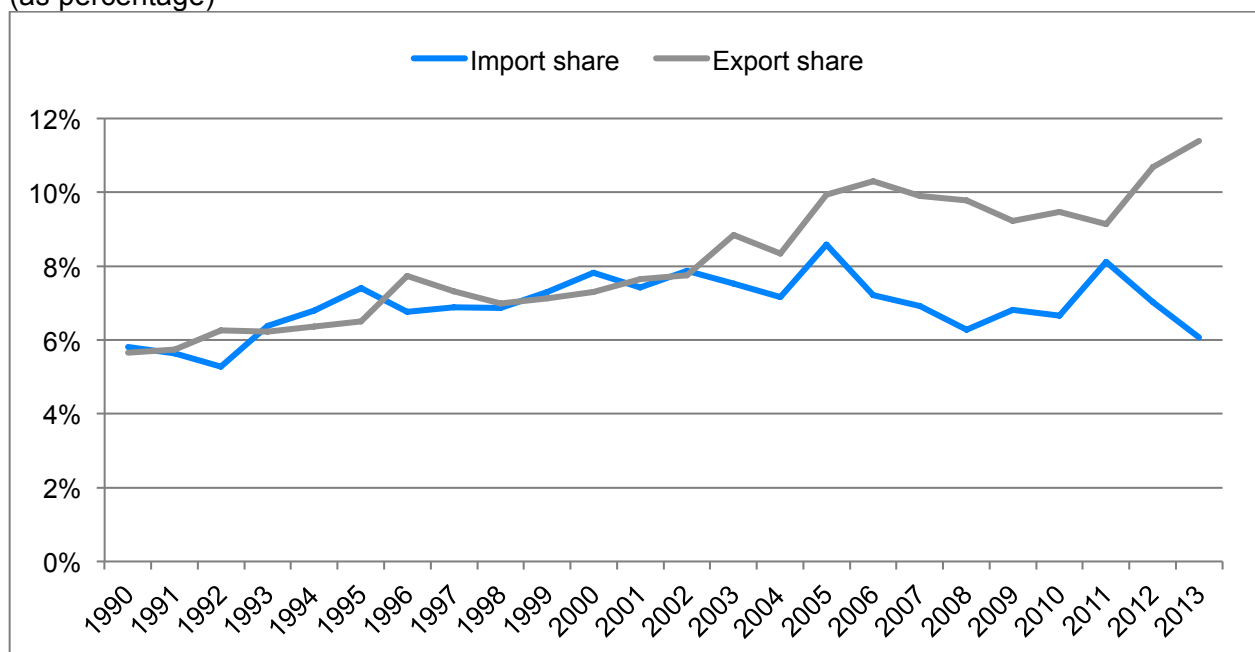
No country will be able to transition to new sources of energy by acting alone, without taking into account international interrelationships. Such a transition requires open markets, transnational networking and the benefits of international specialisation. To achieve Germany's energy-policy goals – efficiency, supply security and environmental compatibility – the following five areas, in which international networking is essential, must be kept in mind:

- **Compensating for fluctuations in the power supply**

Renewable sources of electricity are subject to considerable natural fluctuations. Since there must always be a balance between production and consumption, access to other sources, even at short notice, is essential. Another important consideration is this: When sun and wind are abundant, large-capacity solar and wind-driven power plants produce an excess of energy, and unless it is stored or the plant is switched off, that excess has to be exported to a foreign network.

As a result, the power industry has significantly expanded its foreign trade in recent years (Figure 5-1). Exports have grown from less than six percent in 1998 to over eleven percent today. Imports have remained relatively stable; after a temporary increase, their share has dropped back to about six percent. As renewable sources of energy have taken on a much more prominent role in Germany, export surpluses have grown. However, this increase has not been driven by demand as much as by temporary overproduction. This share can be expected to increase still further in the coming years, as renewables account for an even larger share of Germany's energy supply. Germany will not be able to rely largely on renewables, which are subject to fluctuations, for its power supply without trade with other countries.

Figure 5-1: Imported and exported electricity
(as percentage)



Sources: AG Energiebilanzen, Cologne Institute for Economic Research (IW)

- **Sites for generating renewable energy**

The costs of producing renewable energy can be significantly reduced through European specialisation. One option is to take advantage of sites that are particularly well suited to producing wind or solar energy, which makes it possible to generate more power without investing more money. Internationalising production makes the energy transition more efficient, and hence also more successful, than going it alone.
- **Importing renewables**

Renewables are usually considered to be domestic sources of energy. This is indeed true in the case of electricity, since generating electricity does not require importing fuel. Imports play a role only in the case of biomass, which is the reason why overall, some three percent of renewable energy is imported. Germany's renewable energy sector is dependent on imports less for consumables than for capital goods and related upstream products – solar cells, for example, but also metals needed to produce equipment such as wind turbines (Bardt/Kempermann/Lichtblau, 2013). Plants that generate renewable energy do not differ in this regard from other industrial capital goods. An international division of labor and international trade are essential for economic prosperity.
- **Competition in the electricity market**

Since the late 1990s, systematic efforts have been made to open up the electricity markets and encourage competition. This has led to the emergence of new providers throughout the value chain – particularly for distribution, less so for generating power. If competition were to become more “Europeanised”, with the focus on the European rather than the national market, the level of concentration would drop still further. Companies that loom large nationally would be only one of many providers in the European context.
- **Less cost distortion**

Further Europeanising government regulations would also help to reduce the negative effects of the energy transition on competition. The central problem facing German industry, to a greater extent than its European competitors, is added fees and assessments at the national level. A uniform European approach would significantly reduce cost distortion and prevent national regulations from jeopardising the competitiveness of entire industries. Here, too, attempts by Germany to go it alone threaten prosperity and jobs.

An affordable, secure and climate-friendly energy supply cannot be achieved in isolation; rather, it must be based on integration into all aspects of the European and international markets. International trade is beneficial not only with respect to industrial goods and services, but also for the energy supply. Germany's prosperity is due largely to integration into the global economy. Over the long term, the energy supply, too, will have to be built on an international foundation. Attempting to be self-sufficient in the energy sector is the wrong approach. Success in transitioning to new sources of energy depends on seizing the opportunities provided by an international division of labor.

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