A Study on Oil Dependency in the EU

A report for Transport and Environment

July 2016

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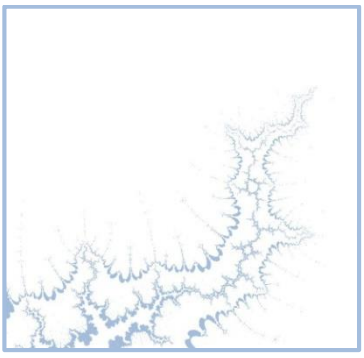

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Authorisation and Version History

Version	Date	Authorised for release by	Description
1.4	07/07/2016	Phil Summerton	Final report

Contents

Executive Summary

Introduction

Transport and Environment (T&E) commissioned Cambridge Econometrics to assess the level of dependency in the 28 EU Member States (EU28) on imported oil, and how it exposes them to environmental and supply risks.

The project comprised three key tasks:

1) a review of historical data on oil dependency in the EU28;
2) an assessment of the EU's exposure to geopolitical and environmental risks through its oil imports;
3) an assessment of the EU's dependence on oil companies that are based inside and outside of Europe.

We summarise our key findings below.

Historical trends in EU oil dependency

The most recent data shows that crude oil and petroleum products account for one third of gross inland energy consumption in the EU. Most of this demand is from the transport sector, particularly from road transport.

Although domestic energy demand has fallen in recent years, crude oil extraction in the EU has fallen at a faster rate. **This has led to an increased dependency on oil imports**. **As of 2014, the EU relies on imports for 88% of its crude oil supply.**

The EU's crude oil refining sector has capacity of around 766 Mt, representing around 16% of global crude refining capacity[1]. However, crude oil production in the EU is relatively low, and in decline. Therefore, of the total volume of petroleum products imported to the EU, the majority (79%, 520 Mt) is imports of primary crude oil, which is used as feedstocks for EU refineries. **In 2015, a year of low oil prices, total spending on crude oil imports in the EU was €187 bn (equivalent to 1.3% of EU GDP, or €368 per capita).** This compares to €40 bn spending on natural gas imports in the same year.

In 2014 and 2015, there has been an increase in the volume of oil imported, as the lower oil price has driven a reduction in domestic production and an increase in demand. In 2015, oil imports (in volume terms) were 7% higher than in 2013 and at the highest level since 2008[2].

EU refineries have capacity to meet most of the domestic demand for refined fuel. However, in 2015, over €62bn was spent on imports of refined fuels, such as diesel. Importing a large volume of refined fuel limits the potential for value added in the domestic petroleum refining sector.

[1] European Commission (2016), 'Oil Refining'. See: https://ec.europa.eu/energy/en/topics/oil-gas-and-coal/oil-refining

[2] European Commission (2016). See: https://ec.europa.eu/energy/en/statistics/eu-crude-oil-imports

The transport sector accounts for two-thirds of the EU's final demand for oil and petroleum products. This poses a particular issue of reliance, as it is difficult to find substitutes for petrol and diesel in the short term and as a result, consumers must absorb changes in oil prices.

Exposure to security of supply risk

An important aspect of oil dependency is the region, country or oil field from which the oil is imported. This is particularly so when considering exposure to security of supply risks and environmental risks.

In 2015, around 30% of EU crude oil imports came from Russia, a further 16% came from Nigeria and sub-Saharan Africa, 16% came from the Middle East and 8% from North Africa. **A high proportion of EU oil imports are from geopolitically unstable regions that have seen increases in terrorism, internal and border conflicts, or wars.** As a result, consumers and industries in the EU face an increased risk of oil supply interruptions and shortages.

Exposure to security of supply risk for oil imports varies substantially across member states. Some EU Member States, such as Denmark and the UK, produce crude oil domestically and have a number of large ports. These additional supply options provide flexibility to switch to other sources if infrastructure or geopolitical factors cut off supply from one country.

Other European Member States rely heavily on just one or two oil exporting countries, which increases their exposure to supply risks. This is particularly evident in the data for Eastern European countries (Poland, Slovakia and Hungary), which are reliant on Russia for over 90% of their supply of crude oil. Furthermore, the sources of crude oil available to landlocked Eastern European countries (such as Slovakia, the Czech Republic and Hungary) is limited because they have no ports for oil tankers and so are completely reliant on oil pipelines from Russia and the former Soviet Union. The Russian annexation of Crimea in 2014 increased geopolitical instability in the region and heightened concerns about the availability of Russian oil and gas supplies to these EU Member States.

Exposure to environmental risk

We also assessed the carbon emissions associated with different sources of EU imports. **The carbon intensity of (upstream) crude oil imported to the EU ranges from around 4gCO_2/MJ to 50gCO_2/MJ, depending on the source of oil imports.** The type of oil that is extracted, the energy intensity of the extraction process and practices such as flaring and venting, are the main factors contributing to these differences in GHG emissions intensity. According to recent analysis by the ICCT[3], crude oil from Canada oil sands and Nigeria has the highest average carbon intensity of all sources.

[3] ICCT (2014) 'Upstream Emissions of Fossil Fuel Feedstocks for Transport Fuels Consume in the European Union'. https://circabc.europa.eu/sd/a/6215286e-eb5f-4870-b92f-26acff386156/ICCT_Upstream-emissions-of-EU-crude_May2014.pdf

Dependence on oil extraction and petroleum refining companies

The final aspect of this study involved assessing EU oil imports by company, specifically the share of EU oil imports sourced from non-European companies. Rosneft, Lukoil, Statoil and Saudi Aramco are the four companies that we estimate to be responsible for the highest share of crude oil sales to the EU. The headquarters and primary operations for all four of these companies are outside of the EU.

We estimate that over 80% of crude oil imports and 95% of refined oil imports to the EU are from non-European companies[4]. Since much of the economic value added in the oil supply chain is based outside of the EU, it is the oil exporting regions that benefit from the jobs and investment.

Domestic production of refined petroleum creates some economic benefits for EU Member States. However, these economic benefits are limited due to the nature of the industry, which typically has a small value chain and low labour intensity. Furthermore, some of the profits generated by these companies are likely to flow out of the EU economy to benefit shareholders abroad.

Conclusions

The EU's dependency on crude oil and refined fuel imports is high and rising. Much of this oil comes from geopolitically unstable regions. This makes the EU economy, particularly its transport sector, vulnerable to supply and price shocks.

The European Commission has put in place some measures to reduce these risks and improve Europe's energy security. The Oil Stocks Directive, for example, requires EU Member States to hold stocks of oil to reduce the effects of supply shortages. However, in the longer term, there is a need to reduce use of petroleum products in order to reduce exposure to security of supply risk. This would have the added benefit of helping to meet climate change commitments. According to the Carbon Tracker initiative[5], 80% of proven fossil fuel reserves must remain in the ground and unburned if we are to stay below 2°C global warming.

[4] For the purposes of this analysis, we refer to 'non-European companies' as companies with head offices based outside of the EU or Norway.

[5] Carbon Tracker Initiative (2014), 'Unburnable Carbon – Are the world's financial markets carrying a carbon bubble'. http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf

1 Introduction and background

The purpose of this study is to assess the EU's oil dependency and the risks associated with imported oil. The remainder of the report is in five chapters.

- Chapter 1 presents recent trends in domestic oil consumption and oil imports. It discusses oil dependency in light of the recent fall in the oil price and discusses key EU policies introduced to alleviate the risks associated with oil import dependency.
- Chapter 2 presents insights from recent data on oil import dependency.
- Chapter 3 discusses the geopolitical risks associated with imported oil and how these could increase the EU's exposure to oil supply disruptions. It also briefly discusses how the carbon-intensity of crude oil and refined petroleum products can vary substantially between countries and oil fields, due to differences in the type of oil and differences in the extraction and refining process.
- Chapter 4 presents data on EU oil imports by company.
- Chapter 5 concludes with the key messages emerging from the study.

1.1 Historical use of oil and petroleum products in the EU

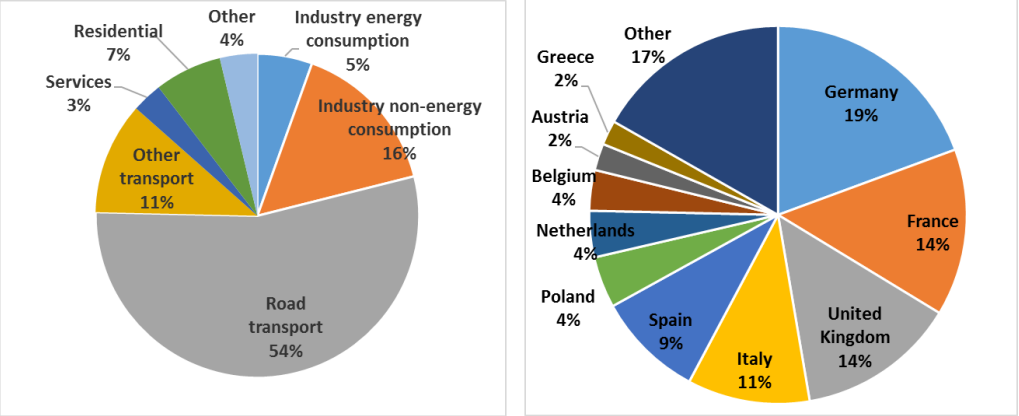
Sectoral demand for oil and petroleum products

Crude oil and petroleum products account for around one third of gross inland energy consumption in the EU. As shown in Figure 1.1, two-thirds of final demand for oil (330 Mt pa) is from the transport sector. Road transport alone accounts for over 50% of final demand for petroleum products (275 Mt pa).

Industries consume around 20% of oil supplied to EU markets. In 2014, industry energy use of oil was 27 Mt pa (5% of total final demand for oil). In addition, large volumes of oil and petroleum products were used in industry for non-energy purposes. Most notably, the chemicals industry used over 60 Mt refined petroleum products as a raw material input for the manufacture of plastics and chemical products[6].

[6] Eurostat Energy Balances, 2014 data

Figure 1.1 EU final consumption of oil and petroleum products by end user and by Member State (2014 data)



Source: Eurostat Energy Balances

Since 2000, there has been a gradual decline in total final consumption of oil and petroleum products in the EU (on average a 1.1% reduction pa). This is due to improvements in vehicle and industry energy efficiency, a transition to alternative fuels and, in more recent years, reduced demand following the recent global economic downturn.

Oil consumption and emissions from transport rose by 36% over the period to 1990-2007, driven by increases in demand, but have since declined, primarily due to improvements in the efficiency of passenger car and vans. Despite this recent reduction in oil consumption and emissions from road transport, energy efficiency improvements in aviation and freight transport have, so far, been limited. In 2013, GHG emissions from transport were 13% above 1990 levels. To meet the 60% target reduction in emissions by 2050 (as outlined in the 2011 Transport White Paper), emissions from transport will need to fall by a further 65%.

Consumption of oil and petroleum products varies substantially across EU member states. As shown in Figure 1.1, Germany, France and the UK, the three largest and most populous EU economies, account for just under half of final EU oil consumption.

Oil intensity of GDP

There is a large range in the oil intensity of EU Member State economies. The most oil-intensive EU Member States are Bulgaria, Cyprus and Latvia, where taxes on fuel and final prices at the pump are relatively low, and where older, more inefficient vehicles tend to remain in the fleet over long time periods. In all EU Member States, the oil intensity of GDP has declined over recent decades, due to energy efficiency improvements, including the introduction of vehicle emissions standards. It is likely that this trend will continue, as EU vehicle emissions regulations become more stringent in the future. However, the current low oil price is likely to put some upward pressure on EU oil demand in the longer term, if demand is not sufficiently constrained by low carbon energy policy.

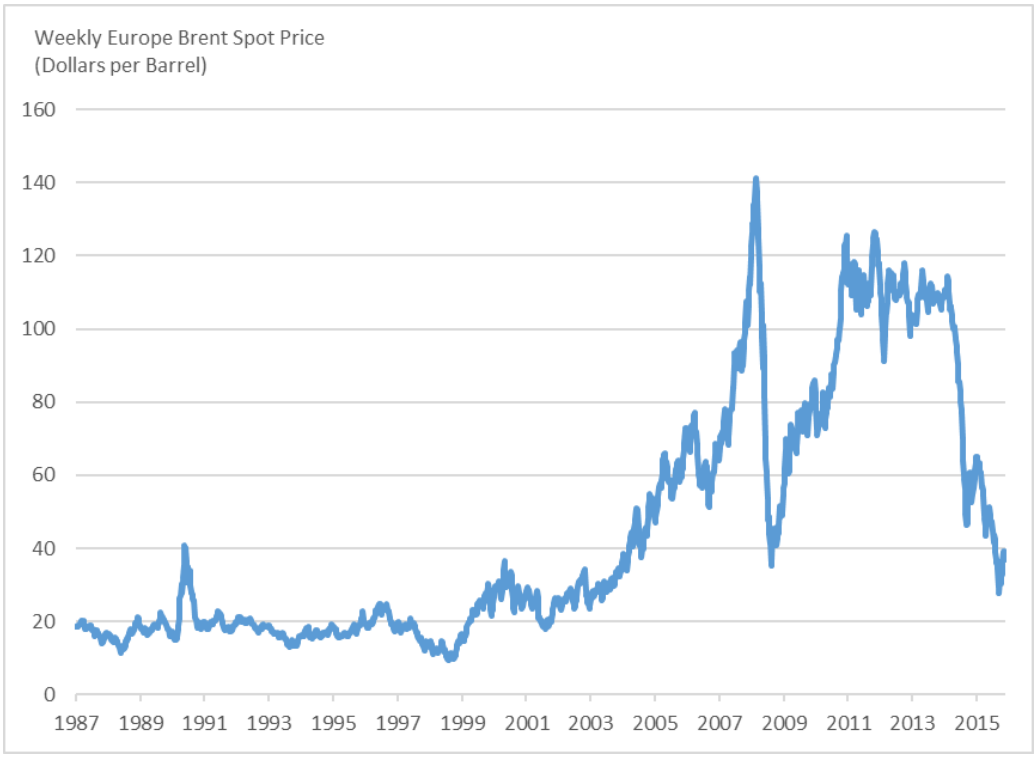
1.2 Supply shocks and oil price volatility

Oil price volatility

Oil prices are inherently volatile. As shown in the chart below, over the past eight years alone, oil prices have risen steeply (to a high of over $140/bbl in Summer 2008) and then plummeted (to a low of around $30/bbl in early 2016). Large fluctuations in the oil price can lead to economic and financial uncertainty, which can reduce investor confidence and supress economic growth.

Historically, dependence on oil in the EU during periods of high oil price shocks has led to economic instability. Oil price shocks in the 1970s and early 1980s, for example, prompted two deep recessions, high inflation and large trade deficits. The price spike in 2008 also raised price inflation in much of the EU, not least because of its impact on the cost of mobility, for which short-term price elasticities are typically low.

Figure 1.2 Historical crude oil price



Source: Thomson Reuters (2016), Weekly Europe Spot Brent Price.

Recent events show how oil prices are susceptible to negative shocks as well as positive shocks. In the latter half of 2008, falling demand at the onset of the global economic downturn caused the oil price to plummet, from a high of $141/bbl in July 2008, to a low of $35/bbl in January 2009 (a 75% fall in just 6 months).

More recently, the shale gas boom in the US and a decision by OPEC to refrain from withholding supply led to another sharp fall in the oil price to a low of $30/bbl in early 2016. A fall in energy prices provides a real-income boost to energy importers but the unexpected depressing effect on consumer prices adds to the macroeconomic challenges posed by a very low-inflation environment in Europe.

Future oil prices

There is high uncertainty around the future oil price due to uncertainties about future long-term levels of oil demand and supply. There is likely to be upward pressure on demand, as many low-income countries develop, populations increase and demand for passenger cars increase. Balancing this is a climate of uncertainty over future resource availability, as new shale discoveries come on stream and new technologies reduce the costs of extraction.

Whatever the future oil price, it is clear that fuel efficiency improvements and measures to reduce demand for oil will improve the EU economy's resilience to oil price shocks.

1.3 EU policy context

Oil and petroleum products are an important part of the energy mix but the EU has become increasingly dependent on imported sources of oil to meet domestic demand. Energy policy in the EU will need to carefully consider the role for oil and petroleum products in the future energy mix and how risks associated with high dependence on oil imports can be mitigated. The table below summarises key policies that the EU has put in place to reduce its dependency on oil imports, including:

- The Energy Union Framework
- The Energy Security Strategy
- The Oil Stocks Directive
- Vehicle Emissions Regulation

Policy measure	Policy description in the context of oil import dependency
The Energy Union Framework	In 2015, the Energy Union strategy was established to ensure that the EU's energy supply was secure, affordable and sustainable. One aspect of the Energy Union includes an ambition to reduce dependence on energy imports and to diversify energy supply in order to reduce exposure to supply shocks from geopolitical risk. Import dependency is particularly high for oil (where imports account for 88% of gross inland oil consumption, compared to 65% import dependency for gas supply and 44% import dependency for supply of solid fuels). Reducing reliance on oil imports will be key to achieving these specific Energy Union goals. The Energy Union also includes an ambition to improve energy efficiency (by at least 27% by 2030), to decarbonise the economy (to achieve a target of 40% emissions reduction by 2040) and to become a global leader in clean energy technologies. Low carbon transport policy and other policy measures to reduce

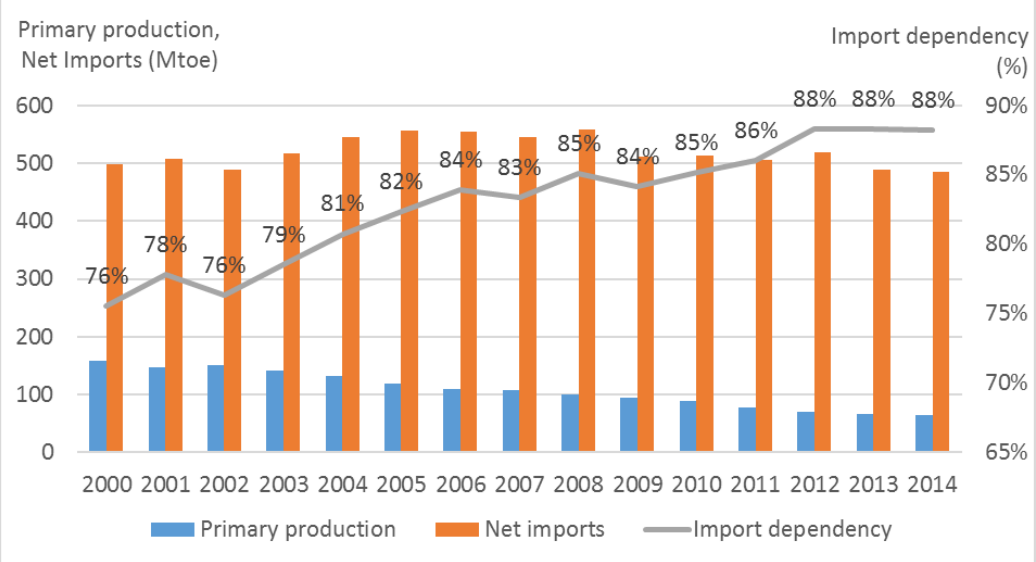
	domestic oil consumption will be an important factor in achieving these targets.
EU Energy Security Strategy	Many countries in Europe (and particularly in Eastern Europe) are reliant on just one or two sources of oil and gas supply and this over-reliance on few sources creates security of supply vulnerabilities. The EU Energy Security Strategy aims to mitigate the risks associated with high dependence on insecure energy supplies and, to some extent, compliments the aims of the Energy Union. The strategy was launched in May 2014, predominantly in response to the Russian annexation of Crimea, which disrupted European imports of Russian gas that transit through pipelines in Ukraine. As part of the Energy Security Strategy, the European Commission carries out stress-testing to assess the likely impacts of disruptions to key sources of oil and gas supply. Through this they have previously identified some key vulnerabilities in the EU oil and gas system. Longer term measures in the Energy Security Strategy include a goal to increase domestic energy production and diversify sources of supply by negotiating effectively with current and new trade partners.
The Oil Stocks Directive	Another initiative to help mitigate the impacts of oil supply shortages is the 2009 Oil Stocks Directive. The Directive requires all EU Member States to maintain stocks of crude oil and/or petroleum products equivalent to at least 90 days of net imports or 61 days of consumption (whichever is higher), which can be quickly and easily accessed during periods of supply crisis.
Vehicle Emissions Regulation	In 2013, the European Commission introduced a target for 2021 that limits CO_2 emissions from new cars to 95g CO_2/km and emissions from new vans to 147g CO_2/km on a test-cycle basis. This is based on an average vehicle in the fleet. The European Commission has also promised new post-2020 efficiency standards. To achieve these targets, EU vehicle manufacturers will need to implement energy-efficient improvements to vehicle technologies and increase the share of low-carbon powertrains (such as electric vehicles) in the sales fleet.

2 EU dependency on oil imports

2.1 Oil import dependency in the EU

Crude oil production in the EU has been in steady decline over the past decade. Despite relatively high demand for oil, the EU's domestic proven oil reserves are very low, now accounting for less than 0.5% of global proven oil reserves[7]. As a result, the EU has become increasingly dependent on oil imports, which accounted for over 88% of the region's total oil consumption in 2014, compared to 76% in 2000 (see Figure 2.1).

Figure 2.1 Primary production and net imports of crude oil in the EU (2000-2015)



Source: Eurostat Energy Balances

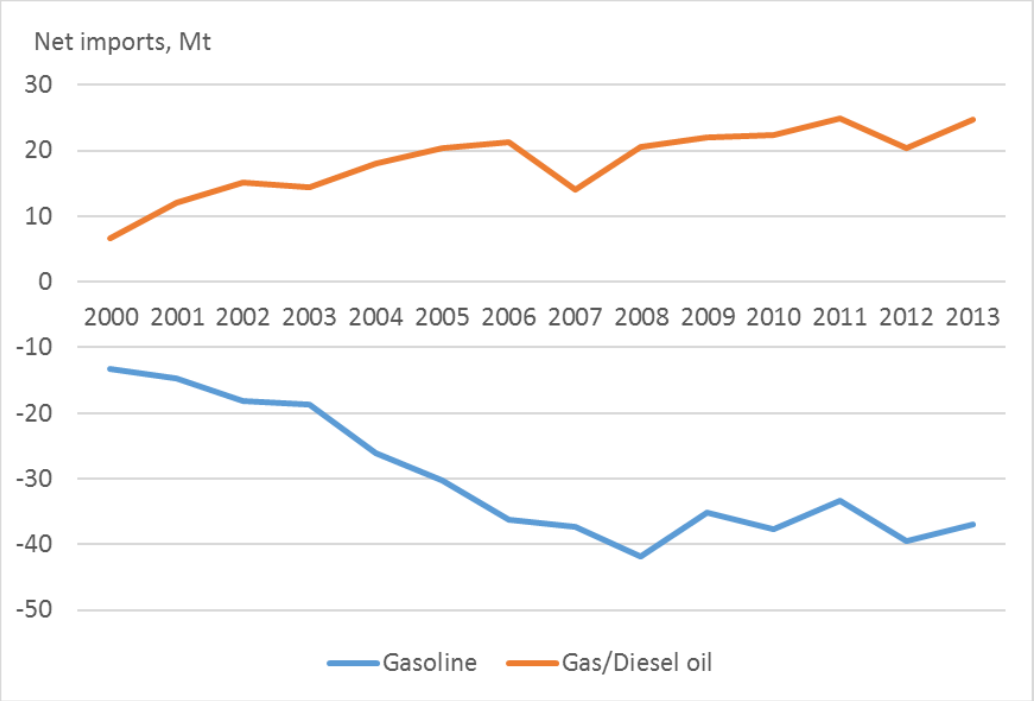
There are only five countries in the EU that have a domestic crude oil extraction industry with output greater than 1 Mt per year: the UK, Denmark, Germany, Romania and Italy. All other EU Member States depend on imports for 90-100% of their domestic crude oil supply.

In 2015, a year of low oil prices, total spending on crude oil imports in the EU was €187bn (equivalent to 1.3% of EU GDP, or €368 per capita). This compares to total EU expenditure on natural gas imports of €40 bn in the same year.

The volume of EU imports of refined fuel is considerably lower than for crude oil, but the value of these higher-priced refined oil imports reached €62bn in 2015. As shown in Figure 2.2, the EU is a net importer of gas and diesel oil and a net exporter of gasoline.

[7] In 2014, the EU's proven oil reserves were 5.7 bbl, compared with global reserves of around 1,650 bbl according to the EIA International Energy Statistics. http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=57&aid=6

Figure 2.2 Net imports of gasoline and diesel oil



Source: Eurostat Energy Balances

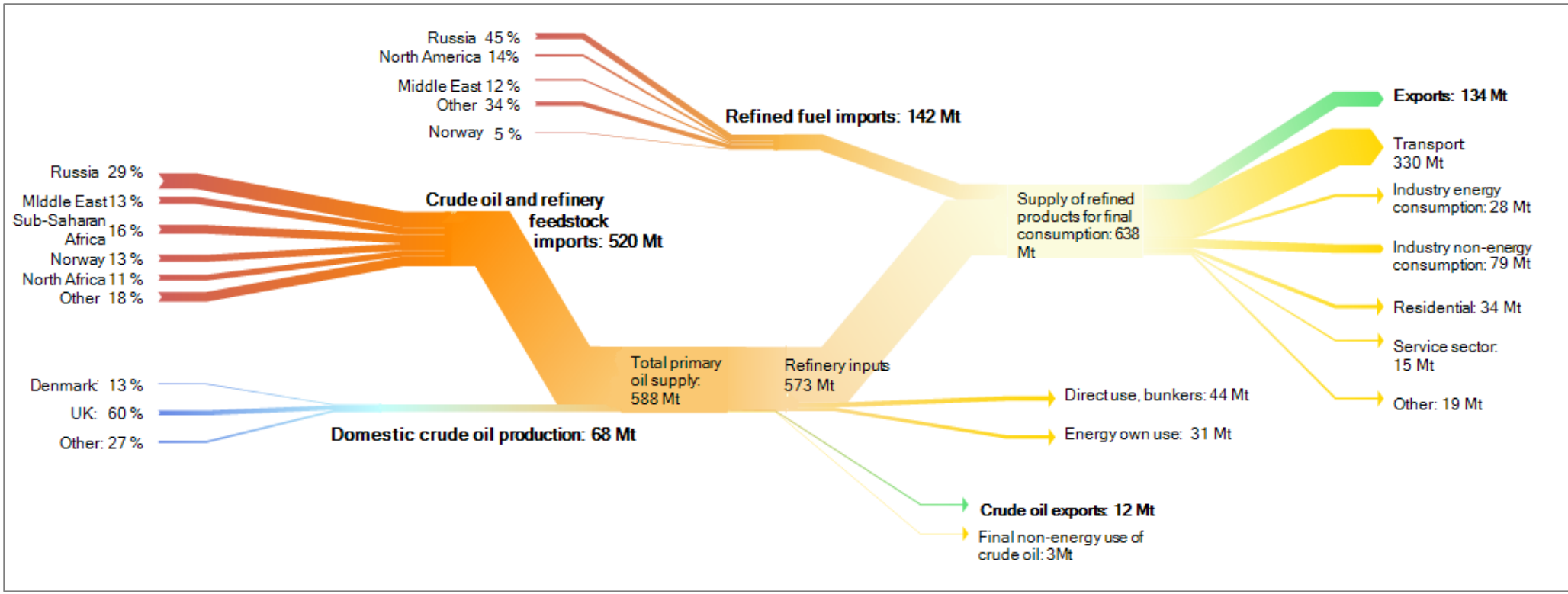
Net imports of diesel oil doubled over the period 2001 to 2013. By 2013, the total value of diesel oil imports reached €37.6bn. By contrast, there is a declining trend in gasoline imports to the EU, that totalled €1.5bn in 2013.

As with the import of any commodity, money spent on oil imports flows out of the domestic economy to the benefit of foreign producers. While some European-registered companies operate global oil fields, the profits from these that flow back to the EU economy (e.g. in the form of returns to shareholders such as pension funds) tend to be small by comparison. This is because shares in these companies are owned by investors across the globe. Furthermore, some imports are sourced from state-owned oil companies which have no European shareholders.

Revenues from EU exports of crude oil and refined petroleum were €4bn and €67bn, respectively, in 2015. Whilst revenues from EU oil and petroleum exports do benefit the domestic economy, it is noted that they are relatively small in scale, relative to expenditure on EU imports of crude oil and petroleum. The oil extraction and refining sectors also have relatively small supply chains and a low labour intensity, which limits the macroeconomic benefit of oil export sales revenue.

Figure 2.3 shows the major oil trade flows in EU oil markets. It particularly highlights the EU's dependence on crude oil imports, with domestic crude oil production at a historical low.

Figure 2.3 Sankey diagram showing crude oil and petroleum imports and exports in the EU



Source: Eurostat 2014 Energy Balances

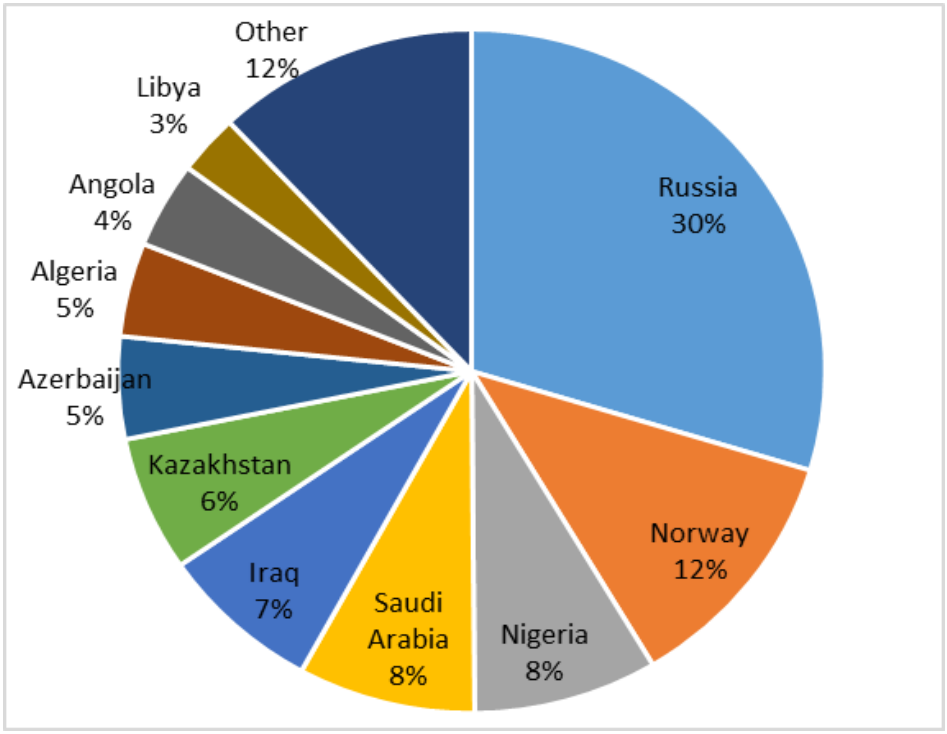
2.2 Sources of oil imports in the EU

In 2015, around 30% of EU crude oil imports came from Russia, a further 16% came from Nigeria and sub-Saharan Africa, 16% came from the Middle East and 8% from North Africa. Many of these regions are geopolitically unstable as they are experiencing internal conflicts or wars.

As a result of the EU's high reliance on oil imports from geopolitically unstable countries, consumers and industries in the EU are highly exposed to the effects of potential supply shortages and oil price volatility.

Figure 2.4 below shows the main sources of EU crude oil imports in 2015.

Figure 2.4 Sources of EU crude oil imports (2015)



Source: Eurostat Energy Balances

The table below summarises the EU's dependence on oil from countries that have recently experienced geopolitical tensions or conflict.

	Share of EU oil imports (2005)	Share of EU oil imports (2015)	EU spending on crude oil		Identified geopolitical risks
			billion dollars	million tonnes	
Russia	30%	30%	$57.4 bn	157.9 Mt	- political instability following annexation of Crimea and involvement in the Syria conflict
Nigeria	3%	8%	$17.6 bn	44.8 Mt	- the militant group Boko Haram controls large territories in the country and this has led to internal conflict in recent years
Saudi Arabia	10%	8%	$16.1 bn	43.2 Mt	- Saudi Arabia is currently facing geopolitical tensions with Iran - neighbouring countries, such as Yemen, face particularly high risk of terrorism and conflict
Iraq	2%	7%	$13.1 bn	39.4 Mt	- the terrorist group, so-called Islamic State, controls large parts of the country, including many of the country's oil fields
Libya	11%	3%	$5.6 bn	15.1 Mt	- intense fighting continues in a number of areas and there remains a high risk of terrorist attacks

For some geopolitically unstable regions, such as Libya, the share of oil exports to the EU has fallen in recent years. This is likely to be due to the effect of oil supply instability in the region.

Overall, the share of oil imported from more politically stable countries appears to be in decline. Crude oil imports from Norway, for example, have declined in recent years. Norway's oil production has fallen by almost half since 2000, from around 3.5 million barrels a day to around 1.8 - 1.9 million barrels a day in 2014. This is reflected in its exports to the EU28, which fell by 45% over the same period. By contrast, the share of oil imported from Russia has increased from 22% in 2000 to 30% over the period 2005-2015. The shares of oil imported from Nigeria and Iraq has also increased in recent years.

EU exposure to security of supply risk due to geopolitical instabilities in the countries supplying oil imports is discussed further and quantified in the following chapter.

3 EU exposure to geopolitical and environmental risk

3.1 Security of supply risks

Increased dependency on imported oil has made the EU vulnerable to the effects of import supply disruptions. Heightening this risk is the lack of diversified sources of supply to many EU countries and a high share of oil imports from geopolitically unstable countries. Furthermore, in some Member States, potential sources of oil supply are limited due to supply infrastructure constraints. This restricts the ability to switch to alternative sources of supply following a supply disruption.

The exposure of EU Member State economies to imported oil supply risk depends on:

- the importance of oil for the domestic economy (spending on oil as a share of total GDP or as a share of total energy demand)
- the diversity of sources of oil supply and the potential to produce crude oil and/or petroleum domestically
- the risk of supply disruptions in the countries from which oil imports are sourced
- the extent to which infrastructure and geographical factors enable Member States to adapt to supply shortages e.g. by switching to an alternative source of supply

For this analysis, we focused on the risk of political instability, terrorism or violence in countries that export oil to the EU. This is based on the premise that disruptions to oil supply are most likely to occur in the countries that are most susceptible to political instability and terrorism. Oil fields are valuable assets, which are likely to be targeted and damaged during periods of war and internal conflict. This hypothesis is supported by recent events in Syria and Iraq, where coalition air strikes have targeted ISIS-controlled oil fields. We do not assess the risk of geographic and climatic hazards, such as earthquakes and hurricanes, on the security of supply.

We used data from the World Bank's Worldwide Governance Indicators[8] and information about the origin, diversity and flexibility of oil supply to estimate exposure to security of supply risk in each EU Member State. Our estimates of exposure to security of supply risk take account of the risk of political instability in the oil exporting countries, the diversity of supply, the proportion of total supply that is imported and the flexibility to switch to alternative sources of supply. We explain our method for deriving an indicator of geopolitical risks to oil imports in more detail in Appendix A.

[8] World Bank (2016), 'Worldwide Governance Indicators'. http://info.worldbank.org/governance/wgi/index.aspx#home

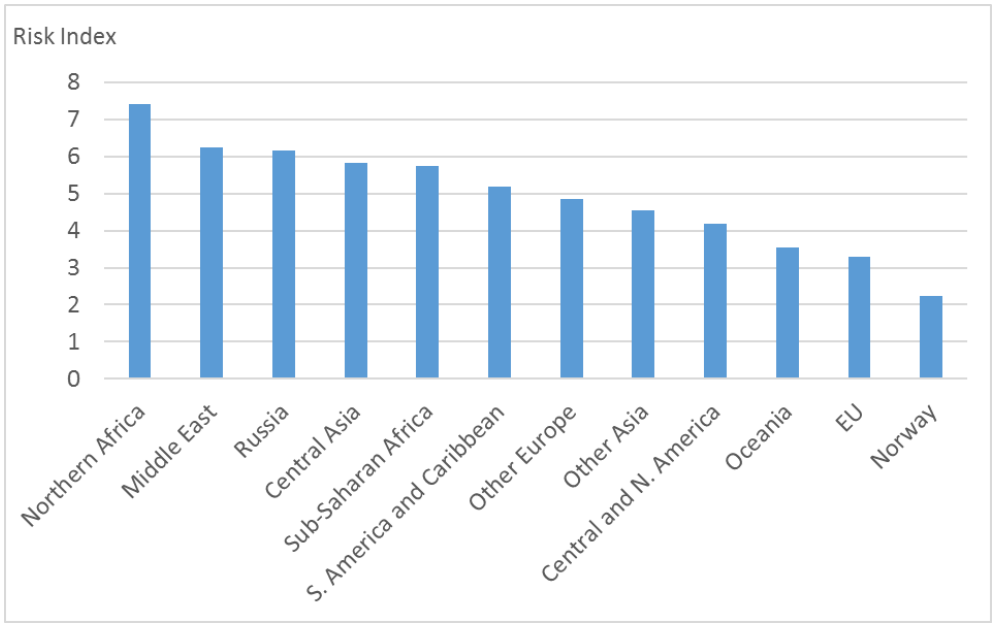
Geopolitical risk in oil exporting regions

The World Bank geopolitical risk indicator for each country is derived using data from surveys about political stability and absence of violence. The surveys are completed by businesses and inhabitants within each country, who score different aspects of society in relation to political stability and violence. The value of the risk indicator ranges from 1-10, with higher values corresponding to the more geopolitically unstable countries. Based on the re-scaled World Bank data, the average value of the geopolitical risk indicator is 4.8. All EU countries are considered to have lower than average levels of geopolitical risk.

Figure 3.1 shows the geopolitical risks associated with different oil exporting regions. According to the re-scaled World Bank data, Northern Africa is the region with greatest geopolitical risk, closely followed by Russia and the Middle East. All three of these regions are important sources of EU oil import supply.

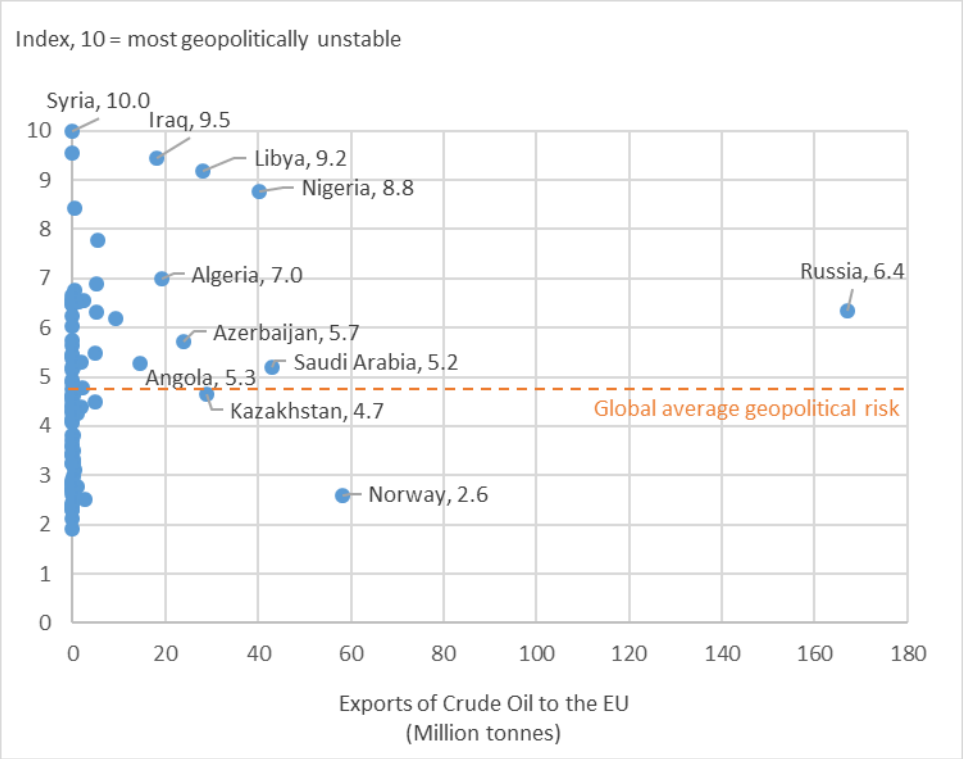
Figure 3.3 shows country-level data for political instability and volume of crude oil exports to the EU. A number of countries with the highest risk of geopolitical instability are also exporters of large volumes of crude oil to the EU. For instance, Iraq, Libya and Nigeria together account for 18% of EU crude oil imports and are among the top 6% of politically unstable countries. Russia, which supplies the highest share of EU oil imports (30%), has a geopolitical instability index of 6, in the middle-upper range.

Figure 3.1 Average geopolitical risk in oil-exporting regions (Index, a higher number corresponds to higher geopolitical risk)



Source: World Bank World Governance Indicators, own calculations.

Figure 3.2 Geopolitical instability in countries exporting crude oil to the EU



Source: Eurostat, World Bank World Governance Indicators, own calculations.

Oil infrastructure constraints

According to the European Commission, around 90% of crude oil imported to the EU arrives by sea[9]. This provides oil supply flexibility. Member States with a coastline and large ports are able to switch to alternative sources of oil supply is one source is interrupted.

However, some landlocked countries in the EU are dependent on crude oil supplied by pipeline. Countries operating inland refineries are typically supplied crude oil by pipeline from large ports in other EU Member States, such as the Rotterdam-Rhein Pipeline (RRP) from Rotterdam, the South European Pipeline (SPSE) from Marseille and the Transalpine Pipeline (TAL) from Trieste.

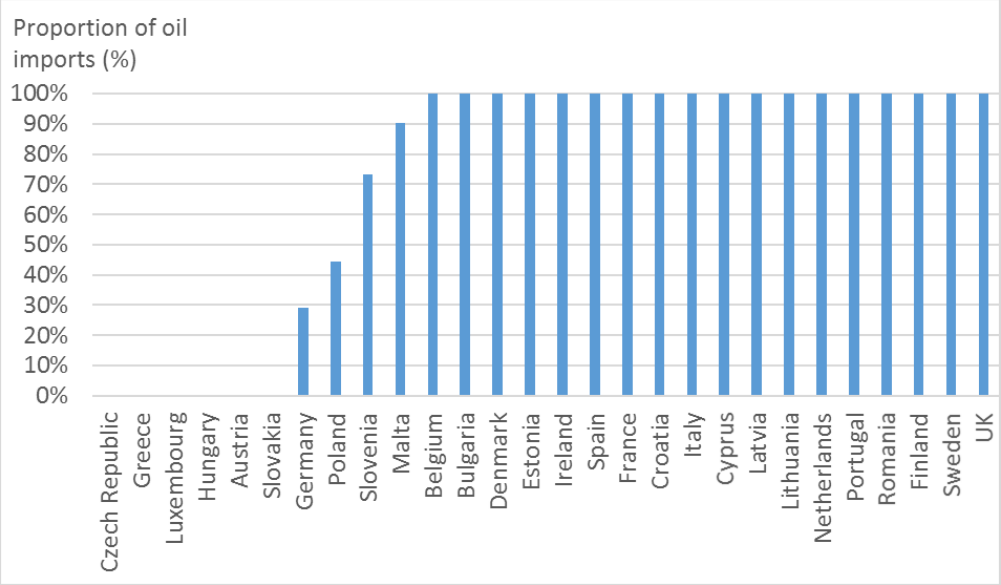
Some countries in Central and Eastern Europe are entirely dependent on the Druzhba oil pipeline, which transports crude oil directly from Russia and is estimated to supply around 30% of Russian oil exports to the EU.

Refineries that are dependent on oil that is transported by pipeline are particularly vulnerable to oil supply shocks. If there is a supply disruption in the oil field at the pipeline's origin, or a problem along the pipeline, then supply of crude oil to these countries could be totally cut off. In landlocked countries, alternative sources of oil supply are limited and the domestic petroleum refining sector could be severely affected.

[9] European Commission (2014), 'In-depth study of European Energy Security' https://ec.europa.eu/energy/sites/ener/files/documents/20140528_energy_security_study.pdf

To take account of differences in the ease at which Member States can switch to alternative sources of oil supply, we estimated the share of petroleum imports that are transported by sea. Our estimates are based on recent Eurostat data on the volume of liquid bulk goods handled in European ports relative to the total volume of oil imported to each country. This was used as a measure of the flexibility to switch to alternative sources of oil supply.

Figure 3.3 Estimated proportion of petroleum imports that arrive by sea



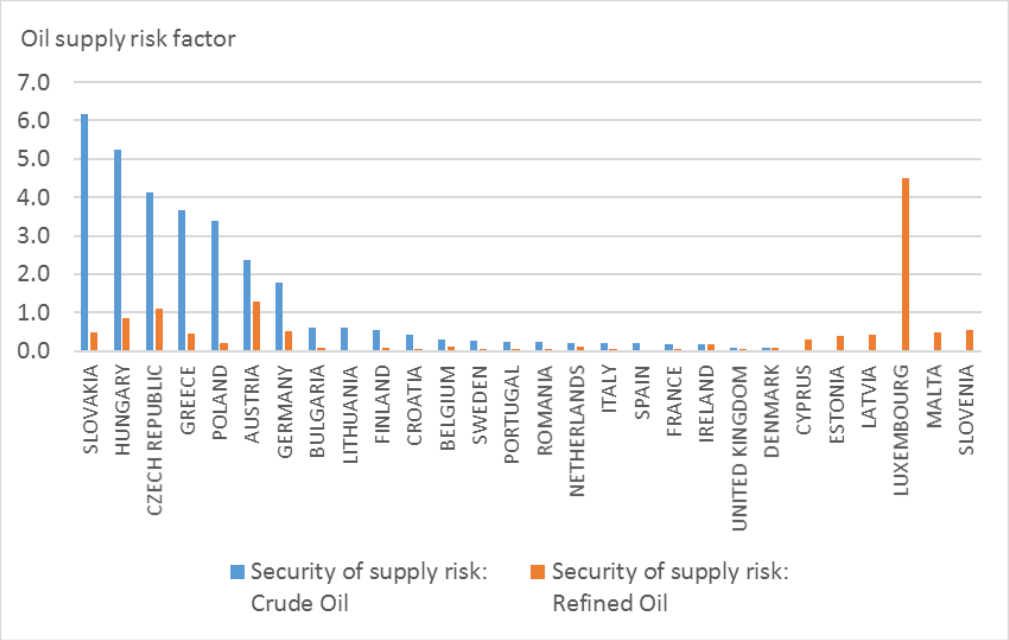
Source: Eurostat, own calculations.

We used this data as a factor in the security of supply risk calculation. For Member States where 100% of crude oil was imported by sea, the geopolitical risk factor was multiplied by 0.1, to reflect reduced risk exposure due to flexibility of supply sources.

Estimated exposure to security of supply risk

Figure 3.4 shows exposure to security of supply risk for Member States, based on the calculation described above and in Annex B. It is immediately evident that oil security of supply risk is highest in Slovakia, Hungary and the Czech Republic. These countries are reliant on Russia for up to 100% of their supply of crude oil and would have limited opportunities to change their source of supply following a supply disruption in Russia or along the Druzhba oil pipeline. By contrast, countries with large sea ports have more flexibility to import oil from different countries in the event of a supply disruption. Domestic crude oil production capacity in the UK and Denmark further reduces the risk to these countries of external geopolitical conflicts causing internal supply disruptions.

Figure 3.4 Security of supply risk in crude oil and refined petroleum supply



Source: Eurostat, own calculations.

Exposure to security of supply risk for refined oil imports was calculated separately. Security of supply risk to refined oil is greatest for the five countries that do not have domestic refining capacity and are entirely reliant on imports for their refined oil supply (namely, Cyprus, Estonia, Latvia, Luxembourg, Malta, Slovenia). Most other EU Member States produce some refined fuel domestically or import refined fuel from a number of different sources, which reduces their exposure to geopolitical risk.

Conclusions

Our estimates of security of supply risk take account of the current composition of oil imports and a measure of the ease of switching to alternative sources (based on the proportion of oil imports that arrive by sea). Our findings show that there are considerable differences among EU Member States, with Eastern European countries most at risk of crude oil supply disruptions.

Assessments of exposure to security of supply risk are increasingly relevant, as recent data published by the U.S. Energy Information Administration (EIA) shows that the global oil supply disruptions have reached a historical peak since the EIA started tracking oil supply disruptions in January 2011. Political disputes and conflict globally, as well as natural factors, including the Fort McMurray fires in Canada, contributed to global oil supply disruptions of over 3.6 million barrels per day (b/d) in May 2016.

Strikes on oil refineries in France in May 2016 following internal labour disputes show how consumers in the EU are vulnerable to the effects of domestic oil supply disruptions, as well as imported supply risk.

The source of oil imports is also important when considering the environmental consequences of fuel use in the EU, as the carbon

intensity of oil can vary considerably between different sources. This issue is discussed further in Section 3.2.

3.2 Environmental and climatic risk from oil imports

According to the Carbon Tracker Initiative[10], for the global climate to remain below 2°C warming, only 20% of the global fossil fuel reserves can be used. Proven oil reserves must therefore remain in the ground and unburned if the Paris agreement is to be met.

Our assessment of the environmental impact of imported oil focuses on risks to global GHG emissions. This risk depends on the types of oil that are extracted, the energy intensity of the extraction process and the incidence of practices such as flaring, which release further GHG emissions into the atmosphere. Whilst it is recognised that there are other environmental risks, such as oil spills, which can have detrimental effects on local eco-systems, these risks are not included in the scope of this analysis.

Lifecycle GHG emissions from petroleum products

The majority of lifecycle GHG emissions from fossil fuels are released at the point of final consumption. In the case of oil used for road transport, 70-80% of well-to-wheel emissions are released into the atmosphere when refined fuels, such as petrol and diesel, are burned in vehicle internal combustion engines. In the EU28, emissions from final oil consumption in the road transport sector alone reached 839 $MtCO_2e$ in 2013.

GHG emissions associated with the oil extraction, transportation and refining process can also be substantial and vary considerably among countries and oil fields. According to the European Commission[11], greenhouse gas emissions associated with crude oil extraction, transportation and refining account for around 18% of lifecycle, well-to-wheel greenhouse gas emissions in the EU. Lifecycle well-to-wheel GHG emissions can be up to 40% higher in cases where carbon-intensive oils, such as shale oil, are used in place of conventional crude oil[12]. The lifecycle GHG emissions from the most carbon-intensive coal-to-liquid fuels are over 80% higher than conventional crude oil.

Carbon intensity of unconventional oils

The extraction of unconventional oils, such as oil shale and tar sands, involve particularly energy intensive processes. In the case of tar sands, the raw form of the oil (bitumen) is heavy and viscous. A large volume of natural gas is therefore required to upgrade this carbon-

[10] Carbon Tracker Initiative (2014), 'Unburnable Carbon – Are the world's financial markets carrying a carbon bubble?'. http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf

[11] European Commission (2009). Consultation paper on the measures necessary for the implementation of article 7a(5). http://ec.europa.eu/environment/air/transport/pdf/art7a.pdf

[12] Moore, I. , Jacobs Consultancy (2011), 'Life Cycle Well to Wheels Assessment of GHG Emissions from North American and Imported Crude Oil'. https://www.ceps.eu/system/files/article/2011/03/Jacobs%20Consultancy%20LCA%20Meeting%20March%2021.pdf; European Commission (2015), 'Fuel Quality Directive' http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L0652&from=EN

intensive feedstock to something that is fluid enough to use. The lifecycle CO_2 intensity of petrol that is produced using bitumen is 107 gCO_2e/MJ and the lifecycle CO_2 intensity of petrol from oil shale is 131 gCO_2e/MJ[13]. This compares to an average lifecycle GHG emissions intensity of petrol from conventional crude of 93 gCO_2e/MJ at the EU level.

Flaring and venting

Other practices such as flaring and venting, a process in which natural gas by-products are burned off when oil is extracted, can also considerably increase the embodied emissions in crude oil.

According to the ICCT (2014)[14], around two-thirds of embodied emissions in primary crude oil are due to flaring and venting. Flaring, venting and fugitive emissions are particularly high in oil fields in Cameroon, Nigeria, the UK and Turkmenistan. As a result, oil from these oil fields is among the most carbon intensive. For example, the carbon intensity of oil from the Tapa oil field in Nigeria is 72.4 gCO_2e/MJ, and 96% of these emissions are from flaring and venting.

Carbon intensity of EU crude oil imports

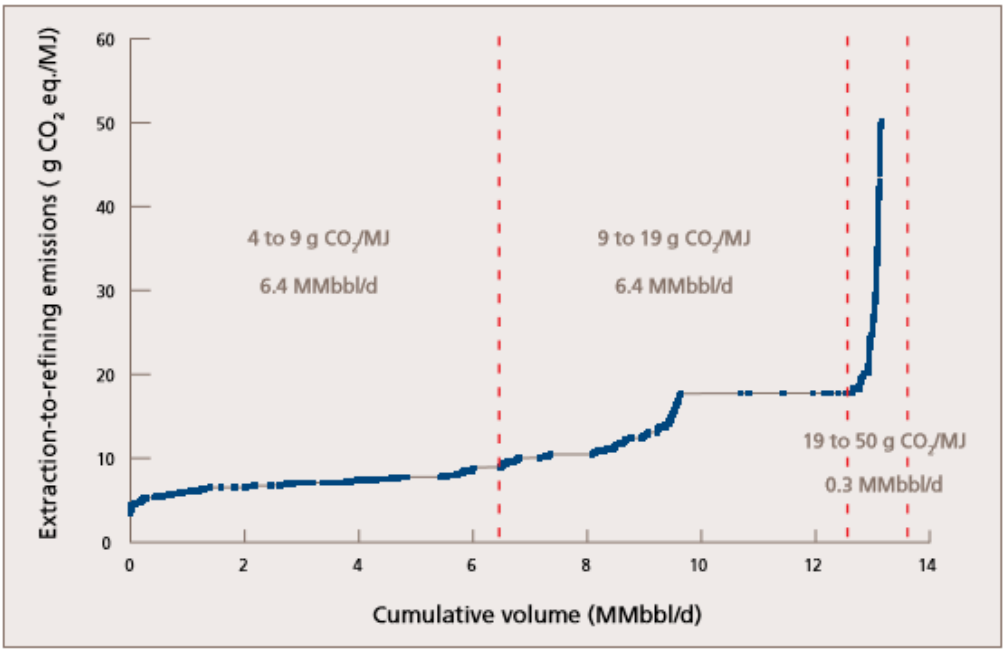
Figure 3.5 below, taken from the 2014 ICCT report, shows that the carbon intensity of crude oil imported to the EU ranges from around 4gCO_2/MJ to 50gCO_2/MJ. Around 49% of crude oil imports are sourced from wells that use little or no flaring, have minimal fugitive emissions and high API gravities[15]. Embodied emissions for this group of oil imports are relatively low at 4-9gCO_2e/MJ. Another 49% is imported from oil fields that do practice flaring, where fugitive emissions are high or where the crude oil has high API gravities, with the CO_2 intensity of extraction for this group ranging from 9-19gCO_2e/MJ. The remaining 2% of oil imports are particularly carbon-intensive, with embodied emissions of up to 50gCO_2/MJ.

[13] European Fuel Quality Directive (2015) http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L0652&from=EN

[14] ICCT (2014) 'Upstream Emissions of Fossil Fuel Feedstocks for Transport Fuels Consume in the European Union'. https://circabc.europa.eu/sd/a/6215286e-eb5f-4870-b92f-26acff386156/ICCT_Upstream-emissions-of-EU-crude_May2014.pdf

[15] American Petroleum Institute (API) gravities are an inverse measure of the density of petroleum liquids relative to water. Fuels with higher API gravities are lighter and have lower densities.

Figure 3.5 The carbon intensity of oil imported to the EU

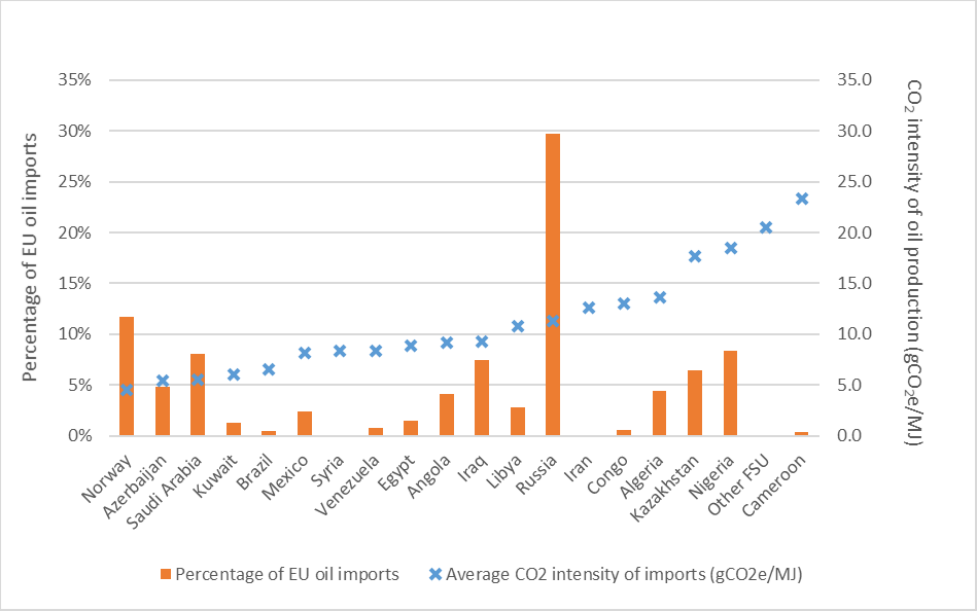


Source: ICCT (2014) 'Upstream Emissions of Fossil Fuel Feedstocks for Transport Fuels Consume in the European Union', 2010 data.

Figure 3.5 below shows the average carbon intensity of primary oil imports from the EU's major oil suppliers. Crude oil imports from Nigeria, Kazakhstan and Algeria are among the dirtiest, with the average carbon intensity of oil imported from these regions between 13 -18 gCO_2e/MJ. This compares to a mean carbon intensity of EU oil imports of 10 gCO_2e/MJ. The carbon intensity of crude oil is particularly high for Nigeria, Kazakhstan and Algeria due to more widespread practice of flaring and venting in oil fields in these countries. Crude oil from Canada, which currently accounts for around 0.5% of EU import supply, is particularly carbon-intensive, as a high share is extracted from oil sands.

In some cases, oil exporting countries are highly exposed to both geopolitical risks and environmental risk. The EU is reliant on Nigeria for 8% of crude oil import supply, yet, according to the World Bank World Governance Index, Nigeria is particularly vulnerable to violence and terrorism risk, which could increase the incidence of oil disruptions. Furthermore, the oil that is imported from Nigeria is particularly carbon intensive, primarily due to the high flaring and venting emissions that are released at the point of extraction. Importing more oil from countries like Nigeria therefore exposes Europe to higher geopolitical risks and higher environmental risks.

Figure 3.6 The carbon intensity of EU oil imports by country



Source: Eurostat Energy Balances (2015); ICCT (2014) 'Upstream Emissions of Fossil Fuel Feedstocks for Transport Fuels Consume in the European Union'
Note(s): CO_2 intensity of oil production is based on average values by region for 2010

Policy context and the Fuel Quality Directive

The 2009 Fuel Quality Directive[16] requires fuel suppliers to reduce the carbon intensity of transport fuel by 6% in 2020 compared with 2010. However, this required reduction is based on a single value for the average EU carbon intensity of each fuel. The Directive does not require differentiation of the carbon intensity of each fuel that is imported (eg based on the source of the imports). As such, the Fuel Quality Directive does not encourage EU Member States to import crude oil from cleaner sources. It only requires that the mix of fuels used is cleaner (based on average carbon intensity values).

A differentiation or a limit on the carbon intensity of primary oils imported into the EU is likely to be a more effective measure to reduce lifecycle GHG emissions of EU oil imports and to therefore reduce the EU's contribution to global environmental and climatic risk.

[16] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L0652&from=EN

4 Oil company revenues and profits

Most crude oil consumed within the EU is imported from abroad. However, it is sometimes argued that the EU still benefits from domestic spending on oil and petroleum products because some of the oil is refined within the EU and revenues could accrue to European companies. Gross Value Added (GVA) in the European petroleum refining sector is around €25bn[17]. The industry supports some employment in the EU, while profits from the companies could benefit European shareholders.

However, it is noted that many companies that export crude oil and refined petroleum to the EU are unlikely to contribute at all to European GVA, as their operations are entirely based outside of the EU. Even of the companies that do operate refineries in the EU, many are not European-registered companies. In many cases, these companies' headquarters are abroad and they operate more refineries, employ more people and contribute more to Gross Value Added (GVA), in non-European countries.[18]

In this chapter, we estimate the share of EU oil expenditure that accrues to companies that are not European-based companies (i.e the headquarters are outside of the EU and Norway) or that have no operations based within the EU.

4.1 Oil imports by company

Crude oil imports by company

We undertook a simple analysis to estimate the proportion of EU spending on crude oil and petroleum imports that accrues to different companies. Many of the world's largest oil companies disclose information about the location of their oil production and refining facilities. We used this data to calculate the share of EU crude oil imports from each oil company.

Our methodology involved three key stages:

1) We collated data on crude oil production from financial statements and balance sheets for large oil companies.
2) We used this data to estimate shares of oil production (and oil exports) by company for each oil exporter.
3) Multiplying the export shares (by company) and the oil import data (by country), we were able to derive an estimate for oil imports by source country and company.

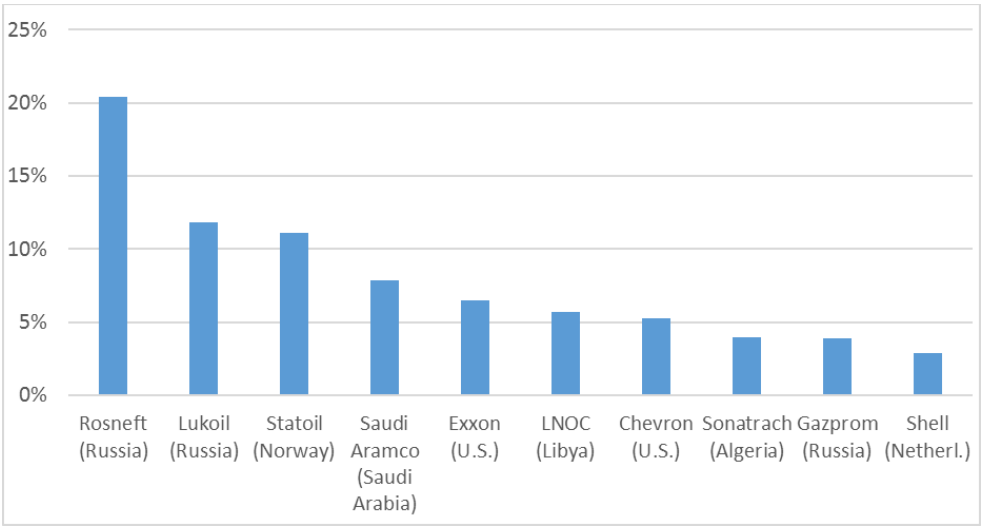
[17] Eurostat, National Accounts aggregates by industry (up to NACE A*64) (nama_10_a64)

[18] For example, Lukoil is a member of FuelsEurope. However, 90% of its oil extraction activities and 68% of its oil refineries are in Russia. Furthermore, over three-quarters of its employees are based in Russia and many of the company's other employees are also based in non-European countries.

Where there are joint ventures or cases where oil fields are owned and operated by different companies, we have split the oil revenues according to shares of production by company.

Results at the aggregate EU level are shown in Figure 4.1.

Figure 4.1 Companies exporting largest volumes of crude oil to the EU in 2014



Note(s): Results do not include intra-EU trade.

We estimate that, in 2014, Rosneft accounted for the highest share of crude oil imports to the EU and most of those imports were sourced from Russia. This was closely followed by Lukoil (another Russian company) and then by Statoil. In aggregate, we estimated that non-European companies accounted for over 80% of EU spending on crude oil imports.

Around half of EU oil imports are from fully or partially state-owned oil companies. Oil imports from fully state-owned enterprises include an estimated 8% share from Saudi Aramco (Saudi Arabia), a 6% share from LNOC (Libya), a 4% share from Sonatrach (Algeria) and a 4% share from Gazprom (Russia).

Refined petroleum imports by company

To estimate the share of refined petroleum exports revenues that accrue to different companies, we undertook a similar calculation. In this case, oil refining capacity was used to estimate refined oil production shares and export shares by company.

Import sources for refined petroleum are more diverse than for crude oil. While crude oil import revenues are concentrated among a few firms, refined petroleum revenues are shared among a much larger group of companies. For example, the top ten companies exporting refined petroleum products to the EU account for around 50% of total exports to the EU. By comparison, the top ten companies exporting crude oil to the EU account for 80% of the total import supply.

Rosneft, Gazprom and Lukoil are the three companies that account for the largest share of EU spending on imports of refined fuels. They are

Russian-based companies and together they account for around 30% of the EU's refined fuel imports.

At the EU level, we estimate that 95% of refined fuel imports are from non-European companies. However, inter-EU trade in refined in oil products is relatively high and, as a result, at the Member State level, the share of refined products from companies operating refineries in Europe is higher, as shown in Figure 4.3.

Figure 4.2 Top ten companies supplying imported refined petroleum to the EU in 2014

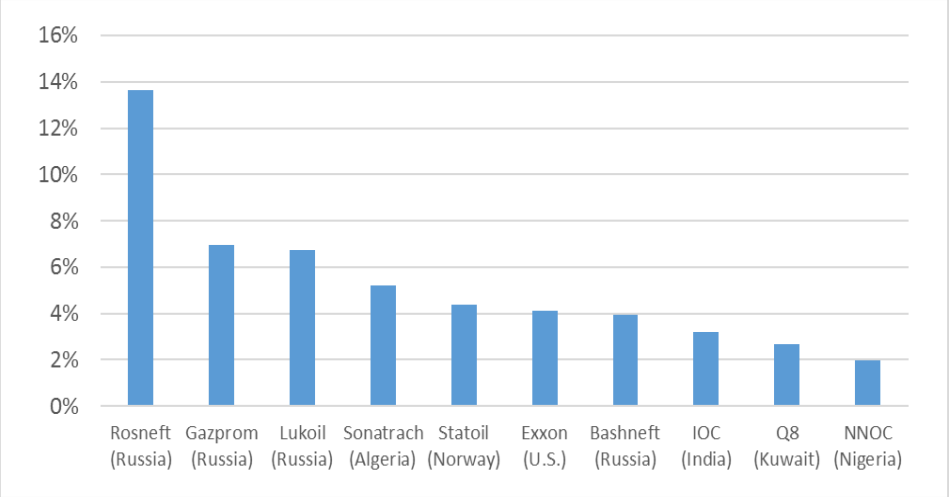
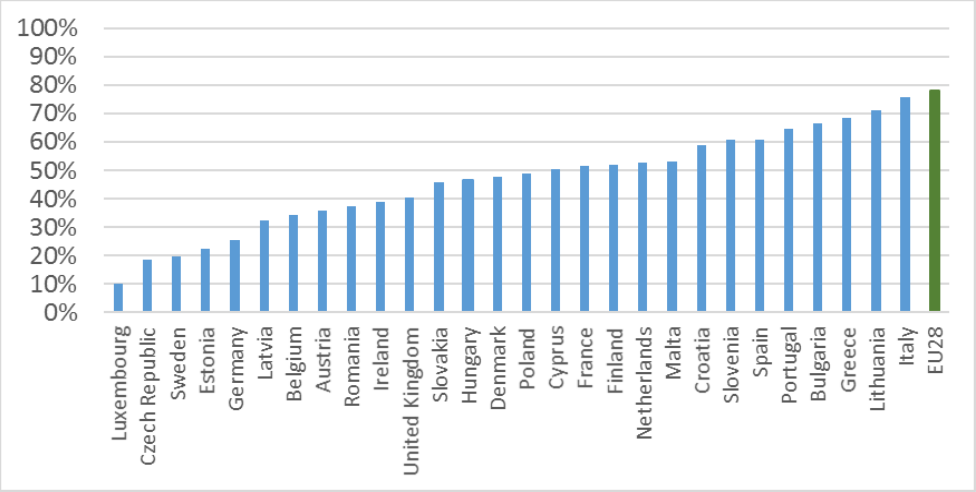


Figure 4.3 Proportion of refined petroleum imports sourced from companies that do not operate refineries in Europe



Note(s): Member State results include intra-EU imports; EU28 results do not include intra-EU imports.

4.2 Conclusion

The economic benefits of EU spending on oil will mostly accrue to the countries where oil extraction and refining facilities are located. That is where investment supply chains are most likely to be located and where

the most jobs will be created. This poses risks to the EU, particularly as a high share of oil imports are from geopolitically unstable countries. In some instances, oil revenues from state-owned companies could be used to prolong wars. In the cases of Syria and Iraq, where many oil fields are controlled by terrorist groups, oil revenues could also be used to fund terrorist activities.

Companies that do not have any operations in Europe account for the majority of EU crude oil and refined fuel imports. We estimate that, at an aggregate level, around 80% of crude oil imports and 95% of refined petroleum imports to the EU accrue to non-European companies[19]. With production and operations of these companies based abroad, the EU is likely to see little to no benefit from this expenditure. Furthermore, many of the companies that account for large shares of EU spending on oil (such as SaudiAramco and Gazprom) are state-owned companies that do not have any EU-based shareholders that could benefit directly.

Although domestic production of refined fuel contributes to EU Gross Value Added (GVA), it is noted that, for this sector in particular, value chains are small and labour-intensity is low. This means that an increase in domestic production of refined fuel is likely to have limited economic benefits, leading to only small increases in employment and intermediate demand in the EU.

[19] For the purposes of this analysis, we refer to 'non-European companies' as companies with head offices based outside of the EU or Norway.

5 Key messages and conclusions

Our research into the EU's dependency on imported crude oil has identified the following key points:

1. The EU's dependency on crude oil imports is high and rising as domestic oil supplies have declined at a faster rate than demand. Imports now account for 88% of the EU's oil supply.
2. In 2015, a year of low oil prices, total spending on crude oil imports in the EU was €187 bn (equivalent to 1.3% of EU GDP, or €368 per capita). An additional €62bn was spent on refined fuel imports in 2015. This compares to total EU expenditure on natural gas imports of €40bn in the same year.
3. The EU's transport sector accounts for around two-thirds of final demand for petroleum products. Road transport alone accounts for 54% of final demand for petroleum.
4. Much of the EU's imported oil comes from geopolitically unstable regions[20]. This makes the EU's economy, particularly its transport sector, vulnerable to security of supply risks.
5. The EU's exposure to security of supply risks has increased in recent years. This is partly because the source of supply has shifted towards more geopolitically unstable regions. Notably, the share of oil from Russia increased from 22% in 2001 to 30% in 2015. While the share of oil from Norway, which is more geopolitically stable, fell by 45% over the same period.
6. Around 40% of the EU's oil imports are from the Middle East and North Africa. This region has a heightened risk of oil supply shortages due to the recent spread of war and terrorism.
7. EU Member States most exposed to security of supply risks include the Czech Republic, Poland, Slovakia and Hungary, most of which are heavily reliant on pipelines from a single country, Russia, for their supply of crude oil.
8. Environmental impacts associated with importing oil vary considerably depending on the source of supply, with the carbon intensity of EU crude oil imports ranging from 4gCO_2/MJ to 50gCO_2/MJ. EU oil imports from Nigeria, Kazakhstan, Algeria and Canada are among the most carbon intensive.
9. The majority of the EU's spending on oil benefits foreign producers. We estimate that, at the EU level, over 80% of companies benefiting from spending on crude oil imports and 95% of companies benefitting from spending on refined oil imports are based outside of the EU and Norway. Four of the five companies exporting the

[20] In 2014, around 30% of EU crude oil imports came from Russia, a further 16% came from Nigeria and sub-Saharan Africa, 16% came from the Middle East and 8% from North Africa.

largest shares of crude oil to Europe (Rosneft, Lukoil, Saudi Aramco and Exxon) are non-European companies.

10. The EU has put some measures in place to reduce oil supply risks. The Oil Stocks Directive, for example, requires EU Member States to hold stocks of oil to reduce the effects of supply shortages.

11. However, the EU does not have proven reserves to increase domestic production. The EU will therefore need to reduce use of oil and petroleum products to further reduce exposure to oil supply risks and price shocks. Reducing demand has the added benefit of contributing towards meeting the EU's climate targets.

12. Efficiency improvements in the transport sector, including a shift to ultra-low-carbon electric vehicles and surface transport, could significantly reduce overall oil demand, so making the EU economy more resilient and energy secure. Recent analysis also shows that more fuel-efficient transport would deliver substantial economic and environmental benefits.[21]

[21] Cambridge Econometrics and Ricardo AEA (2012), 'Fuelling Europe's Future'. Available online at: http://www.camecon.com/Libraries/Downloadable_Files/Fuelling_Europe_s_Future-_How_auto_innovation_leads_to_EU_jobs.sflb.ashx
The Cambridge Econometrics and Ricardo AEA study estimated that ambitious take-up of electric vehicles over the period to 2050 could lead to a 1% increase in EU GDP, up to 2 million additional jobs and an 93% reduction in GHG emissions from cars and vans, by 2050.

Appendices

Appendix A Derivation of geopolitical risk indicator

The EU economy's exposure to oil supply shocks and oil price fluctuations caused by geopolitical instability is dependent on a number of factors, including:

1) The role of oil in the economy i.e. spending on oil as a proportion of GDP
2) Exposure to exchange rate fluctuations through oil imports
3) The risk of oil supply disruptions in countries from which oil is imported
4) The diversity of sources of oil supply
5) Oil infrastructure and the degree of flexibility to switch to alternative sources if one source of supply is cut off

Our analysis of exposure to geopolitical risk took account of the third, fourth and fifth of points above, specifically focusing on imported geopolitical risks, the diversity of sources of supply and the ease at which different countries are able to switch to alternative sources of fuel if one source becomes unavailable.

Methodology for calculating exposure to security of supply risk

Our methodology for calculating exposure to security of supply risk involves use of a simplified Modern Portfolio Theory (MPT) calculation, which takes account of geopolitical risk in each oil exporting partner country, as well as the diversification of oil supply and the extent to which alternative supply options are available.

Our method involved three key stages:

1) We collated geopolitical risk indicators for all oil exporting countries using the World Bank Worldwide Governance Indicators for 'Political Stability and Absence of Violence'. These indicators have been derived based on the response to a series of surveys of households and firms, commercial businesses, information providers, non-governmental organizations and public sector organizations.
2) We transformed and re-scaled the geopolitical risk indicator to create an indicator bounded between 1-10 (with 10 indicating the highest risk, and 1, the lowest risk).
3) For each EU Member State, the geopolitical risk indicator for each oil exporting partner country is weighted by (i) the share of oil supply it accounts for and (ii) a measure of the ease at which these oil imports could be replaced by oil from an alternative source. The result is then squared and summed across oil export partner countries, to take account of the fact that a greater

number of more diversified sources of supply will reduce exposure to risk.[22] We implicitly assume that domestically produced sources of crude oil and refined petroleum have zero geopolitical risk. When weighted by the volume of supply, this reduces risk exposure for a number of large crude oil and refined petroleum producers.

For simplicity, we assume that the covariance of risk between oil exporting countries is 0: we assume that the geopolitical risk in one oil exporting country is completely independent from risk in another country. This is unlikely to be the case for some pairs of countries– the politics of the conflicts in Syria and Iraq, for example, are clearly linked. However, for most pairs of oil exporting countries we would expect low or no covariance.

For the geopolitical risk in refined fuel imports, in cases where refined fuel was imported from other EU Member States, the crude oil supply risk in the Member State that refines and exports the fuel was used as its geopolitical risk indicator.

Security of supply risk in EU Member States

Under the assumption of zero geopolitical risk covariance between oil exporting regions, the formal derivation of the geopolitical risk indicator for each EU Member State is as follows:

$$\sigma_{MS}^2 = \sum_{i=1}^{N} w_i^2 \sigma_i^2 s_i^2 + \sum_{i=1}^{N} \sum_{j \neq i}^{N} w_i w_j \sigma_i \sigma_j \rho_{ij}$$

$i,j = 1,\ldots N$, *oil import partner countries;*
$w_i = share\ of\ oil\ supply;$
$\sigma_i = geopolitical\ risk\ associated\ with\ import\ source;$
$s_i = index\ of\ supply\ source\ flexibility;$
$\rho_{ij} = correlation\ coefficient\ between\ oil\ exporting\ countries\ i\ and\ j$

For simplicity, assume zero covariance between oil exporting regions:

$$\sum_{i=1}^{N} \sum_{j \neq i}^{N} w_i w_j \sigma_i \sigma_j \rho_{ij} = 0$$

$$\sigma_{MS} = \sqrt{\sigma_{MS}^2}$$

[22] If 100% of oil supply was imported from Syria, geopolitical risk would be highest: $1^2 \times 1^2 \times 1^2 = 1$. If oil was imported from two countries, each accounting for a 50% share of imports, and both equally as risky as Syria, then geopolitical risk would be halved $(1^2 * 0.5^2) + (1^2 * 0.5^2) = 0.5$.

Appendix B Oil imports by company and country

Table B.1 Share of EU crude oil imports, by company (based on 2014 data)

Oil company headquarters	Oil company	Other information	Estimated share of EU oil imports
Russia	Rosneft	Not member of FuelsEurope; partially state-owned oil company	20%
	Lukoil		12%
	Gazprom	Not member of FuelsEurope; state-owned oil company	4%
USA	Exxon		6%
	Chevron	Not member of FuelsEurope	5%
Norway	Statoil		11%
Saudi Arabia	Saudi Aramco	Not member of FuelsEurope; state-owned oil company	8%
Libya	LNOC	Not member of FuelsEurope; state-owned oil company	6%
Algeria	Sonatrach	Not member of FuelsEurope; state-owned oil company	4%
Netherlands	Shell		3%
Mexico	Pemex	Not member of FuelsEurope; state-owned oil company	2%
Nigeria	NNOC	Not member of FuelsEurope; state-owned oil company	2%
Brazil	Petrobras	Not member of FuelsEurope; part state-owned oil company	2%
Khazahkstan	KazMunayGas	State-owned oil company	1%
France	Total		1%
Colombia	Ecopetrol	Not member of FuelsEurope;	1%

		part state-owned oil company	
Italy	ENI	part state-owned oil company	1%
Kuwait	Q8		1%
UK	BP		1%
Malaysia	Petronas	Not member of FuelsEurope; state-owned oil company	0%
Tunisia	Agip Tunisia	Not member of FuelsEurope	0%
N/A	Others		7%

Table B.2 Share of EU refined petroleum imports, by company (based on 2014 data)

Oil company headquarters	Oil company	Other information	Estimated share of EU oil imports
Russia	Rosneft	Not member of FuelsEurope; partially state-owned oil company	14%
	Gazprom	Not member of FuelsEurope; state-owned oil company	7%
	Lukoil		7%
	Bashneft	Not member of FuelsEurope	4%
	Russneft	Not member of FuelsEurope	2%
USA	Exxon		4%
	Valero	Not member of FuelsEurope	2%
	Marathon	Not member of FuelsEurope	1%
	Phillips		1%
	Motiva	Not member of FuelsEurope	1%
	Chevron	Not member of FuelsEurope	1%
	Tesoro	Not member of FuelsEurope	1%
Algeria	Sonatrach	Not member of FuelsEurope; state-owned oil company	5%
Norway	Statoil		4%
India	IOC	Not member of FuelsEurope; state-owned oil company	3%
Kuwait	Q8		3%

Nigeria	NNOC	Not member of FuelsEurope; state-owned oil company	2%
UAE	Vitol	Not member of FuelsEurope	4%
Saudi Arabia	Saudi Aramco	Not member of FuelsEurope; state-owned oil company	1%
Brazil	Petrobras	Not member of FuelsEurope; partially state-owned oil company	1%
Kazakhstan	KazMunayGas	Not member of FuelsEurope; state-owned oil company	1%
Ukraine	Ukrtatnafta	Not member of FuelsEurope	1%
Qatar	Qatar Petroleum	Not member of FuelsEurope; state-owned oil company	1%
UK	BP		1%
Israel	Bazan	Not member of FuelsEurope	1%
Netherlands	Shell		1%
Egypt	EGPC	Not member of FuelsEurope; state-owned oil company	1%
Turkey	Tüpraş	Not member of FuelsEurope	1%
Venezuela	PDVSA	Not member of FuelsEurope; state-owned oil company	1%
France	Total		0%
N/A	Others		26%

Appendix C Regional classification

Region	Country
Central Asia	Kazakhstan
	Kyrgyzstan
	Tajikistan
	Turkmenistan
	Uzbekistan
European Union	Cyprus
	Bulgaria
	Czech Republic
	Hungary
	Poland
	Romania
	Slovakia
	Denmark
	Estonia
	Finland
	Ireland
	Latvia
	Lithuania
	Sweden
	United Kingdom
	Croatia
	Greece
	Italy
	Malta
	Portugal
	Slovenia
	Spain
	Austria
	Belgium
	France
	Germany
	Luxembourg
	Netherlands
Middle East	Iran
	Bahrain
	Iraq
	Israel
	Jordan
	Kuwait
	Lebanon
	Oman
	Qatar
	Saudi Arabia
	State of Palestine
	Syria
	United Arab Emirates
	Yemen

Region	Country
Other Europe	Armenia
	Azerbaijan
	Georgia
	Turkey
	Belarus
	Moldova
	Ukraine
	Iceland
	Albania
	Switzerland
	Montenegro
	Serbia
	Macedonia
	Liechtenstein
	Bosnia and Herzegovina
Russia	Russia
Northern Africa	Algeria
	Egypt
	Libya
	Morocco
	Sudan
	Tunisia
	Western Sahara
Norway	Norway

Region	Country
South America and Caribbean	Antigua and Barbuda
	Bahamas
	Barbados
	Cuba
	Curacao
	Dominica
	Dominican Republic
	Grenada
	Haiti
	Jamaica
	Puerto Rico
	St Kitts and Nevis
	St Lucia
	Saint Martin
	St Vincent and the Grenadines
	Trinidad and Tobago
	Turks and Caicos Islands
	Argentina
	Bolivia
	Brazil
	Chile
	Colombia
	Ecuador
	French Guiana
	Guyana
	Paraguay
	Peru
	Suriname
	Uruguay
	Venezuela

Region	Country
Sub-Saharan Africa	Burundi
	Comoros
	Djibouti
	Eritrea
	Ethiopia
	Kenya
	Madagascar
	Malawi
	Mauritius
	Mozambique
	Réunion
	Rwanda
	Seychelles
	Somalia
	South Sudan
	Uganda
	Tanzania
	Zambia
	Zimbabwe
	Angola
	Cameroon
	Central African Republic
	Chad
	Republic of the Congo
	D. R. Congo
	Equatorial Guinea
	Gabon
	Sao Tome and Principe
	Botswana
	Lesotho
	Namibia
	South Africa
	Swaziland
	Benin
	Burkina Faso
	Cape Verde
	Cote d'Ivoire
	Gambia
	Ghana
	Guinea
	Guinea-Bissau
	Liberia
	Mali
	Mauritania
	Niger
	Nigeria
	Senegal
	Sierra Leone
	Togo

Region	Country
North and Central America	Belize
	Costa Rica
	El Salvador
	Guatemala
	Honduras
	Mexico
	Nicaragua
	Panama
	Bermuda
	Canada
	Greenland
	Saint Pierre and Miquelon
	United States
Oceania	Australia
	New Zealand
	Norfolk Island
	Fiji
	New Caledonia
	Papua New Guinea
	Solomon Islands
	Vanuatu
	Guam
	Kiribati
	Marshall Islands
	Micronesia, Federated States of
	Nauru
	Northern Mariana Islands
	Palau
	American Samoa
	Cook Islands
	French Polynesia
	Niue
	Pitcairn
	Samoa
	Tokelau
	Tonga
	Tuvalu
	Wallis and Futuna

Region	Country
Other Asia	China
	Hong Kong
	Macao
	North Korea
	Japan
	Mongolia
	South Korea
	Taiwan
	Afghanistan
	Bangladesh
	Bhutan
	India
	Maldives
	Nepal
	Pakistan
	Sri Lanka
	Brunei Darussalam
	Cambodia
	Indonesia
	Lao People's Democratic Republic
	Malaysia
	Myanmar (Burma)
	Philippines
	Singapore
	Thailand
	Timor-Leste
	Vietnam

Region	Country
North and Central America	Belize
	Costa Rica
	El Salvador
	Guatemala
	Honduras
	Mexico
	Nicaragua
	Panama
	Bermuda
	Canada
	Greenland
	Saint Pierre and Miquelon
	United States
Oceania	Australia
	New Zealand
	Fiji
	Papua New Guinea
	Solomon Islands
	Vanuatu
	Kiribati
	Marshall Islands
	Micronesia, Federated States of
	Northern Mariana Islands
	Cook Islands
	Samoa
	Tonga

Region	Country
Other Asia	China
	Hong Kong
	Macao
	North Korea
	Japan
	Mongolia
	South Korea
	Taiwan
	Afghanistan
	Bangladesh
	Bhutan
	India
	Maldives
	Nepal
	Pakistan
	Sri Lanka
	Brunei
	Cambodia
	Indonesia
	Laos
	Malaysia
	Myanmar (Burma)
	Philippines
	Singapore
	Thailand
	Timor-Leste
	Vietnam