**The Reasons and the Impacts of Crude Oil Prices on World Economy**

**Abstract**

This document discusses the effect of crude oil prices to the world’s Economy. It pays focus on everyday’s crude oil usage and its necessity the modern society. The paper also deals with historical background concerning demand and supply of oil. The most interesting part of all is when the paper gives more information that contains explanation of the crude oil prices’ history, parameters that influence oil prices and also highlights the impacts of change in prices of crude oil to the world’s economy. The article analyses the main factors which influence the impacts of crude oil price changes to the economy of a country especially Organization for Economic Co-operation and Development nations. The paper contains information about each nation of Organization for Economic Co-operation and Development (OECD) and calculates the results of major microeconomic figures and their corresponding factors. It is evident that crude oil prices are influencing people’s day to day life and understands the problems that can improve awareness of energy sources and possibly that can prevent other oil crisis.

Key words: Oil market market, oil crisis, crude oil, OECD, OPEC

**Introduction**

Crude oil and products from oil surround us every single day– the plastic in your toothbrush, your transportation to work or school via vehicles powered by gas, your food grown with the support of petroleum based fertilizers, pesticides, fuel, or even the frozen packaging with petroleum derivate wax. For all of these and much more, we are dependent on oil – a non-renewable source of energy, whose reserves are slowly but surely declining. The limited sources of oil are unevenly distributed around the world and give a stronger position to countries with oil reserves, than those dependent on imported oil. This inequality brings an ability to dictate supply on one side and on the other side economic fragility and vulnerability, because crude oil prices are important to the health of the economy. Higher oil prices can contribute to an economic downturn, while lower prices can speed up an economy and bring real expansion. Crude oil price is not just simply influenced by supply and demand; it is a complex figure with factors like level of petroleum inventories and investments into new refineries, weather problems (such as hurricane) and political tensions (such as strikes in Venezuela).

**Objectives of Theses and Methodology**

One of the objectives of this paper is to clarify the complexities of the crude oil market, draw attention to decreasing oil reserves and point out tightness of oil supply and demand. Second objective is to analyze the history of crude oil prices and the potential impacts on the world economy. The last objective is to determine which countries would be most and least affected by changes in oil prices or availability of oil. To fulfill this commitment we have used four country specific metrics of: 1) Percent oil energy; 2) Percent imported oil, 3) energy usage/capita and 4) GDP/capita. The methodology is gathering data from International Energy Agency (IEA), World Bank and United Nations, calculation of measures recommended by IEA‘s *Analysis of the impact of High Oil Prices on Global Economy* and their comparison and analysis.

**World Proven Reserves of Oil**

Oil reserve is the fraction of oil underground, which can be brought to the surface under reservoir characteristics and limitations of petroleum extraction technologies. The percentage of oil reserve can change in each field over time in response to changes in technology, economics and investment. Oil reserves must satisfy following four criteria: they must be discovered through one or more exploratory wells, recoverable using existing technology, commercially viable and remaining in the ground. Estimates are done on the basis of indirect geology techniques– 2D and 3D reflection seismic surveys are most widely used geophysical techniques in oil exploration. Indirect measurements are only extrapolating an answer based on a collection of related but indirect data and therefore there is always some degree of uncertainty.[[1]](#footnote-2) [[2]](#footnote-3)

Generally speaking, oil producers should revise their reserves estimates in only two situations: when discoveries are made or when some new assessment methodology reveals that they have more oil in existing reserves than previously stated. New technologies usually increase the estimated size of field and therefore oil fields tend to grow with time. Many oil producing nations do not reveal their reservoir engineering field data and instead provide unaudited claims for their reserves– for example during the 1980s or 1990s none of the 6 main OPEC producers had announced any significant new discoveries, nor had assessment technologies suddenly improved, but claimed to be correcting for past mistakes.

Following data shows world proven reserves of oil, counted by BP p.l.c. (Statistical Review of World Energy, June 2008) and by Penn Well Corporation (Oil & Gas Journal, Vol. 105.48). Even though there are significant differences in partial sums and both approaches comprise of different –forms of oil the world totals are in range from 1 237 to 1 331 billion barrels.[[3]](#footnote-4) BP’s approach includes crude oil, gas condensate and natural gas liquids, but does not count with 152.2 billion barrels of Canadian oil sands defined as ‘remaining established reserves‘. PennWell Corporation includes crude oil and also all oil condensates. Both BP and PennWell took United States data from Energy Information Administration’s 2006 annual report (DOE/EIA-0216, 2007).

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| --- | --- | --- |
| **Region** | **BP Statistical Review** | **Oil and Gas Journal** |
| **(Year-End 2007)**  **In billion barrels** | **(Jan 1, 2008)**  **In billion barrels** |
| **North America** | 69.3 | 211.2 |
| **Central and South America** | 111.2 | 109.9 |
| **Europe** | 15.6 | 14.3 |
| **Euroasia** | 128.1 | 98.9 |
| **Middle East** | 755.3 | 748.3 |
| **Africa** | 117.5 | 114.8 |
| **Asia and Oceania** | 40.8 | 34.4 |
| **World Total** | **1237.8** | **1331.8** |

Source: <http://www.eia.doe.gov/emeu/international/reserves.html>, table: own work\*

Problem is that these numbers are questionable. Estimates of proven reserves are routinely exaggerated for economic and political gain. Saudi Arabia alone, owner of the largest oil reserves in the world, raised its estimates overnight from 167 billion barrels to 257 billion barrels.[[4]](#footnote-5)

There are more than 40 000 oil and gas fields of all sizes in the world. However, 94% of known oil is concentrated in fewer than 1500 giant and major fields. The largest conventional oil field is Ghawar Field in Saudi Arabia, owned and operated by Saudi Aramaco. It was discovered in 1948 and production started in 1951. Saudi Armaco and Saudi government closely guard field performance information, therefore little is known about Ghawar, but it is a fact that after more than 50 years of oil production, more water is pumped into the field than oil is extracted, and it seems quite possible that the production rate will decline in the near future. Orinoco Oil Sands in Venezuela and Athabasca Tar Sands in Canada are the largest non-conventional oil sand deposits in the world. Orinoco’s producible reserves are estimated to 236 billion barrels. The Athabasca contain an estimated 175 to 200 billion barrels based on using existing technologies, with the newer one, as much as 2.5 trillion barrels of oil might be recovered, but at very high cost.[[5]](#footnote-6)[[6]](#footnote-7)

The table below together with the graph and map shows that the biggest reserves are in the Middle East, supply of Europe and Euroasia on the second place is mainly met by Russian reserves and African biggest suppliers are Libya and Nigeria.

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| **Greatest Oil Reserves by Country, 2006** | | |
| **Rank** | **Country** | **Proved reserves** |
| **(billion barrels)** |
| 1 | Saudi Arabia | 264.3 |
| 2 | Canada | 178.8 |
| 3 | Iran | 132.5 |
| 4 | Iraq | 115.0 |
| 5 | Kuwait | 101.5 |
| 6 | United Arab Emirates | 97.8 |
| 7 | Venezuela | 79.7 |
| 8 | Russia | 60.0 |
| 9 | Libya | 39.1 |
| 10 | Nigeria | 35.9 |

Source: <http://www.infoplease.com/ipa/A0872964.html>

**Oil Supply**

Year by year, the volume of newly discovered oil is getting lower. Larger fields are easier to find than smaller ones and are therefore discovered first. They are also preferred by oil companies that can more easily make profit from huge yield fields than from small, hardly accessible field. As the time goes by and exploration progresses, the average size of the fields discovered decreases, as well as the amount of oil found per exploratory drilling. Even though vast quantities of oil still remain in the ground, it is in the highly uncertain or even problematic environments: deep below the Arctic ice, in small African regimens wracked by civil war or inside the fortress OPEC, whose political machinations may affect long term supply more powerfully than any geology. The ability to get and use this oil depends on many variables- technological, economical, financial and political– these are hard to predict and even harder to control.

Since 1995, the world has used 24 billion barrels of oil a year, but has found, on average just 9.6 million barrels of new oil annually[[7]](#footnote-8), this would mean that every year the amount of reserves found is less than the demand and demand continuing to climb each year is not a good situation.

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| --- | --- | --- | --- | --- | --- | --- |
| **Global Balance Summary** (million barrels per day) | | | | | | |
|  | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
| **Global demand** | 86.13 | 88.27 | 90.02 | 91.91 | 93.84 | 95.82 |
| **Global supply** | 84.47 | 86.45 | 87.75 | 89.05 | 90.12 | 90.92 |
| **Non-OPEC supply** | 49.98 | 50.99 | 51.65 | 51.94 | 52.2 | 52.56 |
| **Global Crude Capacity** | 34.49 | 35.46 | 36.1 | 37.11 | 37.92 | 38.36 |

Source: International Energy Agency, Oil Market Report, November 2008, 19.12.2008

About 40% of the World oil supply is provided by OPEC countries, where the biggest producer is Saudi Arabia with the world’s largest oil field– Ghawar. Main non-OPEC producers are North America (14.06 million barrels per day), former USSR (12.81 million barrels per day), Europe (4.70 million barrels per day), Latin America (4.02 mb/d) and China (3,83mb/d). US main oil fields are in Alaska (Prudhoe Bay) with production of 7.5 mb/d, 5mb/d comprise of crude oil and rest is covered by natural gas supply. Canada’s Alberta with oil production 3.27mb/d covered by synthetic crude oil, bitumen and natural gas. Russian production is at 10.0mb/d, where short-time decreases in Lukoil, Gazpromneft and Sakhalin 2 are compensated by increases in Rosneft and Gazprom. Discoveries in Azerbaijan and Kazakhstan led to the expectation that the development of large fields (Tnegiz, Kashagan, Azeri, Chirag, Guneshli) can maintain the present production. Norwegian oil production averages 2.4mb/d. Even though historically, mature fields suffer due to mechanical outages and equipment failures, these are compensated thanks to development of non-conventional sources and new areas (including tar sands, shale oil and deepwater fields). United Kingdom production around 1,5mb/d is an average between decline in mature fields and start-up of new fields (Ettrick, Jura, Tweedsmuir, Saxon). Latin American production is supported by stronger performance of Argentina, Columbia and Peru. China’s largest oil field– Daqing is already in decline, but there are efforts to develop offshore oil production.[[8]](#footnote-9) [[9]](#footnote-10)

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| **Non-OPEC Oil Supply** (million barrels per day) | | |
|  | **2008** | **2009** |
| North America | 14.06 | 14.28 |
| Europe | 4.7 | 4.27 |
| Pacific | 0.7 | 0.81 |
| **Total OECD** | **19.46** | **19.36** |
| Former USSR | 12.81 | 13.04 |
| Europe | 0.12 | 0.11 |
| China | 3.83 | 3.91 |
| Other Asia | 2.66 | 2.74 |
| Latin America | 4.02 | 4.28 |
| Middle East | 1.61 | 1.55 |
| Africa | 2.56 | 2.56 |
| **Total Non-OECD** | **27.6** | **28.2** |
| Processing Gains | 2.24 | 2.29 |
| Other Biofuels | 0.46 | 0.58 |
| **Total Non-OPEC** | **49.76** | **50.42** |

Source: International Energy Agency, Oil Market Report, November 2008

**Oil Demand**

The increase in economic activity pushes up the demand for oil. The International Energy Agency (IEA) set average consumption of oil in 2008 to 88.3 mb/d in comparison with the year 2002 when the consumption was 78.3 mb/d. Demand growth is highest in the developing world, particularly in China and India and to a lesser extent in Africa and South America, where demand grows more than three times faster than that of OECD countries. High demand growth exists primarily due to rapidly rising consumer demand for transportation via cars and trucks, rapid urbanization, higher living standards and less efficiently used energy (in average, they use twice as much oil to produce a unit of economic output). They also tend to be large players in the energy intensive processing of primary commodities and heavy industry.

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| --- | --- | --- | --- |
| **Global Oil Demand** (million barrels per day) | | | |
|  | 2007 | 2008 | 2009 |
| Africa | 3.1 | 3.1 | 3.1 |
| America | 31.1 | 30.3 | 30 |
| Asia/Pacific | 25.1 | 25.7 | 26 |
| Europe | 16.1 | 16 | 15.8 |
| Former Soviet Union | 4.1 | 4.2 | 4.3 |
| Middle East | 6.5 | 6.9 | 7.2 |
| **World** | **86.1** | **86.2** | **86.5** |

Source: Energy International Agency, Oil Market Report, July 2007

Although demand growth is highest in the developing world, the United States is the world’s largest consumer of petroleum. Between 1995 and 2005, US consumption grew from 17.7 million barrels a day to 20.7 million barrels a day. China, by comparison increased consumption from 3.4 million barrels a day to 7 million barrels a days, in the same time frame. China has declared a goal to generate approximately 10% of its requirements through renewable sources of energy by the year 2010. [[10]](#footnote-11) Majority of American consumption comes from personal automobile use (American drivers consume 45% of total world consumption of gasoline), which is necessary for American way of life in suburban low–density settlements. There is a recent shift from gas driven SUVs to more fuel efficient vehicles and hybrid versions. Fuel consumption demand growth in North America grows twice as fast as in Europe or Pacific. In recent years, production of biofuel increased. Some commodities like maize, sugar cane or vegetable oil can be used as food, feed or to make biofuels. In 2007, 25% of maize grown in the United States was used for biofuels or ethanol production. There is a risk connected with diverting farmlands or crops for biofuels production in detriment of the food supply on a global scale. A World Bank policy research working paper released in July 2008 concluded that ‘large increases in biofuels production in the United States and Europe are the main reason behind the steep rise in global food prices‘.[[11]](#footnote-12)

Supplies of oil and gas are essential to modern agriculture techniques. Oil prices can increase the cost of fertilizers, food transport and industrial agriculture, while a fall in global oil supplies could cause spiking food prices and unprecedented famine in coming decades.[[12]](#footnote-13)

**Pre Embargo Period, 1848-1973**

World War II was devastating to Europe. Coal mines that were under control of Nazi Germany were damaged and mines in Britain were not able to supply the necessary resources to make up for shortages. In 1947 United States produced the Marshall Plan which provided economic and energy aid to Western Europe by supplying equipment for mine recovery and emphasized a transition to petroleum-based economy using imports from the Middle East.[[13]](#footnote-14) In 1948 crude oil prices ranged between $2.50 and $3.00 ($17 and $18 when viewed in 2006 dollars). By 1956, oil accounted for approximately 22 percent of total European energy consumption with 90 percent of this oil being supplied by the Middle East and 70 percent shipped through Suez Canal. What became known as Suez Crisis started when Gamal Abdel Nassar (Egyptian president) nationalized the Suez Canal in 1956, the fear from disrupted oil supply induced Great Britain, France and Israel to merge and organized coordinated attack against Egypt. Although the fighting ceased in December 1956, the canal remained closed to oil shipments until May 1957 and an extensive energy crisis plagued Europe. The Suez Crisis had two consequences: First was foundation of Organization for European Economic Cooperations (OEEC) to develop energy strategies for future petroleum shortages and second one was Mandatory Oil Import Program (MOIP) established by US President Dwight Eisenhower in 1959. ~~By~~ issuance of ‘Quota tickets‘ to individual companies were used to control the amount of oil shipped to the USA.[[14]](#footnote-15) MOIP and economic recession in Europe reduced the demand of foreign oil, and the supply even increased thanks to the opening of new oil markets in Algeria (northern Africa). These caused successful price reduction, which was positively viewed in all oil-importing countries, but declining revenues in major oil-exporting countries led to formation of Organization of Petroleum Exporting Countries (OPEC) in 1960, with its main objective of restoring original prices. In January 1961 OPEC adopted a charter with three aims: to raise the incomes of member countries to fund development, to seize an increasing level of control over oil production from the international companies and to unify production policies.[[15]](#footnote-16)

This cartel, even though not very powerful yet, served as a remark of crude oil importance in the world and growing tensions led to aggregation of major industrialized countries into Organization for Economic Cooperation and Development (OECD) in 1961. This organization actually replaced OEEC but extended membership to the USA, Canada, Japan, New Zealand and Australia.[[16]](#footnote-17) The emergency strategies that were developed after the Suez Crisis helped moderate the impacts of another oil crisis that emerged in 1967. Tensions between Israel and Arab nations culminated in Israel‘s preemptive attack on Egypt in June 1967, starting the Six-Days War. Arab states implemented an oil embargo against the United States and Europe, because of their support for Israel. The oil shortage that followed was moderated by an increase in exports from Venezuela, and Iran (which did not participate in the embargo) and from an increase in US production. The embargo was cancelled by the end of July, but growing the unrest among Arab producing nations over support of Israel led to foundation of Organization for Arab Petroleum Exporting Countries (OAPEC) in 1968 for the purpose of uniting political interests in the Arab nations. Throughout the post war period oil-exporting countries found increasing demand for their crude oil but a 40 percent decline in the purchasing power of a barrel of oil. In March 1971, the balance of power shifted. That month the Texas Railroad Commission set prorating at 100 percent for the first time. This meant that Texas producers were no longer limited in the amount of oil that they could produce; there was no more spare capacity and therefore no tool to put an upper limit on prices. More importantly it meant that the power to control crude oil prices shifted from United States to OPEC.

**Embargo Period, Crises in Iran and Iraq, 1973- 1990**

In 1972 the price of oil was stable around $3.00 per barrel ($15.00 viewed in 2006 dollars), but volatile geopolitical situation did not leave it stable for long time. Till the end of 1974 the price quadrupled to over $12.00 ($42.00 viewed in 2006 dollars). This increase was caused by oil crisis of 1973, which started as a Yom Kippur War, when Egypt and Syria launched an attack on Israel. United States, its allies in Western Europe and Japan supported Israel and in response to this aid, members of Organization for Arab Petroleum Exporting countries (OAPEC, founded in 1968) initiated oil embargo against US and other allies of Israel. This 6 months long embargo caused the largest energy crisis in United States history. Although the major oil-producing companies increased their production, the shipment to USA was reduced from 6 million to 5 million barrels per day. This crisis demonstrated the consequences of dependence on foreign oil and forced all affected countries to react.

Within the framework of OECD was established in 1974 International Energy Agency (IEA). ‘Its mission was to develop strategies for energy security during emergencies and to reduce member countries dependence on oil (IEA 2005) ‘. Many countries implemented national energy policies, France, Germany and the Netherlands began to expand their nuclear program, Great Britain diversify its oil imports, Europe began to increase oil imports from the Soviet Union and Japan shift away from oil-intensive industries and invested in industries such as electronics[[17]](#footnote-18). From 1974 to 1978 world crude oil prices were relatively flat ranging from $12.21 to $13.55 per barrel ($39 to $42 viewed in 2006 dollars), but Second Oil Crisis (or Energy crisis) in 1979 increased prices to $39,50 ($68.00 viewed in 2006 dollars). It resulted from Iranian revolution, which caused inconsistent oil export with the loss of 2 to 2.5 million barrels per day. This amount was partly covered by increasing production of other OPEC countries, but later on Iran weakened by the revolution was invaded by Iraq and the combined production of both countries decreased by 6.5 million barrels per day, which was 10% of 1979 oil production[[18]](#footnote-19). The 1973 and 1979 energy crisis increased public awareness that oil is a limited resource, and that it would eventually run out as an economic viable energy source. Consumers’ reactions were better insulation of their houses, more energy efficiency in industrial processes and automobiles with higher efficiency. These factors along with economic recession and increased exploration and production outside OPEC caused a reduction in demand which led to falling crude oil prices to $10 ($20 viewed in 2006 dollars ) and so called Oil Glut of 1980‘s. To sustain prices, an OPEC meeting in Vienna in 1982 agreed to set quotas, but since under OPEC’s charter these quotas can only be advisory, only three countries decide to apply them. During the Embargo period, the US imposed price controls on domestically produced oil in an attempt to lessen the impact of the 1973-1974 price increase. The result of the price control was that the US consumer of crude oil paid about 50 percent more for imports than domestic production and US producers received less than world market price. The domestic petroleum industry was actually subsidizing the US consumer. In the short term, the recession was less because US consumers faced lower prices than the rest of the world.  However, higher petroleum prices faced by consumers would have resulted in lower rates of consumption and as a consequence, the US would have been less dependent on imports in 1979-1980 and the price increase in response to Iranian and Iraqi interruptions would have been significantly less.

**Gulf War and OPEC’s quota control, 1990-2007**

In 1990 lower production, uncertainty associated with the Iraqi invasion of Kuwait and the Gulf War lead to short-time price increase to $30 viewed in 2006 dollars, but once the Kuwait was liberated, oil prices entered a period of steady decline until 1993. The price cycle then turned up. The United States economy was strong and the Asian Pacific region was booming. From 1990 to 1997 world oil consumption increased by 6.2 million barrels per day and Russian production declined over 5 million barrels per day pushing the prices to $25 per barrel. The price increase came to a rapid end in 1997 and 1998 when the impact of the economic crisis in Asia was either ignored or severely underestimated by OPEC. In December 1997 OPEC increased its quota by 2.5 million barrels per day (10%), but previously booming Asian economies decreased oil consumption for the first time since 1982. The combination of lower consumption and higher production decreased prices by 40% ($15 per barrel). OPEC reacted by cutting quotas in April (1.25 million barrel per day) and July (1.335 million barrels per day), but prices continued down through December 1998.

In April 1999 OPEC reduced production by another 1.719 million barrels which was sufficient to move prices above $25. Growing US and world economies were not supported enough by OPEC quota increases totaling 3.2 million barrels per day and prices were pushed even further. Increased oil consumption was mainly covered by Russia which dominated the non-OPEC production growth and was responsible for most of the non-OPEC increase since the turn of the century.[[19]](#footnote-20) OPEC overshot the market again in 2001, when increase in non- OPEC production and weakened US economy put downward pressure on prices. OPEC reduced production by 3, 5 million barrels per day and this would be probably sufficient if the year 2001 would not be scarred by the September 11th terrorist attack. Prices went down by another 35%, but given the political situation all oil producing countries delayed additional cuts until January 2002.In mid 2002, there was over 6 million barrels per day of excess production capacity. By the end of 2002 problems in Venezuela led to a strike causing decrease in Venezuelan production. In March 2003 Venezuelan production was beginning to return, but military action commenced in Iraq – these did not only reduce Iraq production, but also significantly increased consumption. Inventories in the US and other OECD countries remained low and improving US economy and rapidly growing Asian economy led to erosion of excess oil production capacity to below 2 million barrels per day. In a world, that consumes over 80 million barrels per day of petroleum products, 2 million barrels is not sufficient excess and prices were pushed to $40– $50 per barrel. Increased price of oil allowed alternative methods of oil production like extraction from oil shale and tar sands. Security of supply and increased consumption were not the only influences that led to high oil prices. Weak dollar, low level of petroleum inventories, lack of investment into new refineries, weather problems (hurricanes), political tensions and OPEC supply cuts as well as a number of accidents were pushing oil prices even higher. In January 2007 price of barrel was around $62.00 and at the beginning of 2008 reached $86.00. With that high oil prices governments subsidized farmers to grow crops for energy. Cultivations had massively shifted toward biofuel feedstock (especially maize), often at the expense of soybean and wheat cultivation. About 30% of cultivation went into ethanol rather than into food and feed markets. High energy prices had also made agricultural production more expensive, by raising the cost of mechanical cultivation and inputs like fertilizers and pesticides. The result of government intervention into oil market was sharp increase of food prices that led to nutrition problems of poor people in developing countries, inflation pressure and in some countries to civil unrest[[20]](#footnote-21).

In November 2008 prices were falling not as a consequence of increased supply or increased energy efficiency, but because of reduced economic activity. China, which has been one of the main engines of global oil demand growth over past several years faced for the first time threat of economic slowdown. Even though, financial crisis affected mainly developed economies, they constituted important markets for Chinese exports. Decrease in demand, unstable global financial system and price drop led to worries about future investments in new oil production. Prices around $60 per barrel forced oil producers to rethink investment plans or scale back on existing projects. Oil is already more costly to extract, because new fields are hardly accessible and needed technology is very expensive. On the top of that the new fields are smaller so they do not yield that much profit. Present under-investment may lead to future oil-supply crunch, because increased output depends on adequate and timely investment[[21]](#footnote-22).

Global Economic Crisis lead to further decreases in crude oil demand and therefore the price of crude oil drop in February 2009 to $35 per barrel. If we compare the crude oil price of $150 per barrel from mid 2008 and price from February 2009, we get an incredible difference of $115. Low crude oil prices are causing significant problems to exporting countries. Fields that are small and hardly accessible are stopping production, because under recent prices is not profitable. National budgets of exporting countries are dependent on profits from crude oil market- Russia needs to sell a barrel for at least $70 to have balanced national budget and Venezuela’s budget is from 50% dependent on earnings from crude oil. Shortage of earnings in oil exporting countries may lead to even deeper problems than only those connected with economic crisis.[[22]](#footnote-23)

**Crude oil price analyses**

The long term view shows that world oil prices since 1869 adjusted for inflation averaged $21.66 per barrel in 2006 dollars. Fifty percent of the time world prices were below the median of $16.71 per barrel. The results are significantly different if only post-1970 data are used. In that case US crude oil\* prices average $29.06 per barrel and the more relevant world oil price averages $32.23 per barrel. The median oil price for that time period is $26.50 per barrel.[[23]](#footnote-24)

**Case study of OECD countries**

OECD countries consist nowadays from 30 nations, that can be divided into OECD North America (Canada, Mexico, United States), OECD Pacific (Australia, New Zealand, Japan and Republic of Korea) and OECD Europe (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom). Oil is a critical source for energy for almost every country but is also required for agriculture, manufacturing and plastics. Because oil impacts almost every aspect of a country‘s economy, having a reduced oil supply or more costly oil would negatively impact each of the OECD countries economies as they are all net importers. Together these 30 OECD countries span 3 different continents. Some of these countries have domestic oil supplies while others do not, many countries have significantly different GDP/person and each country often supports significantly different major industries. Because of these differences, each country would be impacted differently. Among International Energy Agency‘s *Analysis of the impact of High Oil Prices on Global Economy* from 2004, there are several factors influencing the magnitude of the direct effect of a price change to country‘s economy. Magnitude depends on the share of the cost of oil in national income, the degree of dependence on imported oil, the gas-intensity of the economy and the ability of end-users to reduce their consumption and switch away from oil. In my study I will focus on dependence on imported oil, percentage of oil energy and efficiency in conversion of oil into GDP. For my research I took information for each OECD state, from International Energy Agency – statistics of 2006 Energy Balance, World Bank - 2007 GDP per capita and United Nations Department of Economic and Social Affairs: Population division – 2007 Population.

Taken the figures of Energy Balance, I have counted the percentage of energy that is covered by oil (in table marked as ‘oil energy‘), percentage of imported oil (in table marked as ‘imported oil‘), than I have used information from World Bank and United Nation and counted amount of energy consumed per person (in table marked as ‘energy/capita‘) and I have used this figure to divide GDP per capita and the result gained is the efficiency of energy conversion into GDP (in table marked as ‘GDP/Energy‘). Detailed information about each OECD state is in the supplements. Here is the table with calculated results. Percentage of imported oil is in few countries over 100% which is a result of stock exchange, or small amount of export to neighboring countries.

Two of the hypotheses that I wanted to test using this data were:

*1- The more dependent a country is on imported oil, the less dependent it will be on oil as an energy source.* This would be logical if countries in recognizing their economic dependence on a critical expensive commodity with erratic pricing and supply problems that they would then put long term programs in place to reduce this dependency and minimize the money sent out of the country. *2- The more energy that is used in an economy, the more robust that economy is or that GDP and energy are directly correlated related.* This would be logical in that the higher the standard of living is in a country, and the more money that each person has then that the more energy that that person might use by having a car, air conditioning, living in a bigger house, etc. Also because I would expect that a country with a higher GDP would manufacture more consumer goods for both use and consumption but also for export.

**Impact of Crude Oil Prices on OECD Countries**

We have attributed the failure of my first two hypotheses to country differences and political and historical factors that the simple metrics I had could not distinguish between. I now suspect that even if a country had similar GDP/person and % of imported oil and % oil energy that I would see significant differences between countries but that there are countries that I could find that would be less impacted by changes in oil cost or supply and those that would be more impacted. To test this, we created the following graph.



Source of data: International Energy Agency, World Bank, United Nations; graph: own computation

Here the x axis is the energy use/person, the y axis is GDP/Energy, and each data point color and shape denotes a range of GDP/person for that country. Additionally, I have divided the data up into four quadrants using the GDP/Energy and GDP/person. Red points represent countries with low GDP (GDP/capita lower than $20 000), blue points countries with medium GDP (GDP/capita between $20 000–$40 000) and green point countries with high GDP (GDP/capita over $40 000). Further, the medians are dividing graph into 4 quadrants: Quadrant A represents highly efficient and low energy use countries– the more diagonally further country is from median’s intersection, the better is its position. There are countries with high GDP/person (Ireland, Switzerland, Denmark, and United Kingdom) and medium GDP/person (Greece, Italy, Spain, and Portugal). Countries from A quadrant would be least affected by crude oil price change. Quadrant B consists of countries, which are efficient in energy conversion into GDP, but have higher energy consumption per person. There are only countries with high GDP/person like Norway, Austria, France, Germany, Netherlands, Sweden and Luxembourg and to decrease their impact of crude oil price change they need to decrease energy consumption per capita. Countries in quadrant C are weak in efficiency, but their energy consumption per person is quite low. There are only countries with low GDP (Turkey, Hungary, Mexico, Poland, and Slovak Republic) that can improve their situation by increasing the efficiency of energy conversion to GDP may be by shifting to less energy demanding industries. Finally, the quadrant D contains countries with low efficiency and high energy consumption, and the more diagonally further country is from median’s intersection, the worse is its position. Here are situated countries with low (Czech Republic, Republic of Korea) median (Japan, New Zealand, Australia) and even high GDP/person (Belgium, Finland, United States, Canada, Iceland). These countries would be most affected by crude oil price change; their economies are fragile in relationship to crude oil. Further research might study differences between high and low efficient countries, type of their industries in detail and solve the question of dependency on imported energy sources. It is needed to find a solution that improves situation of countries from D quadrant and explore how are countries from A quadrant keeping up their GDP per capita, while consuming lower amount of energy than other countries.

**Conclusion**

Crude oil market is affected by many variables and therefore is hard to make any prediction for longer term. When I was starting with research for this bachelor thesis, prices of crude oil were very high and main concerns were about crude oil reserves, tightness of oil market and time of crude oil peak. Few months later, under the circumstances of economic crisis, the situation is totally opposite- price of crude oil is around $45 and the biggest problems are connected with oil-exporting countries’ national budgets. Complexity of the market and unexpected changes are influencing the whole economy. The degree of influence on each country depends on the percent of oil energy, percent of imported oil, energy usage per capita and GDP per capita. Among my calculations the most affected countries would be Czech Republic, Republic of Korea, Japan, New Zealand, Australia, Belgium, Finland, United States and Canada. Any changes in the crude oil price will cause bigger shifts than for example in Ireland, Switzerland and Denmark, which are efficiently converting energy into GDP. Further research might study the differences between high and low efficient countries, type of their industries in more detail and examine the problem of dependency on imported energy sources in greater depth. It is important to explore differences between most and least affected countries and identify the reasons of these differences and learn what can be done better. From time, when price of wooden barrel was bigger than price of the oil inside, we have come a long way. Today we can better control oil wells, have better technology that allow us to drill more crude oil from wells than before, we have built pipelines all around the world and we became very dependent on oil. On one side we have huge progress of our society and on the other one vulnerability and fragility that comes with tight dependence.The problem is that we are missing signs that would show us this dependence is actually threatening us and we need to find another sources of energy or better way how to use those we have around us – in our country, under our control. Usually price is a good indicator – when the supply is getting low, the price of the product dramatically increases, but oil price is the result of many factors – economic recession lowers the oil price, but that does not mean that we have bigger supply than before the economic crisis or that our dependency is smaller than before. Instability around oil fields can drive the oil price up, but this does not mean that we have lost some of our oil sources– or at least not for a long time.What each human being can do is to be aware that oil is a resource to be used as sparingly and as wisely as possible and that each person should work to reduce that consumption of oil. This can be done for example by using public transportation instead of own vehicle, better insulating one’s home, car pooling or changing the type of heating system in his/her apartment to renewable sources of energy. These changes are not for free– they cost us money, effort and can decrease our comfort. And not to put down personal effort, but in the big picture one person can’t change that much, when the world consumption is around 88 million barrels per day. But we are a world of almost 7 billion and 7 billion times just a bit saved for each person can be a lot.We need to have complex system that would bring real change for our country and for the world. These changes can be supported by everyone just doing the “right thing” but re-enforced with economic incentives and penalties. We need to have government programs that would set the conditions for environmentally or energy friendly behavior for financial premium or penalties. These conditions have to be complex and closely checked, since only measurable and monitored programs that cannot be cheated will actually work. It will be a very long time before there would be zero dependence on oil. We need to improve our dependence on oil on the hope that the oil will keep coming through the pipelines for many years even though we have no control over the source.

**Bibliography**

1. BURDA, M., WYPLOSR, CH.: Macroeconomics 4th edition, Oxford University Press Inc., New York 2005, ISBN-10: 0-19-926496-1
2. DEFFEYES, K.: Beyond Oil: The View from Hubbert’s Peak, Hill and Wang, New York, 2005
3. KOYAMA, K.: Prospects of the International Oil Market and Crude Oil Prices in 2008, Institute of Energy Economics, Japan 2007
4. MOAN, J., SMITH, Z.: Energy Use Worldwide, ABC-Clio, California, 2007, ISBN 978-1-85109-890-3
5. ROBERTS, P.: The end of oil: on the edge of a perilous new world, Houghton Mifflin Company, New York, 2004, ISBN: 0-618-23977-4
6. ZUBAIR, I.: Macroeconomics Issues and Policies in the Middle East and North Africa, International Monetary Fund, Washington D.C., 2001, ISBN: 1-58906-041-5
7. Energy Watch Group: Crude Oil – The Supply Outlook, February 2008 <http://www.energywatchgroup.com/fileadmin/global/pdf/2008-02_EWG_Oil_Report_updated.pdf2007>, [cit. 2008-19-12].
8. EIA: Annual Energy Outlook 2006, February 2006 http://www.eia.doe.gov/oiaf/archive/aeo06/pdf/0383(2006).pdf, [cit. 2008-19-12].
9. EIA: World Proved Reserves of Oil and Natural Gas

http://www.eia.doe.gov/emeu/international/reserves.html, [cit. 2008-25-12].

1. Guardian: After the Credit Crunch, the Oil Crunch

<http://www.guardian.co.uk/business/2008/nov/12/oil-gas-companies-credit->crunch , [cit. 2008-12-11].

1. IEA: Member Countries and Countries Beyond the OECD

<http://www.iea.org/textbase/country/24_country.asp>, 26.1.2009, [cit. 2009-26-1].

1. IEA: Analysis of the Impact of High Oil Prices on the Global Economy

<http://www.iea.org/Textbase/Papers/2004/High_Oil_Prices.pdf>,[cit. 2008-10- 10].

1. International Food Policy Research Institute: Rising Food Prices

<http://www.ifpri.org/pubs/bp/bp001.asp>, [cit. 2008-12-11].

1. Infoplease: Greatest Oil Reserves by Country, 2006

<http://www.infoplease.com/ipa/A0872964.html>, [cit. 2008-19-12].

1. Oil Shale and Tar Sands Programmatic Information center: About Tar Sands

<http://ostseis.anl.gov/guide/tarsands/index.cfm>,[cit. 2008-19-12].

1. OPEC: What are the uses of crude oil?

<http://www.opec.org/library/FAQs/CrudeOil/q4.htm>, [cit. 2008-05-12].

1. Society of Petroleum Engineers: Petroleum Resources Management System

<http://www.spe.org/spe-app/spe/industry/reserves/prms.htm>, [cit. 2008-05-12].

1. United Nations: World Population Prospects http://www.un.org/esa/population/publications/wpp2006/English.pdf, [cit. 2008-26-01].
2. World Bank: 2007 GDP per capita

http://siteresources.worldbank.org/DATASTATISTICS/Resources/GDP\_PPP.pdf, [cit. 2009-01-26].

1. WTRG Economics: graph of oil prices

<http://www.wtrg.com/oil_graphs/crudeoilprice4774we.gif>, [cit. 2008-05-12].

1. WTRG Economics: Oil Price History and Analysis <http://www.wtrg.com/prices.htm>, [cit. 2008-05-12].

1. All Experts: <http://en.allexperts.com/q/Energy-Industry-Oil-2441/Oil-Exploration-Techniques.htm>, 19.12.2008 [↑](#footnote-ref-2)
2. Society of Petroleum Engineers: <http://www.spe.org/spe-app/spe/industry/reserves/prms.htm>, 5.12.2008 [↑](#footnote-ref-3)
3. EIA: <http://www.eia.doe.gov/emeu/international/reserves.html>, 25.12.2008 [↑](#footnote-ref-4)
4. ROBERTS, P.: The end of oil: on the edge of a perilous new world, Houghton Mifflin Company, New York 2004, ISBN: 0-618-23977-4 [↑](#footnote-ref-5)
5. Oil Shale and Tar Sands Programmatic Information center:<http://ostseis.anl.gov/guide/tarsands/index.cfm>, 19.12.2008 [↑](#footnote-ref-6)
6. EIA: http://www.eia.doe.gov/oil\_gas/natural\_gas/data\_publications/field\_code\_master\_list/fcml.html, 19.12.2008

   \* Data from August 27, 2008 (in Billion Barrels); US data are from EIA U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 2006 Annual Report, DOE/EIA-0216 (2007). [↑](#footnote-ref-7)
7. ROBERTS, P.: The end of oil: on the edge of a perilous new world, Houghton Mifflin Company, New York 2004, ISBN: 0-618-23977-4 [↑](#footnote-ref-8)
8. IEA, Oil Market Report, November 2008, <http://www.scribd.com/doc/11050158/IEA-Oil-Market-Report-November-13-2008>, 19.12.2008 [↑](#footnote-ref-9)
9. Energy Watch Group, <http://www.energywatchgroup.com/fileadmin/global/pdf/2008-02_EWG_Oil_Report_updated.pdf>, 19.12.2008 [↑](#footnote-ref-10)
10. BP Statistical Review of World Energy: <http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2008/STAGING/local_assets/downloads/pdf/statistical_review_of_world_energy_full_review_2008.pdf>, 19.12.2008 [↑](#footnote-ref-11)
11. World Bank: <http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2008/07/28/000020439_20080728103002/Rendered/PDF/WP4682.pdf>, 19.12.2008 [↑](#footnote-ref-12)
12. AE Biofuels: <http://www.alternative-energy-news.info/technology/biofuels/>, 19.12.2008 [↑](#footnote-ref-13)
13. MOAN, J., SMITH, Z.: Energy Use Worldwide, California 2007, ISBN 978-1-85109-890-3 [↑](#footnote-ref-14)
14. [↑](#footnote-ref-15)
15. **OPEC Countries:** Algeria, Angola, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, Venezuela. [↑](#footnote-ref-16)
16. **OECD Countries:**  1961: Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Republic of Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

    1964: Japan, 1969: Finland, 1971: Australia, 1973: New Zealand, 1994 Mexico, 1995 Czech Republic, 1996: South Korea, Hungary, Poland, 2000: Slovakia. [↑](#footnote-ref-17)
17. EIA: <http://www.eia.doe.gov/emeu/international/oilprice.html>, 5.12.2008 [↑](#footnote-ref-18)
18. MOAN, J., SMITH, Z.: Energy Use Worldwide, California 2007, ISBN 978-1-85109-890-3 [↑](#footnote-ref-19)
19. WTRG Economics: <http://www.wtrg.com/prices.htm>, 5.12.2008 [↑](#footnote-ref-20)
20. International Food Policy Research Institute: <http://www.ifpri.org/pubs/bp/bp001.asp>, 12.11.2008 [↑](#footnote-ref-21)
21. Guardian: http://www.guardian.co.uk/business/2008/nov/12/oil-gas-companies-credit-crunch , 12.11.2008 [↑](#footnote-ref-22)
22. Petrol: [http://www.petrol.cz/ropa/clanek.asp?id=11298](http://www.petrol.cz/ropa/clanek.asp?id=11294), 28.2.2009 [↑](#footnote-ref-23)
23. WTRG Economics: <http://www.wtrg.com/prices.htm>, 5.12.2008

    \* US price average is lower because of imposed price control on domestic production from 1973 to January 1981 [↑](#footnote-ref-24)