

# **Chapter 4**

## **Financial Issues Affecting Energy Security**

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### **4.1 Introduction**

When considering the topic of energy security, it is easy to assume that our main problems with energy security will arise from other countries cutting-off fuel supply to importing nations. Or perhaps, energy security issues will arise from mishaps associated with a planned change such as the implementation of a “smart grid.”

The problem that is easy to overlook is that the economic outlook for most countries is changing in major ways as the world’s oil supply tightens. Oil importers (and importers of other high-priced energy products) can increasingly expect the high cost of these imports to have an adverse impact on their economies. More recession can be expected, as can higher unemployment rates. Even exporters can expect problems, in some situations.

The net effect of these changes is that many countries will have difficulty finding the financial resources (including credit) required to *pay for* imported energy, so will *lose energy security because of their inability to buy imported fuel*. There are likely to be other follow-on effects as well, because the general population will be poorer and governments will be less able to pay for services they have paid for in the past. Activities as routine as reconnecting energy supplies after storms and floods may suffer because governments will not have the funds needed to pay for necessary repairs. The incidence of civil disorder may be greater as well, as citizens become less happy with the government’s reduced role.

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## 4.2 Background

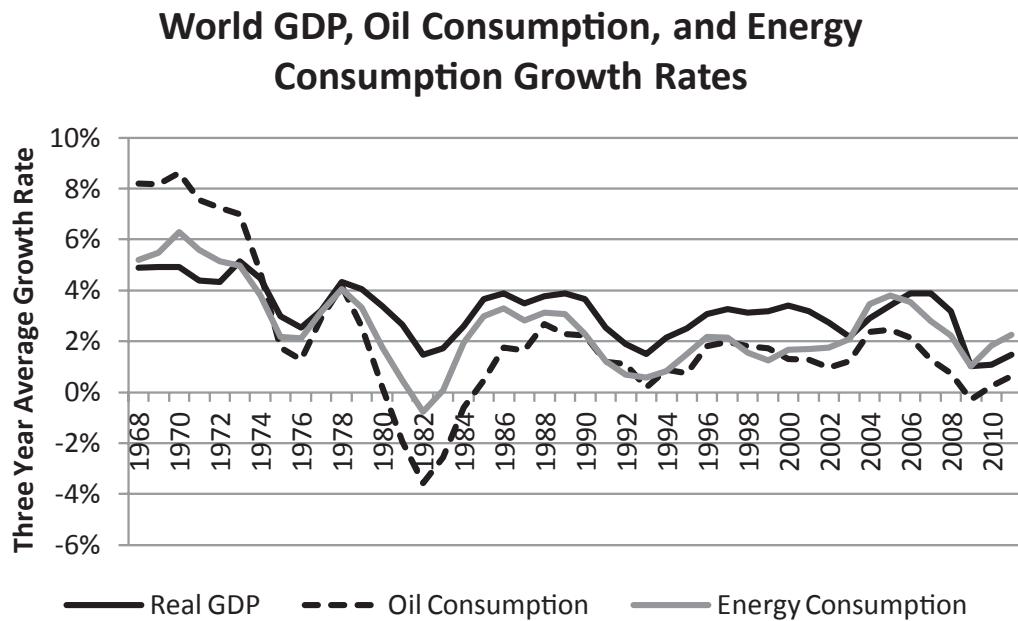
As background, we would like to explain a couple of points that are in conflict with what many economists believe:

- i. The financial problems that advanced economies are seeing today, including debt defaults, are closely tied to limited oil supply.
- ii. These financial problems are likely to get worse because our oil supply problem is not fixing itself, and it is nearly impossible to transit away from oil as a transportation fuel quickly.

To some extent, these points were covered in my talk 2 years ago at the 2010 Advances in Energy Studies Conference, in Barcelona, later published as a paper called, “Oil Supply Limits and the Continuing Financial Crisis” (Tverberg 2012).

There is a close tie between growth in energy consumption in general, and oil in particular, with GDP growth, as can be seen in Fig. 4.1.

At least part of the reason for the close tie among the three values shown in Fig. 4.1, is the fact that when goods and services are manufactured and transported, it takes some form of energy for this activity to take place. In some instances, it will be only human energy, and the source of this energy will be food. In other instances, oil or electricity will be used for manufacturing and in transport. Thus, at least part of the reason for the tie between GDP growth and oil and energy growth is because of the function energy products perform.



**Fig. 4.1** Three-year average growth rate of world real GDP, oil, and energy consumption (BP 2012; USDA Economic Research Services 2012). Maddison (2010) used to estimate GDP growth rate for 1965 through 1969

There is another connection as well. People who are earning wages have the economic means to buy such devices as cars and motorcycles. Thus, if higher GDP leads to higher employment, this will also lead to more energy consumption. Laying-off workers is likely to lead to lower oil and energy consumption.

If there is a close tie between oil and energy consumption and GDP, it should not be surprising if high oil prices tend to lead to recession, particularly in oil-importing countries. (Exporters have the advantage of collecting additional revenue to offset the adverse impact of higher prices. Also, they often charge their own population a lower price than the world oil price, sheltering them from the rising prices).

There are several connections between oil prices and GDP. One is the following: When the price of oil rises, consumers find that the cost of commuting is higher, but their wages are not any higher. Food prices are likely to be higher as well because oil is used in growing and shipping food. The cost to manufacturers of shipping goods is higher. If oil is used in manufacturing, the cost of the product is likely to be higher as well. These higher prices tend to squeeze people's budgets, leading to cutbacks in discretionary spending.

Figure 4.2 shows that the cost of oil was very high in the late 1970s and early 1980s, as well as in 2008 and 2011. If we compare these dates to the dates of recessions and cutbacks in oil use in Fig. 4.1, we see that there is a close correspondence between price spikes and recession, at least for the late 1970s and early 1980s time period, and for the 2008 time period. It is perhaps too soon to tell if the 2011 price spike is leading to recession. Economist James Hamilton has shown that 10 of the last 11 recessions in the USA were associated with oil price shocks (Hamilton 2011). He has also published a paper specifically linking the recession of 2007–2008 with the stagnating world oil production and the resulting spike in oil prices (Hamilton 2009).

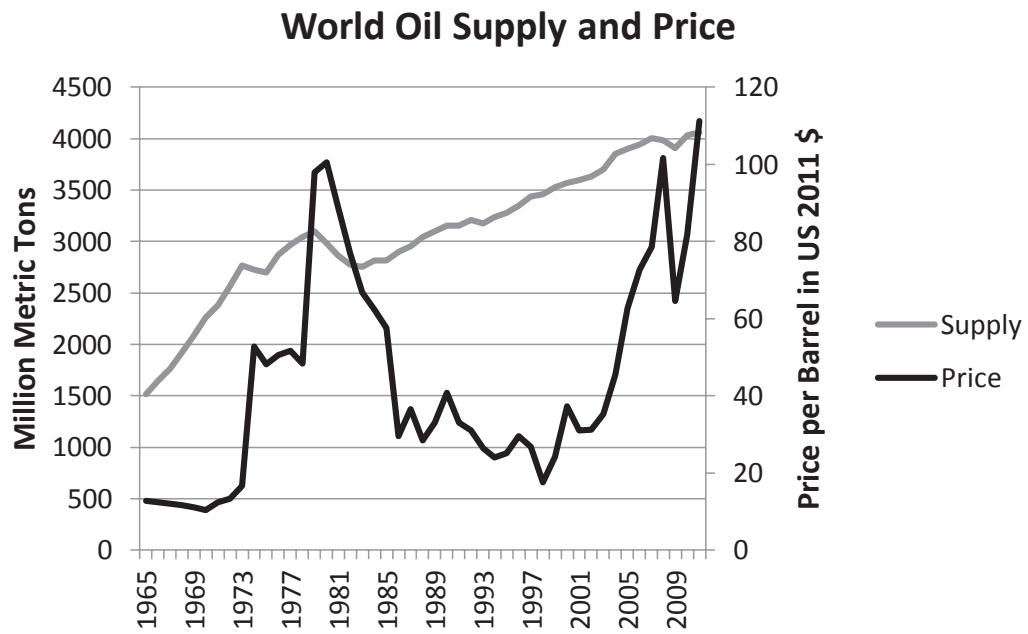


Fig. 4.2 World oil supply and average price in dollars in 2011. (BP 2012)

### 4.3 Reasons for the Current High Price of Oil

There are two reasons why the current price of oil is high compared to historical prices:

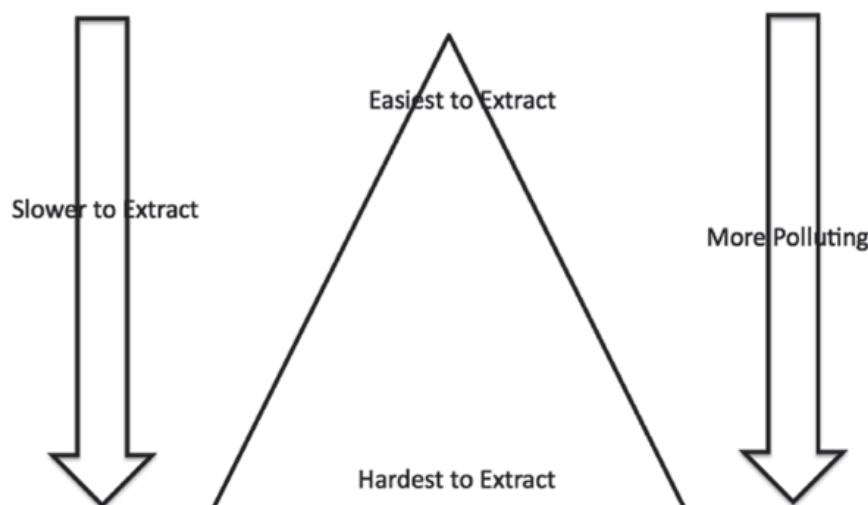
- i. The cost of extracting oil is rising, because the easy (and cheapest) to extract oil (at the top of Fig. 4.3) was extracted first. There always appears to be plenty of resources left, but they are more expensive to extract, slower to extract, and often more polluting. If the sales price does not reflect the current higher cost of extraction, oil companies will not extract the oil.
- ii. There is an imbalance between supply and demand.

With respect to this imbalance, oil supply is not rising very quickly, even when alternatives, such as biofuels, are included. The successively lower trend lines (Fig. 4.4) suggest that production may flatten further and may even fall in near future.

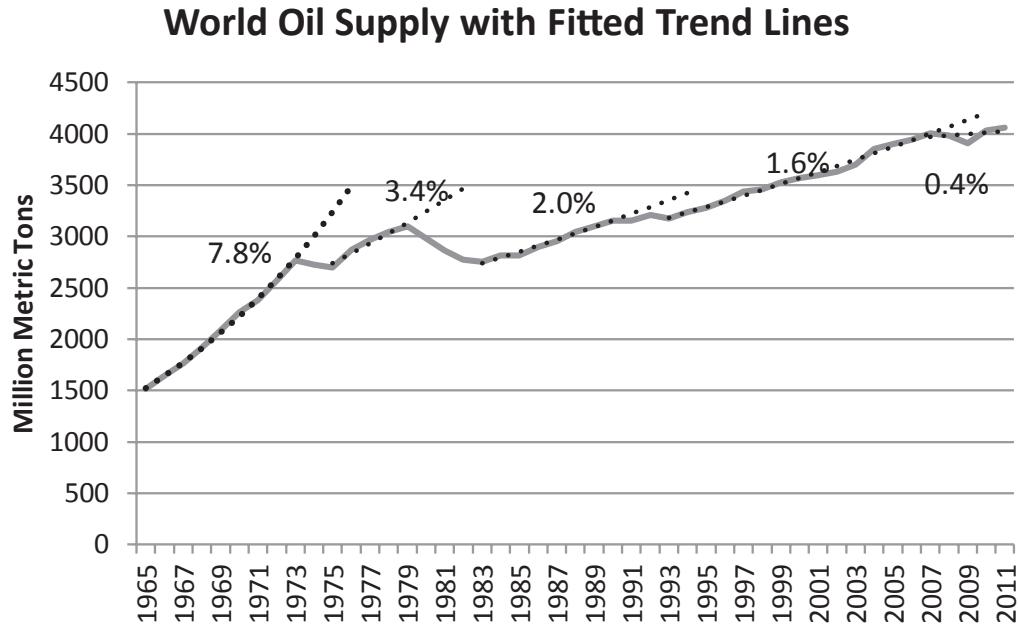
Oil demand of many newly industrializing countries as well as of oil exporters is increasing rapidly, putting great stress on the available oil supplies (Fig. 4.5).

From Fig. 4.5, it is clear that the consumption of the remainder is rising rapidly, even as the consumption of Area (1) (EU-27, USA, and Japan) is falling. If oil consumption of Area (1) (EU-27, USA, and Japan) is falling, this puts these countries at risk of recession because of the close connection between oil consumption and GDP growth. Recession (or even slower economic growth) also makes debt more difficult to repay. This is especially true for governments, because recession tends to be associated with greater unemployment. Governments find themselves collecting fewer tax dollars because fewer people are employed.

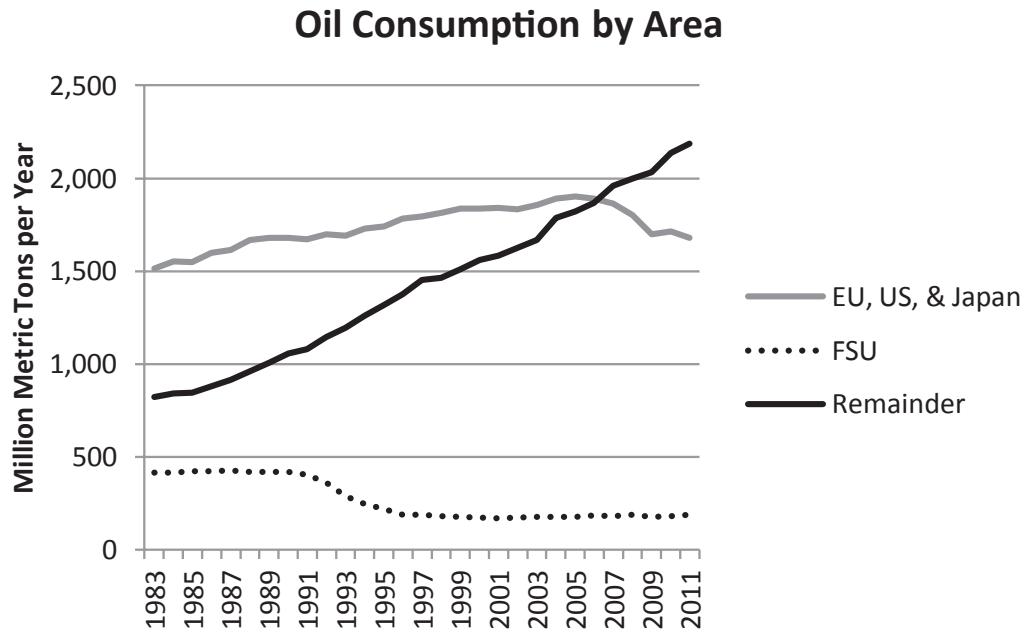
At the same time, they need to pay more unemployment benefits to people out of work, and they often have other obligations as well (bailing out banks; attempts to stimulate the economy).



**Fig. 4.3** Illustration showing the reason for confusion about future availability of energy resources. The issue is not when the resources will run out; it is when they become too expensive for economies to afford them



**Fig. 4.4** Current oil consumption including biofuels and other alternatives. Trend lines fitted to successive “run-ups” in oil production. “Actual” oil supply consumption amounts based on BP (2012) data



**Fig. 4.5** Current world oil consumption. Consumption is divided into three areas. a EU-27, USA and Japan. b Former Soviet Union (FSU), and. c Remainder (= World minus Area (1) and Area (2)). Area (3) remainder includes developing nations and oil exporters. (BP 2012)

The problem with high oil prices cannot easily be solved. The cost of extraction is persistently high, and tends to be rising. The usual substitute is biofuel, and its cost tends to be as high as, or higher than, that of oil. Biofuels also tend to use land that could otherwise be used for agriculture. In 2011, biofuels amounted to only 1.5 % of total world liquid fuels consumption ([BP 2012](#)).

## 4.4 Examples of Financial Problems

### 4.4.1 Example of Financial Problems #1: Greece

Greece is in the news for its debt default problems. Few people are aware that Greece is very much dependent on imported oil, and that the high price of imported oil is likely to cause financial difficulties.

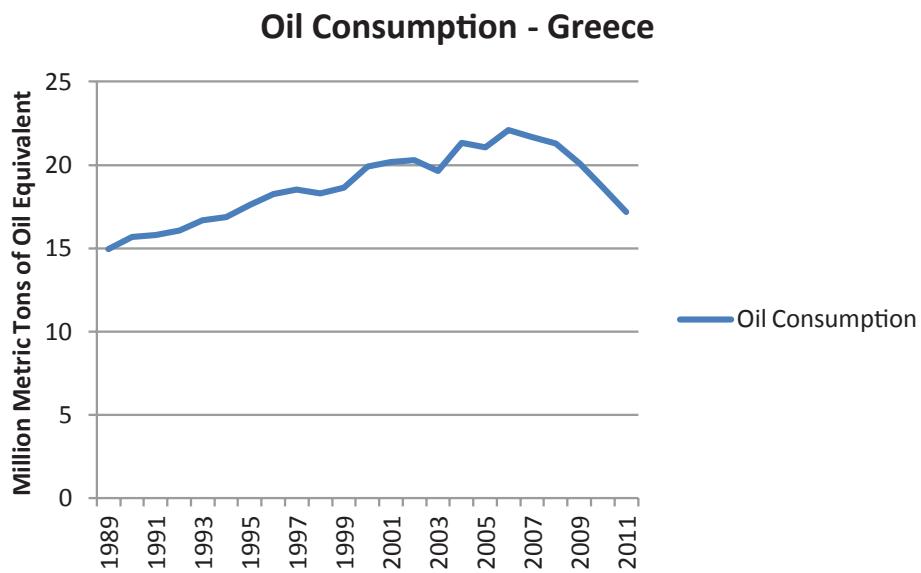
Tourism is a major industry in Greece, providing 15% of GDP ([CIA 2012](#)) and 20% of jobs ([World Travel and Tourism Council 2006](#)). Tourism depends on low-priced oil in two ways:

- i. High oil prices tend to make the cost of visiting Greece unaffordable because of the higher cost of airfare.
- ii. If a spike in oil prices leads to recession elsewhere, the people who have been laid off from work will likely not be in the market for tourism services.

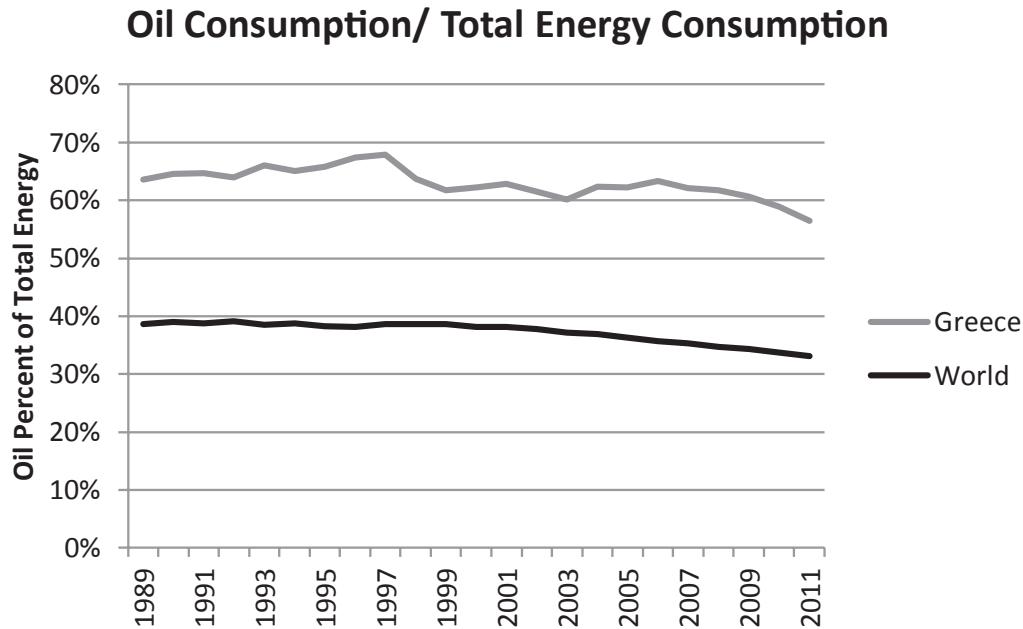
The amount of oil consumed in Greece has been declining since 2006 (Fig. 4.6).

Greece is vulnerable to disruption from high oil prices for a variety of reasons:

- i. It is dependent on tourism as a major source of revenue.



**Fig. 4.6** Greek oil consumption since 1989. ([BP 2012](#))



**Fig. 4.7** Greece's oil consumption, as a percentage of its total energy consumption, compared to a similar ratio using world data. (BP 2012)

- ii. Greece produces virtually no oil itself, so nearly all of its oil is imported. Thus, if prices rise, the extra cost must be paid to other countries, depriving Greece of revenue that might be used within the country to buy other goods and services, leading to reduced demand and perhaps layoffs in those industries.
- iii. A disproportionately large share of Greece's energy comes from oil (Fig. 4.7), as opposed to, for example, coal or nuclear energy.

Greece's oil consumption, as a percentage of total energy consumption, has been consistently higher than the world's average (Fig. 4.7).

A recent Reuters' article gives a few clues regarding the way these problems tie into Greece's energy security (Pappachristou 2012). The article says that Greek energy companies are seeking emergency bank loans to pay suppliers in order to avert widespread power and gas cuts during the tourist season. About 80% of the gas comes from Russia, via pipeline. At the heart of the cash crunch is a 350 million € deficit because revenues have not matched the subsidies paid to renewable energy producers. The same article indicates that electricity theft and looting of copper wire have increased greatly. Furthermore, because of the high level of unemployment, about 300,000 customers have applied for special lower tariffs.

In the Greek situation, a significant part of the original problem appears to be that high oil prices adversely affected tourism and other parts of the economy, for the reasons mentioned in Sect. 4.2. Furthermore, the timing of the oil consumption decline (2007 onward in Fig. 4.7) matches up well with the timing of when oil prices rose (Fig. 4.2), and when recession from those high oil prices hit.

Ultimately, the impact of the high oil prices was layoffs, reduced government revenue, and increased difficulty by the Greek government in paying back its debt.

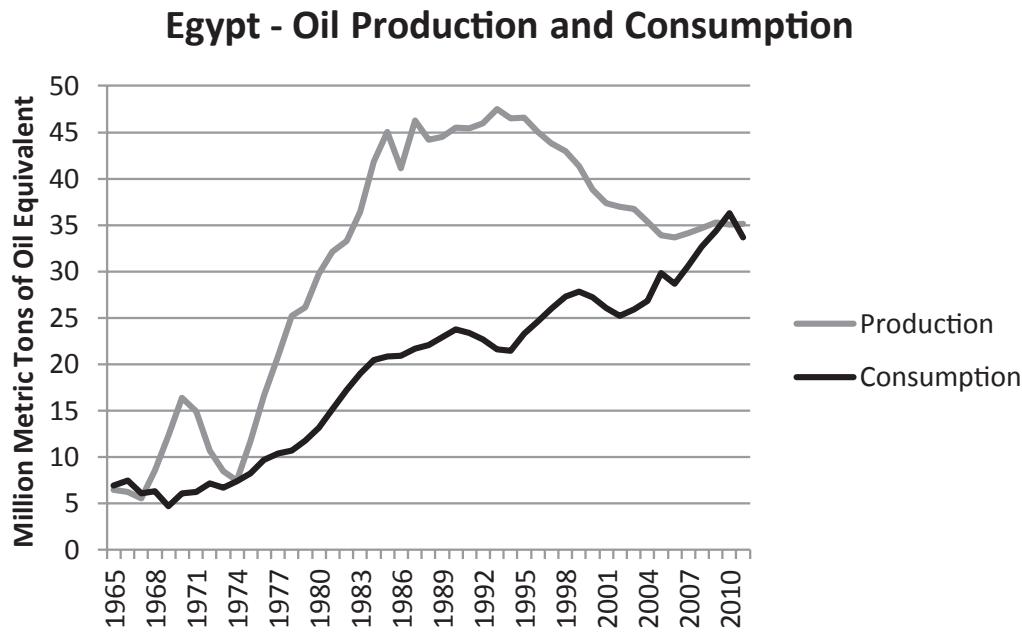
Now, the problems are being transferred to other energy sectors. There are problems paying for imported natural gas. The electricity sector is collecting fewer funds from customers, and customers are stealing copper from the grid. The financial rating of the largest electricity provider, Public Power Corporation, has been downgraded to CC “with negative outlook” by Standard & Poor’s (Reuters 2012).

One of the concerning issues is the statement that renewable energy subsidies are “at the heart of the cash crunch” (Pappachristou 2012). The information provided in Sects. 4.1 and 4.2 of this chapter strongly suggests that high oil prices will cause adverse impacts to oil-importing economies. If renewable energy is even higher-priced than oil (or even if it is comparably high-priced), logic suggests its high cost could be problematic as well, especially if the renewable energy solar panels or wind turbines are imported from outside the country.

#### 4.4.2 Example Financial Problems #2: Egypt

Egypt represents a different kind of oil-related financial problem. Until 2010, Egypt was an oil exporter, and was able to pay for food subsidies from the funds generated from oil exports (Tverberg 2011). Now its oil production has been reduced to the point that it is no longer an oil exporter (Fig. 4.8), and that change is creating financial difficulties. Figure 4.8 shows that Egypt’s oil exports have dropped to virtually zero, and that its own consumption has recently decreased.

While Egypt was an oil exporter, its population grew to 80 million people, half of whom earn less than \$ 2/day. The country has a subsidy program for basic



**Fig. 4.8** Oil production and consumption in Egypt (BP 2012). Difference between production and consumption represents exports

types of food and for fuel, which prevents chronic hunger among the poor, offering (among other things) loaves of bread for less than \$ 0.01 (Jerusalem Post 2011). The problem with the loss of oil exports is that it is almost impossible for the government to continue the level of subsidies it has provided in the past without running huge deficits.

One of the issues with the funding shortfall is that it creates a situation that no leader can fix. The riots that removed President Mubarak from office in early 2011 were at least partially caused by food price increases that were not offset by higher subsidies (Jerusalem Post 2011). Any new leader who tries to reduce subsidies is also likely to meet opposition.

With oil exports disappearing, Egypt's natural gas exports suddenly became more important to them. In 2005, the Egyptian government signed a 20-year contract to sell Israel natural gas, with a fixed price for 15 years. Market natural gas prices went up shortly after the contract was signed. After Mubarak was ousted, inquiry began into this contract (Carlisle 2011). In April 2012, natural gas supplies to Egypt were cut off (Cohen and Rabinovitch 2012) and in June 2012, jail terms were given to several former high-level officials, relating to this deal (Daragahi 2012).

While the breakup of the gas deal could have happened regardless of Egypt's oil export situation, the fact that Egypt's financial situation had deteriorated made it much more likely to happen. Also, the fact that oil prices were rising during the 2000s contributed to the rise in market price of natural gas after the contract was signed. The higher recent prices are what made the original contract so objectionable.

Egypt's political instability would seem to leave it open to other types of energy security risks as well, as the country's finances deteriorate further.

#### **4.4.3 Example of Financial Problems #3: India**

India represents a third type of financial problem that is threatening the country's energy security. India's economy has been growing rapidly, but its own sources of oil, coal, and natural gas have not been able to keep pace (Figs. 4.9, 4.10, and 4.11).

The growing gap between consumption and production is covered by high-priced imports, in both Figs. 4.10 and 4.11.

With all types of energy resources, there is a problem with progressively higher costs, as the easiest to extract resources are pulled out of the ground first, as shown in Fig. 4.3. This is happening in coal and natural gas as well as oil. Imported sources are especially costly because transport costs are involved as well.

The Wall Street Journal published an article recently titled, "Grinding Energy Shortage Takes Toll on India's Growth" (Sharma and Bahree 2012). The article reports:

With annual demand expected to more than double in the next two decades to the equivalent of 6 billion barrels of oil, the energy crunch threatens to knock India off its growth path. The national economy has already slowed amid paltry business investment and stalled reforms. It tallied just 5.3% growth in the quarter that ended March 31, the lowest level in almost a decade and well shy of the country's 9% goal.

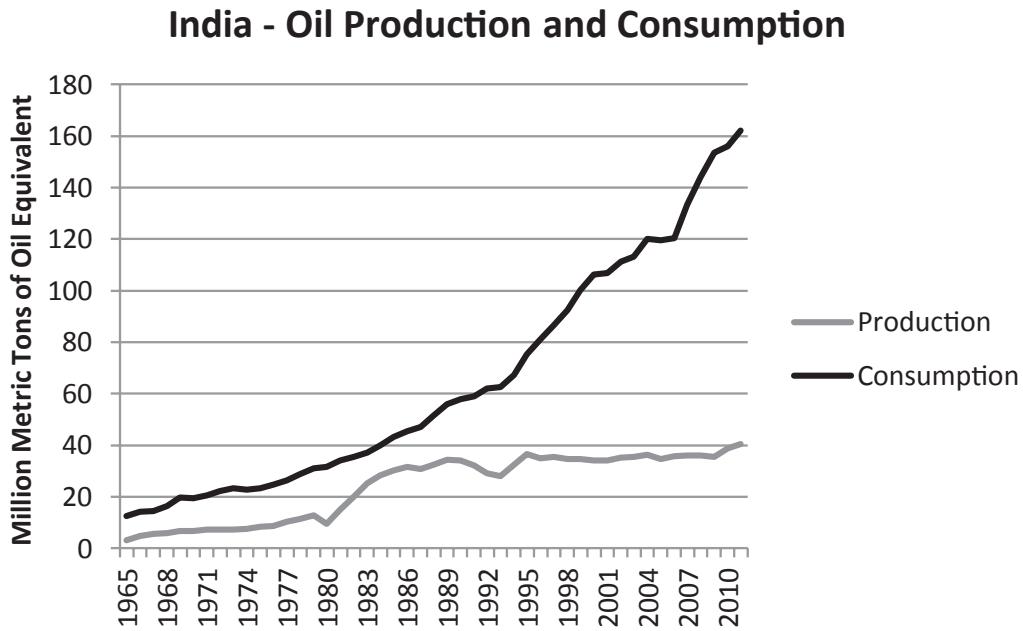


Fig. 4.9 India's oil production and consumption. (BP 2012)

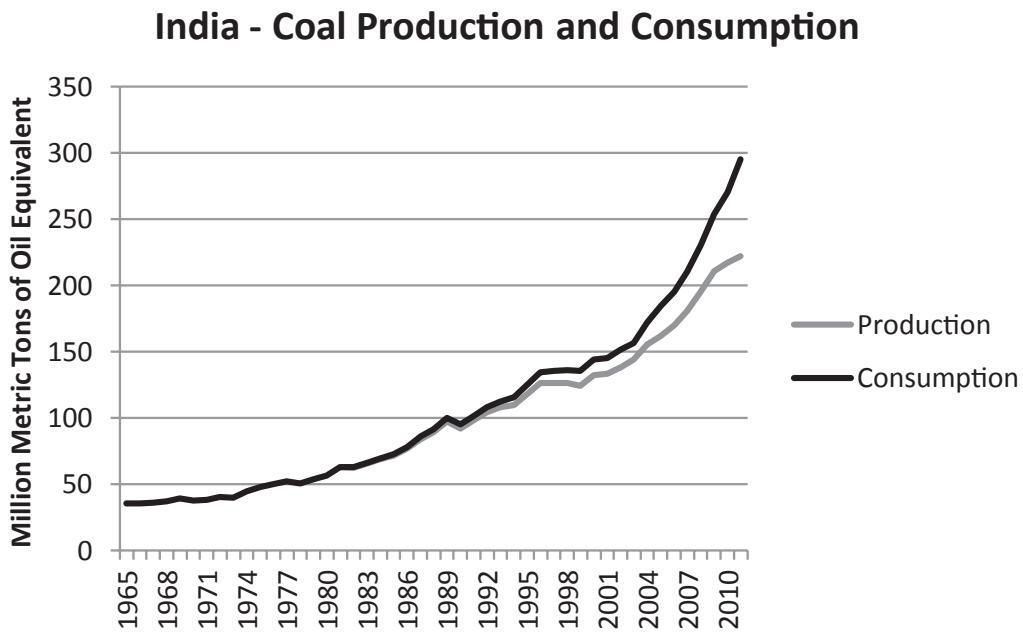


Fig. 4.10 India's coal production and consumption. (BP 2012)

Expensive imports have taken a toll on the nation's finances. Though global crude oil prices have eased in the past few months, India is seeing little benefit because its currency, the rupee, has been dropping against the dollar, the currency used to price oil. Economists say gasoline prices need to increase more, with the tougher task of deregulating the prices of diesel and cooking gas still ahead.

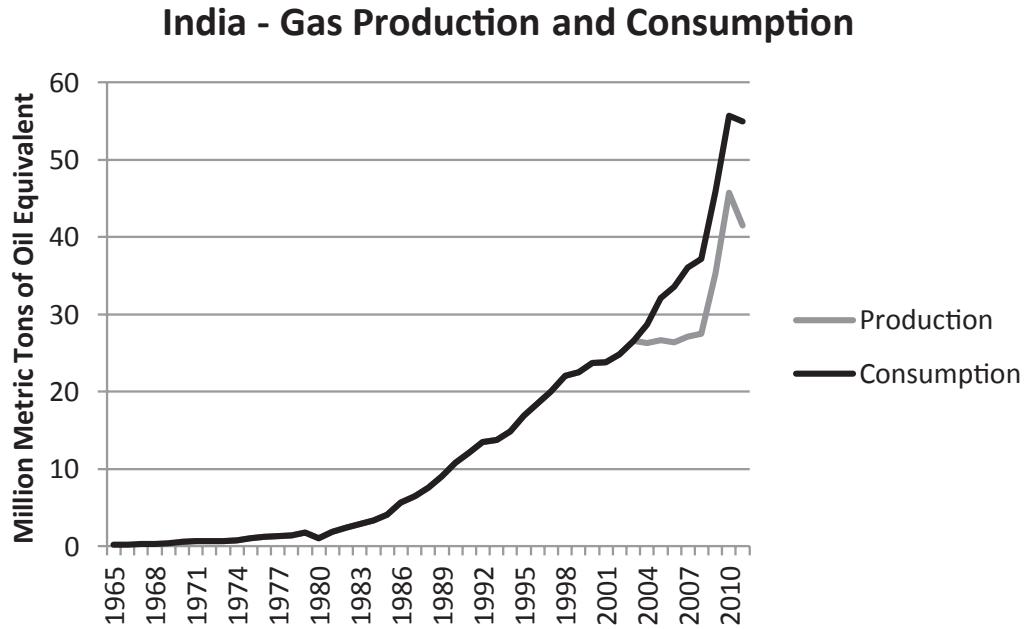


Fig. 4.11 India's natural gas production and consumption. (BP 2012)

"The prime minister and a few wise men are beginning to realize that there's a very bleak outlook in terms of energy security, and that this is going to create the single largest constraint on the economy, one of alarming proportions," said Gokul Chaudhri, a partner at New Delhi-based consultancy BMR Advisors, whose clients include Indian and foreign energy firms. (Copyright © 2012, Dow Jones & Company. Reprinted with permission)

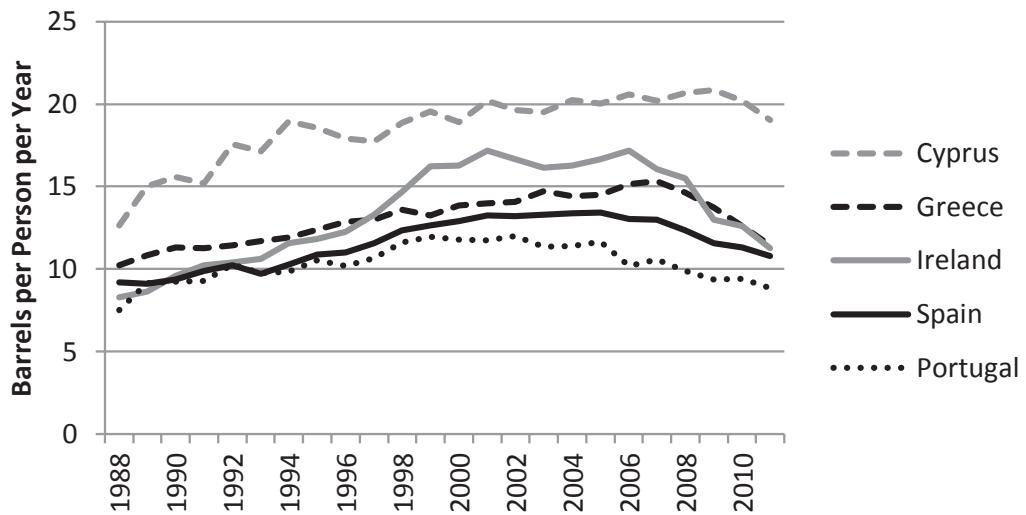
The article also reports new coal-fired electric power plants can't get enough coal, leading to electricity outages, and that Standard & Poor's is considering downgrading India's debt rating to "junk" status, because of its 5.8% budget deficit and inability to reform its system of subsidies. The article ends with the quote, "In all probability the import dependence in primary energy is going to increase," said Mr. Alhuwalia, of the Planning Commission. The real issue is, "Can we pay for that energy?"

Thus, India is suffering from financial problems from the high cost of imported fuel, even though its sources of fuel are diversified, and even though it has an economy that is still growing. If its rating is downgraded to "junk," India is likely to find that the cost of borrowing makes imported fuel even more expensive, making it even more difficult to buy sufficient imported fuel.

#### 4.4.4 *Other Countries Following the Paths of Greece, Egypt, and India*

There are many countries that appear likely to eventually have problems of the types illustrated in the examples.

## Per Capita Oil Consumption - EU Countries with Recent Bank Bailouts



**Fig. 4.12** A comparison of per-capita oil consumption of EU countries with recent bank bailouts. (US Energy Information Administration 2012)

Greece illustrates the problems of those who import a large share of their energy such as high-priced oil. EU countries that recently needed bailouts from other members include Cyprus, Spain, Greece, Ireland, and Portugal (Hadjicostis 2012). Figure 4.12 shows that these countries show the familiar pattern of declining oil consumption in recent years. (We show consumption on a per-capita basis, so that countries with dissimilar populations can better be compared). Cyprus shows less of this pattern than the other countries with bailouts, perhaps, because its financial problems are reported to reflect contagion from Greek bank defaults (Hadjicostis 2012), rather than its own economic problems.

There are of course many other importing countries with declining consumption of oil. One is the USA. Like Greece, it has debt problems (Dixon and Cowan 2012) that will be exacerbated by recession related to high-priced oil.

Egypt illustrates a few of the issues of oil exporters in decline. There is a finite amount of oil in the ground. At some point, each country will reach the point where the cost of extraction will exceed the world oil price. In some cases, world oil price will rise enough to make additional extraction feasible. The increase in oil price is not automatic; however, because high oil prices tend to lead to recessionary impacts in oil-importing nations and a cutback in demand for oil (illustrated in Fig. 4.12). As a result, at some point (perhaps 2 years from now for one country, perhaps 20 years from now for another), each oil exporter can be expected to reach a point, where it needs to make a transition from depending on oil exports to support other programs, to finding other sources to support these programs. Countries that are currently oil exporters, and thus are likely at some point to face these issues, include OPEC countries, Mexico, Norway, and Russia.

India represents some of the issues of the countries that are trying to grow rapidly from a low base. Here, the issue is high cost, not only of oil, but also of other types of imported energy products. This higher cost makes products less competitive, and as a result, slows economic growth. Examples of countries likely to eventually face these same issues, based on similar energy growth patterns, include China, Pakistan, Bangladesh, and Thailand.

## 4.5 Diversity of Types of Financial Risks

Clearly, the largest financial risk is the inability to buy imported energy products, because of lack of credit, or lack of funds to pay for the imported oil. Greece's example indicates that financial problems in one sector (oil) can affect the country's creditworthiness, and because of this cross-over, can affect its ability to buy imported fuel of other types.

Subsidies are likely to be another issue. The way these are financed is by having an economy that is rich enough to subsidize the item in question—usually food or fuel. But the cost of importing high-priced energy products tends to make economies less wealthy, making it harder for them to pay for subsidies. This happens at the time when the need for subsidies is the greatest. This combination is an issue that no politician can adequately handle.

If a government is having financial difficulty, it is likely to have trouble funding basic services of many sorts such as disaster relief after storms or floods. The lack of disaster relief could leave electricity and gasoline/diesel fuel customers without services for long periods after what would normally be temporary outages.

Physical security, illustrated by stealing of copper wire, or of electricity itself, is another issue. This could be an issue in any of the countries, where the standard of living is declining, either because of increased unemployment or because subsidies are being cut for food/fuel. If the government lacks money for an adequate police force, this could make the situation worse.

Increasing civil unrest is another issue. Civil unrest may become an issue if citizens blame leaders for increased unemployment and inability to continue food/fuel subsidies. One recent example was Egypt, but other countries are at risk as well. Countries with a large number of bankruptcies and cutbacks in services, such as Greece, appear to be candidates for civil unrest. In some cases, civil unrest could potentially lead to damage to energy infrastructure.

Another issue is how nuclear power plants, and the storage of spent fuel, will fare in a world with increasing financial problems and civil unrest. The meltdown at Fukushima has illustrated the need for continuous electrical power in order to keep spent-fuel pools cool, at least with some designs (World Nuclear Association 2011). Nuclear power plants are now being built in the Middle East, India, and China, in addition to their early locations of the USA, Europe, and Japan. If these countries start having political disruptions, or more intermittent electricity, there would seem to be a possibility of interrupted electric power to spent fuel pools. Some reactors

now being built are expected to last 60 years, and the spent fuel will need to be handled for some time after that, so the issue is really a long-term one.

A further issue is whether countries will be faced with refinery closures as their finances deteriorate. The pattern is as follows: citizens buy less gasoline and diesel products, as the price of oil products rises. At the same time, profit margins of refineries in the distressed area erode because fewer customers can afford their oil products. Eventually, some of the refineries find that they need to close because they are losing money. This has recently happened in Europe, leading to closure of refineries operated by Petroplus ([Global Politics 2012](#)).

Closing refineries then has implications for other industries, such as the chemical industry and the asphalt industry, because refineries make a range of products. The oil products needed to support these other industries are lost as well when a refinery is closed, even though demand for them may remain high.

When refineries close, there is also less redundancy in the supply chain. Products that a particular area uses, but are not made in sufficient quantity locally, may need to be imported. Also, in time of higher need (for example, at harvest time), adequate supplies of a particular fuel may not be available.

## 4.6 Conclusions

Energy security is not something we can depend on in the future. Financial problems of a number of countries appear likely to play havoc with energy security, as we have known it. Energy outages because countries cannot afford energy products, or cannot get the credit needed to buy energy products, are likely to become common.

Solutions to these energy security risks are not obvious. In fact, the use of renewable energy may make these energy security issues worse, if the real issue is the high price of energy products, and the substitutes are even higher-priced.

Taxes on oil products by one country (or by several countries) may not be a solution either. The problem is that the world's oil supply remains close to fixed, regardless of price. Unless the taxes are worldwide, the taxes tend to shift usage from countries with these taxes to the countries without them, making the problems of the countries with the taxes worse. Figure 4.5 shows that the growth of oil consumption is already very skewed. The countries with declining oil consumption tend to be the ones that experience recession.

If our problem is that high-cost energy products cause financial distress, we need to address this issue directly, and seek out low-cost energy sources as solutions. Otherwise, we may simply need to give up energy sources as they become too expensive for our economies, and live with very changed economies.

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