Introduction

A focus on oil hardly needs justification. Oil is a political commodity (Penrose 1976) and has always assumed center stage in key international affairs. Moreover, oil is a global commodity: crude oil together with its refined products is the most widely traded physical commodity measured either by volume or value (Stevens 2005). On a weight or volume basis, oil has the highest energy content compared with other fuels such as gas or coal. Despite a reduction in its relative share within the global energy mix in the last decade, oil remains the largest source of primary energy (34.4% in 2010), followed by coal (29.1%) and natural gas (23.4%) (see Table 5.1). As a liquid fuel, it is highly convenient, and exhibits large technical economies of scale at the various stages of production and transportation (Frankel 1969). The transport and aviation sectors, the lifelines of a modern economy, are still almost totally reliant on refined products from crude oil.

From a producers’ perspective, oil is a crucial resource. Despite efforts to diversify their economies away from hydrocarbons, the oil sector remains the engine of economic growth and development in most producing countries. Oil exports generate the bulk of the foreign currency needed to meet import requirements. They also generate the bulk of the government revenues needed to implement key developmental and social projects and to diversify and industrialize their economies to achieve sustainable economic growth and to create employment opportunities for the hundreds of thousands of workers entering their labor markets each year. Given the dominance of the oil sector in their economies, producers are vulnerable to episodes of price instability and to protracted declines in oil prices, especially as compared with the more diversified OECD economies.

Moreover, since the large oil price shocks of the 1970s, it has been widely argued that these shocks have had large effects on the global economy, with nine of the ten post-World War II recessions in the US preceded by episodes of sharply rising oil prices (Hamilton 1983). However, recent studies indicate that the sharp oil price rises during 2002 and 2008 did not have the anticipated adverse effect on the global economy (Kilian 2009; Segal 2011) or core inflation (Cecchetti and Moessner 2008). For instance, Rasmussen
and Roitman (2011) show that oil price shocks have generally not been associated with a contemporaneous decline in output, with the exception of the US, and although there is evidence of lagged negative effect on output especially for OECD economies, the effect has been relatively small. Nevertheless concerns about the impact of high oil prices on the global economy continue to dominate the public and academic debate, with Christine Lagarde, the managing director of the IMF, describing the recent oil price rises as “a new threat that could derail the recovery” while Ali Naimi, the Saudi Oil Minister, described high international oil prices as “bad for Europe, bad for the US, bad for emerging economies and bad for the world’s poorest nations.”

Increasingly, oil market developments need to be seen in a broader context for more than one reason. To start with, energy policies interact with other political and economic policy agendas, particularly energy security and climate change. Another reason is that long-term analyses of the position of oil, usually based on extrapolation, have frequently turned out to be spectacularly wrong. Is extrapolation of relatively high oil prices today justified or will oil market dynamics take a different turn? The recent sharp oil price movements have added another dimension related to the drivers of oil prices, the role of fundamentals versus speculation in the oil price formation process, and the design of regulation of commodities derivatives in the aftermath of the 2008 financial crisis (Fattouh et al. 2012; Turner et al. 2011). Another reason for analyzing oil in the broader international context is the issue of rent distribution and how competition to capture a higher share of the rent in the oil supply chain shapes producer–consumer relations (Fattouh and van der Linde 2011).

The objective of this chapter is to focus on issues surrounding international oil markets within the wider context of international energy, energy security and climate change policies, the global economy, and producer–consumer relations. The following sections cover the position (and uncertainties) of oil in the energy mix, energy security, climate change, taxation and subsidies, pricing in the international oil market, and the absence of anticipated feedbacks. The concluding section reverts to some of the big questions and contradictions in the current energy discourse and how they might be resolved.

**Projections and Uncertainty about Policy**

Long-term projections of oil prices, usually based on extrapolation, have frequently turned out to be spectacularly wrong. Extrapolation from the 1950s and 1960s led the Club of Rome to predict unsustainable growth and unaffordable prices. High prices were indeed a feature of the 1970s and early 1980s. But two world recessions (often regarded, rather simplistically, as oil induced), the spectacular substitution of natural gas for oil in power generation and in space heating, as well as technological innovation and
developments on the supply side (e.g., the North Sea, Alaska) confounded the conventional wisdom. Instead, oil prices effectively collapsed from 1985 into 1986 (sometimes described as the “counter shock”) ushering in nearly two decades of low oil prices and low investment in all segments of the oil sector.

The dangers of extrapolation were, again, spectacularly illustrated by the *Economist* newspaper’s (1999) prediction that “the world is awash with the stuff, and it is likely to remain so” and that “$10 might actually be too optimistic” and oil prices might be heading for $5 per barrel. Only nine years later, in 2008, the price of dated Brent reached its historic high of $144.2 per barrel on July 3, and at the time of writing (November 2012), with recovery from the “great recession” on its way and geopolitical uncertainty abounding, Brent is again trading at around $110 per barrel.

Is extrapolation of high oil prices justified now? The conventional wisdom among oil analysts is that structural changes have tightened market fundamentals and have placed oil prices in an upward path. One of the most important shifts in oil demand dynamics in recent years has been the acceleration of oil consumption in non-OECD economies. Between 2000 and 2010, oil demand growth in non-OECD outpaced that of the OECD in every year. During this period, non-OECD oil consumption increased by around 13 million barrels per day (mbd) while that of the OECD dropped by 1.5 mbd (BP 2011). At the heart of this growth lies the Asia-Pacific region, which accounted for more than 50% of the incremental change in global oil demand during this period.

According to the conventional wisdom, this demand can only grow further as economic development proceeds, household incomes improve, and car ownership increases. Evidence from countries with long time-series data such as the US, Japan, and European countries shows a slow growth of car ownership at early stages of economic development. As income per capita reaches a certain threshold, growth in car ownership is twice as large as the growth in income. At high levels of income, growth in car ownership tends to slow down but will continue to grow as fast as income (Dargay et al. 2007). Although many expect OECD economies to reach a saturation point very soon, the evidence of such a saturation effect is not yet very strong. This stylized fact also applies across countries: countries with relatively higher income per capita tend to have higher car ownership.

On the supply side, despite the sharp rise in the oil price between 2001 and 2008 and the price rebound since 2009, the response of non-OPEC supply outside the Former Soviet Union has been muted. Between 2000 and 2010, non-OPEC production added only around 4 mbd to world oil supplies (BP 2011) with the bulk of the increase accounted for by Russia. This slow growth can be explained by a number of factors including sharp decline rates in mature oil fields and the increasing cost of exploration and development of new reserves. According to OPEC (2009), the weighted average annual observed decline rate, over the period 2000–2008, stood at 4.6% per annum, implying that 1.8 mbd of non-OPEC supply needs to be replaced each year simply to prevent oil supply from declining. A combination of high oil prices, hardened fiscal terms, and limited access to reserves has also pushed non-OPEC producers to explore new frontiers. These include the exploitation of oil reserves in deep and ultra-deep waters in places such as the Gulf of Mexico and shale oil in the US, Angola and Nigeria in Africa, and Brazil in South America. In addition, oil companies have turned to developing unconventional resources such as oil sands, bitumen, extra heavy oil, and shale oil, as well as biofuels, coal to liquids (CTL), and gas to liquids (GTL).

These changes on the supply side have a number of important implications. In effect, the world has entered the phase of substituting a relatively cheap-to-extract barrel with a relatively expensive-to-extract one. It has become technically, financially, and
managerially much more challenging to extract oil in new areas. In addition, maintaining stable decline rates in mature fields requires the use of advanced and more costly technology. Moreover, the production of unconventional resources such as oil sands and shale oil raises serious issues about the environmental costs, including the effect on greenhouse gas (GHG) emissions. Finally, because of the risks and the higher costs involved in development and production, non-OPEC supply has become more sensitive to oil price cycles. Specifically, there seems to be an asymmetric response to oil price changes. A sharp rise in the oil price induces a modest investment response in non-OPEC countries, while a decline in the oil price generates a sharp fall in investment in the oil industry, especially in those segments with relatively high marginal costs.

With these changes in the dynamics of oil supply and demand, combined with the fact that oil supply and demand responses to prices are low especially in the short run, it is easy to produce scenarios that lead to higher prices into the future. An extremely important aspect of the story is that oil will continue to be required in the transport sector where substitution is extremely difficult. Producers of oil, so the story goes, can be relatively complacent because oil is “special.”

But history suggests the need for caution. There have been enormous changes in the relative prices of different sources of primary energy. In the 1980s, a comparable change in relative prices led, in the industrial countries, to a massive substitution of gas (and coal) in power generation and in space heating, essentially eliminating oil from the mix except in niche sectors such as stand-by generation capacity. It is argued that the easy substitutions (the low hanging fruit) have already occurred. But is this true? And will it remain true? There are substitutes for crude oil in its main usage. One, obviously, is biofuels. They are small as yet. But Brazil, perhaps a special case, has substituted around 50% of its gasoline consumption in the transport sector with ethanol, and it happened over a relatively short period of time. Corn ethanol in the US is highly controversial, given its costs, its carbon footprint, and its effect on land use and food prices. But technological breakthroughs are possible. As with other technological developments, they are, perhaps, difficult to predict, but the economic incentives are already in place. Ethanol, even at present, makes a significant contribution to US fuel supply.

The possibility of substitution for crude oil in its main use is even more obvious from another direction. Different fossil fuels, coal, oil, and gas, can be converted into each other, at a price and with costs in terms, for example, of thermal losses and of carbon emissions. At current prices, especially in North America, both GTL and CTL appear to be economic. The capital costs are high, but in the longer term there are major implications for a study such as this. Within the fossil fuel sector, backstop technologies should limit the price of oil and oil products, in much the same way as the prospective costs of developing more difficult oil reserves such as oil sands and shale oil should limit prices at the margin. It is possible to imagine a transport sector, technically much like it is today, with little dependence on crude oil as such. Of course, low cost oil, for example from the Middle East, could still compete, but not at any price! One implication is that the idea of “peak oil,” usually based on some idea of the physical availability of oil, needs to be critically evaluated. If oil, gas, and coal are considered together as potential sources of liquids for the transport sector (and feedstock for the chemicals industry) the problem is not shortage but, from a climate change point of view, abundance. The consequences of using what is available without some way of dealing with CO₂ emissions would, according to climate scientists, be catastrophic.

A rather different potential channel is the substitution of gas for oil at the point of use. There is still oil used in power generation, especially in non-OECD countries,
which is increasingly uneconomic. More radically, compressed natural gas (CNG) or liquefied petroleum gas (LPG) could be used directly in the transport sector. Public sector transport in Delhi, for example, is almost entirely based on CNG, which can compete with diesel even at relatively high Asian gas prices (Jain and Sen 2011). The potential for such substitution is very large. Clearly, too, there is the possibility of substitution through transformation, especially through the use of electricity to replace end use fossil fuel burning applications, such as electric cars and heat pumps. The processes are in their infancy, and the lags are likely to be long even with favorable technical developments, especially in battery technology. But, increasingly, the different elements in the complex international energy system are likely to come together via the electricity sector. Many observers strongly believe that hybrid and electric cars are destined to play a key role in the future. Deutsche Bank (2009), for instance, predicts that in the US, hybrid and electric cars will account for around 25% of new vehicles by 2020 and 8-9% of the vehicles on the road. For China, it predicts that about two thirds of new light vehicle sales will be highly efficient and that half of all light vehicles will be electric or hybrid by 2030. In its reference scenario, the EIA (2010) expects the market share of “alternative” vehicles to increase to 49% of new vehicle sales by 2035 in the US, from the 2008 level of 13%.

The “shale gas revolution” is a clear example of how technological innovation could prove to be a game changer. The conventional wisdom had it that the US would become a major importer of LNG within the Atlantic basin, competing with Europe and Asia. Instead, its demand for imports of LNG effectively disappeared. Reflecting this, domestic gas prices in the US fell sharply, and at the time of writing are a fraction of Asian LNG prices. Some analysts now see the US as a substantial potential net exporter of gas to the rest of the world, with arbitrage working the other way. Hydraulic fracturing and horizontal drilling technology are also helping to unlock billions of barrels of oil, with some analysts predicting the US supply from tight oil will reach 3 mbd by 2020 (Wall Street Journal 2012). Others go further, claiming that recent developments in the US energy sector have “unexpectedly brought the United States markedly closer to a goal that has tantalized presidents since Richard Nixon: independence from foreign energy sources” and predict wide repercussions which “could reconfigure American foreign policy, the economy and more” (Krauss and Lipton 2012).

The main message is that, though oil is special, it is not that special, and the possible technical and economic substitutions against oil could, in the longer term, be very great, especially if electricity makes major inroads into the transport sector. A crucial part of the story is price: both the general level of energy prices relative to other goods and services, and the relative prices of competing fuels within the overall mix. There have been large increases in the price of energy over the last decade and large changes in relative prices. If they persist, the future is unlikely to be like the past.

The wide divergence in views about the future position of oil in the energy mix is mainly about the role of technology and policy: what policies will be adopted and how effective these policies will be in shaping the oil market. Two types of policies stand out: energy security and climate change.

**Energy Security and Investment**

Much oil is concentrated in the Middle East and other politically unstable areas of the world economy, distant from the main concentrations of consumption. This gives rise to security concerns among oil importing countries, which fear disruption to the regular flow
of oil supplies. Such disruptions can occur at any segment of the very long oil supply chain, which includes refining, international and local transport, storage, and delivery facilities. Disruptions can be caused by a large number of factors such as technical failures, weather events (hurricanes and storms), terrorist attacks on oil facilities, civil strife in producing countries, wars involving oil exporters, revolutions and regime changes that restrict the export capability of some producers, closure of oil trade routes, and a deliberate action by one or a group of exporters to restrict their oil supplies to certain consuming countries (sometimes referred to as the “oil weapon”).

During the 1990s, the availability of large spare capacity and the willingness of key OPEC member countries to fill the gap in case of disruption meant that concerns about physical disruptions received little priority in consumer countries’ policy agendas. This however has changed in recent years. A decline in the size of spare capacity and a series of supply shocks in key producing countries such as Iraq, Venezuela, Nigeria, and Libya have brought to the fore the issue of energy security. Iran’s recent threat to use the oil weapon, the European embargo on Iranian oil imports, and the US sanctions on financial institutions engaging in direct dealings with Iran’s Central Bank have further elevated the geopolitical risks as well as fears of a major supply disruption (El Katiri and Fattouh 2012).

Depending on the nature of the disruption and the availability of spare capacity, the market often adjusts to disruptions through sharp price increases. In such events, consumers who are concerned about securing oil supplies tend to increase their precautionary demand, causing prices to jump higher than what is justified by the reduction in supplies due to the disruption. Sharp adjustments in the oil price often impose high economic and social costs on oil importing countries. In order to mitigate the impact of such supply shocks, many governments hold strategic oil stocks, with the US, through its Strategic Petroleum Reserve, holding the largest stockpile. At the core of the International Energy Agency (IEA), established in 1973 in the wake of OAPEC’s decision to restrict oil exports to the US and selected industrial countries, are the requirements that IEA members maintain emergency oil stocks equivalent to at least 90 days of net oil imports and participate in oil allocation among members in case of emergency disruption. India and China have also embarked on ambitious plans to build their strategic reserves, with recent heightened geopolitical risk providing a strong impetus for accelerating such plans and expanding the size of strategic stocks. In the short term, maintaining strategic stocks remains the most concrete and effective instrument available to oil importers to deal with physical disruptions.

In the long run, governments can pursue policies aimed at diversifying energy sources, reducing oil dependency, and encouraging oil substitution policies through regulations, incentives, subsidies, taxation, moral suasion, and/or combination of these instruments. There is much uncertainty as to whether these various policies will be implemented and the potential impact of such policies on long-term oil demand. The large sums of government investment in research and development, and financial incentives for alternative forms of energy and for reducing dependency on oil, are not new on the political agenda. Comparable investment pledges and incentives have been made in the past century with few tangible results. Furthermore, these policies and debates are very much influenced by economic developments and by oil price behavior. Economic recessions, combined with low oil prices, might dampen enthusiasm for some expensive alternative energy projects and carbon taxes, while high and volatile oil prices can speed up efforts for alternative energy projects. That being said, the pressure to restructure the energy mix away from oil will not disappear. However, the effects of policies on oil demand, even when widely
implemented, will not be disruptive to the oil market. Nevertheless, the impacts of these policies are cumulative and most probably irreversible and hence cannot be ignored in the long term.

The dynamics of supply and demand may also result in market dislocations. In the worst possible scenario, global oil supply may not grow fast enough to meet the expected demand growth due to insufficient investment in new productive capacity. In such a scenario, given the long gestation lags in investments in the oil sector, most of the adjustment occurs through price increases. New oil supplies, the entry of competing fuels, and/or the development of efficiency measures cannot act as immediate adjustment mechanisms. Declines in oil demand associated with economic slowdowns and high prices can resolve investment bottlenecks and may even create spare capacity in the system. Spare capacity and an environment of low oil prices can, in turn, discourage investment in the oil sector. The disincentive to invest then creates the roots of the next oil price shock once oil demand recovers. In other words, the adjustment mechanism in the oil market is far from smooth: the oil market can witness long periods of large surplus capacity followed by periods of tight capacity. These alternating states of the oil market affect investment decisions and, hence, future supply availability.

This feature of cyclicality is common to other industries as well, but there are three special features that distinguish the oil industry from other industries. First, in countries where proven oil reserves are highly concentrated the decision to extract and develop these reserves is in the hands of governments or state actors. This has important implications, as decisions about whether and how much to invest are affected by economic and political factors and by events both inside and outside the oil market. The oil price is one of the various determinants of investment. Other determinants include political impediments such as sanctions, civil strife or internal conflicts; the nature of the relationship between the owner of the resource and the national oil company responsible for exploiting these reserves; the technical and managerial capability of the national oil company; the degree of access to reserves to foreign investors; and the petroleum regime and the fiscal system that govern the relationship between national and international oil companies. One factor that has received special importance in the consumer–producer dialogue is long-term oil demand uncertainty. Oil producers often argue that the policies of consuming governments, both implemented and announced, play an important role in inducing uncertainty and thus, in the face of calls for security of supply, they have coined the concept “security of demand.”

Second, oil projects have long gestation periods and can be subject to delays. These delays do not only occur because of the size of the projects and the large capital outlays involved but can also be due to issues such as access to reserves and the complexity of the negotiations between international oil companies, national oil companies, and the owner of reserves in both the pre- and post-investment stages. The relationship between the international oil companies and the owner of the reserves (the government or state-owned enterprise) is affected by oil price developments, but equally importantly, it affects oil price behavior through the investment channel.

Finally, producers’ investment decisions affect the market structure in a fundamental way. High oil prices do not necessarily induce governments of producing countries to increase investment and productive capacity. In contrast, a combination of high oil prices and limited access to reserves has pushed many international oil companies to explore new frontiers. The effect is that the cheapest oil reserves are not necessarily developed first, allowing for the coexistence of both high-cost and low-cost producers, with important consequences for the process of oil price formation.
The interactions between energy security and geopolitical issues, on the one hand, and more straightforwardly economic issues such as investment, on the other, account for part of the complexity surrounding discussions of international oil. Within such a framework, the main issue is how the oil market and its different players adjust to ensure the market does not suffer from a serious dislocation. But such a framework already appears out of date, due to the developing climate change agenda, which now interacts with nearly all aspects of the energy debate.

The Climate Change Agenda

The climate change agenda starts with an imperative, essentially to control cumulative GHG emissions (especially CO₂) in order to limit the risk of global temperature rise above some dangerous or very costly level. Needless to say, the science is subject to considerable uncertainty (there remain climate change skeptics), which is an essential part of the policy problem. Put thus starkly, the issues may appear mainly scientific and technical rather than economic, except in the rather trivial sense that whatever needs to be done should be done in the least costly way. This methodology is apparent in the widespread use of scenarios or “backcasts” illustrating possible ways of meeting particular specified targets for emissions at some future date: see, for example, the IEA’s 450 scenario (IEA 2010), intended to limit global temperature rise to 2 °C. It is not surprising that analysts in the economic realist tradition, as well as many climate change economists, are highly skeptical about the usefulness of such exercises. The output of such exercises is the delineation of a gap between what is likely under a business as usual (BAU) scenario and what is required. The typical response has been the widespread adoption by governments of targets for GHG emissions or for renewable energy use, essentially a declaration of intent rather than a clear, worked-out policy response.

But the existence of the climate change agenda markedly alters the nature of the debate over international energy, including oil. First, the largest and fastest growing source of GHGs is coal, not oil (the largest users of coal are China, followed by the US, India, Indonesia, Russia, and Germany). For a given amount of energy, coal is roughly twice as polluting as gas, with oil roughly in between. Obviously there are potentially huge benefits to GHG emissions from the widespread substitution of gas for coal, largely in the power sector. To go further, however, would require substitution of non-carbon sources of primary energy, such as hydro and nuclear, renewables, and/or the development of carbon capture systems allowing the continuing use of hydrocarbon fuels.

Second, some potential substitutions for oil such as CTL and GTL are themselves extremely bad from the point of view of carbon emissions. Thus, they are a potential solution to a shortage of oil, but not to wider climate concerns.

Third, a potential solution for the transport sector via electrification would be no use at all if the electric power was produced by burning coal. (There is an irony in the enthusiasm for electric vehicles by the US and China, the two largest coal-burning countries in the world.) Most climate scientists believe that meeting targets such as those of the IEA would require the more or less complete decarbonization of the power sector as well as substantial reductions (compared with BAU) in hydrocarbon use in transport.

Finally, climate change policies induce wide uncertainty about the future position of oil in the global energy mix. As suggested in the literature on irreversible investment under uncertainty, the large investment outlays in oil projects and the irreversible nature of these investments have the effect of increasing the value of the option to wait. There is
thus a case for producers to delay their investment decision until there is clearer picture of how climate change policies will affect their core product, at what pace this will occur, and what impact these policies will have on the oil price. The lack of a credible global approach aimed at putting a universal price on carbon only adds to this uncertainty.

Clearly, the climate change perspective on international oil issues is very different from the conventional wisdom among many oil industry analysts of expected tight market fundamentals. At the extremes, different assumptions account for the difference between worries over “peak oil,” on the one hand, and worries about “stranded oil” on the other. Essentially, the differences hinge on technical and economic assessments (e.g., about efficiency developments and substitutions) and about the policies that are likely to be adopted. Thus forecasts for oil depend crucially on assumptions, or forecasts, about the policies that will be adopted and about how effective they will be. Integrating potential policy responses in projections, however, creates wide uncertainty about the future evolution of oil market fundamentals.

It might be thought that assessments or forecasts based on “likely policies” are the most “reasonable” in the circumstances. But the contradictions remain. BAU, as climate change analysts often point out, does not work, and the same may be true for “likely policies.” The message then becomes essentially a contradiction: the forecast will not materialize since, if it did, something else would have to happen in response to the increasingly urgent need for climate change mitigation strategies.

Taxation, Subsidies, and Rent Distribution

The energy security and climate change agendas interact with another core feature of the oil market: the distribution of rent among the various players in the supply chain and between consuming and producing countries. As put by Fattouh and van der Linde (2011), “oil creates large economic rents, which are contested between producing and consuming countries, and among the various other players active in parts of the value chain, each wanting to capture a share. The sizable economic rents have been a prize deemed worth fighting for, far beyond the normal competition among market players. They have guaranteed persistent involvement by governments everywhere, either as producers or tax collectors.”

The failure to appreciate this special dimension of the oil market has often rendered analyses of oil and its role in the political and economic order incomplete and misguided. Consumer governments, not surprisingly, would prefer to capture the rents involved via domestic taxation or equivalently by cap and trade systems, such as the EU’s Emissions Trading System. Demand for petroleum products is highly inelastic due to limited substitutes, while its consumption is associated with negative externalities such as air pollution and adverse health effects. Thus, taxes on petroleum products are also perceived to be an efficient way to raise revenues for consuming countries and as a way to correct for negative externalities. Since taxes represent a large portion of the price of petroleum products at the pump, a given rise in international crude oil prices is associated with less than proportionate increase in the price of petroleum products. Thus, in many countries, taxation weakens the demand response of petroleum products to changes in crude oil prices in international markets. In recent years, many OECD and non-OECD countries are stimulating the use of renewable energies, often through a combination of subsidies and taxes, to change the composition of their energy mix to one with lower carbon content. Such policy measures can have large impacts on the demand and supply for certain fuels.
From the oil producers’ perspective, taxes on petroleum products are seen as discriminatory, tending to dampen oil demand growth, and reducing the producers’ export share in the energy mix in the long term. Equally importantly, they raise a distributional issue since, through taxation, consuming countries can capture part of the rent, and in many cases more than the share extracted by producers themselves.

The counterpart of producers’ complaints about taxation of petroleum products is concerns about energy subsidies. The policy of maintaining tight control of domestic energy prices has characterized the political and economic environment in many producing countries for decades. The objectives behind such a policy range from overall welfare objectives such as expanding energy access and protecting poor households’ incomes to economic development objectives such as fostering industrial growth and smoothing domestic consumption, and to political considerations, with energy subsidies constituting one of the various channels through which resource-rich countries can distribute oil and natural gas rents to their population (see El Katiri et al. 2011 in the context of Kuwait). While energy subsidies may be seen as achieving some of a country’s objectives, they are a costly and inefficient way of doing so. Energy subsidies distort price signals, with serious implications on efficiency and the optimal allocation of resources. They also impose enormous fiscal burden on state budgets. Over time, energy subsidies may also strain the export capabilities of producers, when demand continues to rise faster than supply. Subsidies may also undermine the climate change agenda and sustainable development.

**Oil Price Movements: Speculation versus Fundamentals**

During the period 2002–2008, the oil market experienced the most sustained increase in prices in its recent history, with the annual average price rising for seven consecutive years. This sustained rise in the oil price occurred in the absence of shifts in the power structure between producers and consumers (as happened in 1973 when OPEC took control over the pricing system) or big supply shocks (such as the disruption that followed the Iranian revolution in 1979). The oil price boom ended with a spectacular collapse toward the end of 2008, which saw the oil price decline by more than $100 per barrel in December 2008 from its July 2008 peak.

The sharp swings in oil prices in 2008 have polarized views about the key drivers of oil prices. On the one hand, some observers within the oil industry and in academic institutions attribute the recent behavior in prices to structural transformations in the oil market. According to this view, the boom in oil prices can be explained in terms of oil demand shocks, low price elasticities, rigidities in the oil industry due to long periods of underinvestment, and structural changes in the behavior of key players such as OPEC.

Within this tradition, some argue that price instability is an intrinsic feature of the oil market since there is a wide range within which the oil price can clear (Mabro 1991: 23). The lower boundary of the range is set by the cost floor of oil production in key OPEC countries, while the upper boundary is set by the potential entry of oil substitutes and, more recently, by the anticipations and behavior of participants in the financial markets. When the market is characterized by excess capacity, as it was in 1998, the oil price tends to move toward the lower boundary. When the market is characterized by excess demand (ex-ante), potential substitutes and adjustments in demand patterns cannot place a cap on the oil price in the short term. Instead, in the absence of spare capacity, most of the market adjustment is likely to occur through sharp increases in oil prices.

An opposing view is that changes in “fundamentals” or even expectations about these fundamentals have not been sufficiently dramatic to justify the extreme cycles in oil prices.
According to this view, the oil market has been distorted by the entry of speculators and financial players and particularly by substantial and volatile passive investment by index investors in deregulated or poorly regulated crude oil derivatives markets (Masters 2010).

While financial institutions have been the largest traders of oil since 1985, banks have become more involved in bridging the gaps between producers and a more diverse set of customers. In the last few years, other financial players such as pension funds, hedge funds, and retail investors increased their exposure to the oil market, a process referred to sometimes as “financialization” of oil markets (Tang and Xiong 2010). Financial innovation provided an easy and a cheap way for various participants, both institutional and retail, to gain exposure to commodities through a variety of financial instruments such as futures, options, index funds, exchange-traded funds, and other bespoke products. Figure 5.1 shows that between 2000 and 2011 the quarterly average of the number of outstanding oil futures contracts at the end of each NYMEX trading day increased dramatically from around 400,000 contracts to more than 1.4 million contracts (each representing 1000 barrels).

Many factors have been suggested to explain why financial players have increased their participation in commodities markets. Tight market conditions encouraged the entry of active money funds and institutional investors into commodities markets, including the crude oil market. Tight market conditions increase the upside potential for financial investments and speculative bets, especially in the presence of shocks originating from various sources. The historic low correlation between commodities in general and other financial assets such as stocks or bonds increased the attractiveness of holding commodities for portfolio diversification. Because commodity returns are positively correlated with inflation, many investors entered the commodities market to hedge against inflation risk and a weak dollar. Furthermore, expectations of relatively high returns to investment in commodities compared to other financial assets motivated many investors to increase their exposure.
Due to data limitations, issues of causality and endogeneity, and lack of a clear definition of concepts such as speculation and financialization, the academic literature has not provided convincing evidence that speculation or “excessive speculation” has been the key driver of oil prices during the period 2002–2008 (see Fattouh et al. 2012 for a recent review). Quite to the contrary, evidence from structural models indicates that oil demand shocks driven by global economic expansion account for the bulk of price increases. Some studies such as Lombardi and Van Robays (2011) find some evidence of destabilizing speculation, but its importance is very limited, especially in the long run.

This does not imply that the large entry of financial players had no impact on oil markets. However, the literature has so far failed to provide an answer as to whether increased financialization has been detrimental to the functioning of the oil market and whether it has resulted in the improvement or the deterioration of social welfare. For instance, some argue that financialization contributed to an increase in price co-movement between oil and financial assets such as stocks and bonds, enhancing volatility spillover effects from financial markets to the oil market (Tang and Xiong 2010) and eroding the diversification benefits in commodity markets (Silvennoinen and Thorp 2010). Hamilton and Büyüksahin et al. (2009) find that increased financialization is associated with more efficient derivatives pricing methods. Pirrong (2011) shows that greater financial market integration increases liquidity, reduces the market price of risk, and increases the level of inventories, with the effect of lowering of probability of future price spikes.

Nevertheless, concerns about the impact of “excessive” speculation and financialization have pushed many governments to tighten regulation of commodity derivatives markets. In 2010, President Barack Obama signed the most sweeping financial rules since the Great Depression into US law (the Dodd–Frank Wall Street Reform and Consumer Protection Act). The Commodities Futures Trading Commission (CFTC), the agency with the mandate to regulate commodity futures and option markets in the US, has identified 30 areas where rules will be necessary. These reforms will have direct impact on the functioning of commodities’ derivatives markets. Some of the rules relate to clearing and trading mandates, the purpose of which is to move “standardized” derivatives onto clearing houses to reduce risk. Other rules relate to data reporting requirements. These include the establishment of swap data repositories (SDRs) and the requirement that both cleared and uncleared swaps be reported to SDRs registered with the CFTC. Another important area is the imposition of limits on aggregate positions and the amount of positions (other than bona fide hedging positions) that may be held by any person with respect to physical commodity futures. The European Commission has also issued many rules concerning commodities. These include the Regulation on Energy Market Integrity and Transparency (REMIT) which covers all wholesale energy trading in the EU, including contracts and derivatives for the supply and transportation of natural gas and electricity, and the European Market Infrastructure Regulation (EMIR) aimed at mandating central clearing of eligible derivatives contracts and improving reporting by requiring over-the-counter trades to be reported to electronic trade repositories.

**Increased Uncertainty and Limited Feedbacks**

Fattouh (2010) proposes an interpretation of the long-term behavior of oil prices based on a shift to a regime of increased uncertainty about oil market fundamentals and lack of feedbacks. Until recently, expectations about short-term oil price behavior rested on the assumption that changes in oil prices would induce responses or feedbacks from
supply, demand or policy, or a combination of all three, which would prevent prices from rising above a certain ceiling or falling below a certain floor. On the demand side, the feedbacks from high oil prices to demand operated through two main channels. High oil prices would have an adverse impact on oil demand through a price effect, an income effect, and changes in consumer behavior. Furthermore, high oil prices would eventually slow economic growth and induce recessionary pressures, with a detrimental effect on global oil demand. On the supply side, high oil prices encourage investment in the oil sector, inducing a supply response, but with a multi-year lag. High oil prices also encourage substitution at the margin by increasing the price of oil relative to other energy sources. One important factor that allowed the conventional framework to persist for a long period of time was the availability of large spare capacity. Spare capacity effectively increased the elasticity of oil supply and generated strong feedbacks, even when the market endured strong shocks that resulted in large supply disruptions.

As oil prices rose sharply during the boom years, perceptions of strong feedbacks were replaced by perceptions of limited feedbacks. Uncertainty as well as difference of opinion about the existence, the size, and the timing of feedbacks from prices to oil supply and demand increased markedly. In particular, four key feedbacks that were expected to put a ceiling on the oil price were not strong or visible enough: high oil prices did not trigger inflationary pressures and a subsequent recession; high oil prices did not induce an immediate strong growth in supply at the margin; during the upswing, producer power did not appear to be the cause of the price rises but nor was it used to limit the rise in prices; and the gradual erosion of spare capacity has had the effect of steepening an already highly inelastic supply curve. The lack of feedbacks affected the way in which expectations were formed, with important implications for oil price determination. The market entered into a phase of indeterminacy of beliefs, where market participants (including oil companies and oil producers) did not know where to anchor the anticipated oil price that would balance supply and demand in the short and long run. In effect, prices in the short and long run became jointly determined (Fattouh and Scaramozzino 2011).

In a framework of difference in opinions, heterogeneity of traders and uncertainty about feedbacks, higher order beliefs (players’ beliefs about other players’ beliefs: players’ beliefs about other players’ beliefs about other players’ beliefs, and so on) can play an important role in influencing short-term price movements (formalized by Allen et al. 2006). This captures some of the intuition provided by Keynes’s “beauty contest” metaphor where traders are motivated to guess other traders’ guesses to benefit from short-term movements in oil prices, and offers useful insights that help to explain the sharp rise in oil prices in the first half of 2008. One such insight is the importance that public information or publicly observed signals acquire in the context of beauty contests, even if these public signals do not necessarily reflect large changes in underlying fundamentals or provide new information to the market. Since public signals can affect a player’s guess about other players’ guesses, they could have a disproportionate impact on the oil price (Morris and Shin 2003). The framework can also account for another interesting feature of the oil market. While there is an endless stream of public news and information, traders often seem to limit their attention to a few signals that they consider important. For coordination games to work in practice, market participants should only consider signals that are public and are thought to affect the expectations of other participants at a particular point in time. After all, it is impossible to coordinate on a large number of public signals. To what extent do these features that characterize price behavior in equity markets also play out in the commodities market? This is yet to be determined and is need of further research.
Conclusions

This chapter has emphasized a particular view of oil markets and their instabilities, stressing the uncertainties about the fundamentals, indeterminacies resulting from a lack of feedbacks, and the need for the market to coordinate on some consistent view (or story) in a situation where there is a wide range of plausible future possibilities (at least quite a wide range). But what are some of the policy implications if this kind of account is true? It is certainly of little help to those whose job it is to forecast the oil price, since it suggests intrinsic uncertainty. To an extent, it may justify the use of scenarios which focus on what goes with what, rather than unconditional projections. It may help in throwing some light on the debates over speculation versus fundamentals, since, if the situation is as described, it would seem unlikely that regulatory measures such as position limits would make much difference. On a more positive note, it may suggest more research and analysis on the factors that may, if perceived by the players in the market, limit the range of possibilities. An obvious example would be the dissemination of research on backstop sources of liquid fuels, and backstop technologies.

One obvious point is that, if the problem arises from a lack of feedbacks, and uncertainty about the fundamentals, then there are policies that could help. These range from simple dissemination of information about fundamentals, to policy moves to strengthen the perception that there will be responses, on the supply side or the demand side, to commitments by certain players to act in particular (contingent) ways. For instance, if market perceptions are wrong about the extent and the timing of feedbacks (for instance, if the market believes that there are no feasible instruments while in fact these exist), then policy could play a role in preventing sharp price movements by increasing the visibility of these feedbacks and policy responses.

The analysis points to the importance of a transparent and cooperative international approach to the issues involved, within institutional forums such as the International Energy Forum, the G20, and other bodies. This appears especially important when oil market issues are seen in the wider context of other agendas such as security and climate change, since developments in these areas can clearly influence oil market outcomes.

In fact, a lot is known in broad terms about the drivers of oil prices. For example, it is a safe bet that the anticipation of a marked slowdown in non-OECD growth (on the basis of news about the data, or because of new analysis from the IMF or other bodies) would lower the oil price. News about potential supplies from Iraq, or about deep-water technical problems in the Gulf of Mexico or offshore Brazil, feeds into the general picture with usually predictable effects. The list of potential impacts is endless. The uncertainty about many of these means that it is no surprise that forecasts and assessments often turn out to be wildly wrong. When the world changes, so does the oil market.

A particular uncertainty, which is especially important for the future of oil, concerns technical change and the diffusion processes involved in large transitions. Despite the lack of a coherent international climate change mitigation program, there is in fact a great deal going on, with different approaches and different policies in different countries responding to local conditions and local market failures. Much of this is irreversible and cumulative. Could it turn into a major transition with large effects on the future demand for oil? It is very hard to quantify. Such a large-scale transition certainly appears necessary if climate change mitigation goals are to be realized. We have already noted that, for something like the IEA’s 450 scenario to be realized, this would require more or less complete decarbonization of the electricity sector, and substantial decarbonization...
of the world’s transport sector as well. This is a scenario in which oil demand could fall substantially, with stranded assets in the longer term.

There are some paradoxical aspects to this. The deployment of renewables on a large scale, which would almost certainly require subsidies, could lead to low oil prices, leading to the need for even higher subsidies. An alternative, within consumer countries, would be higher taxes on conventional fuels or on their carbon content to make alternatives economic, unless there were spectacular falls in the costs of alternatives and technologies. Countering the problem with higher taxes would have to be international, otherwise cheaper oil would flow to areas where fossil fuels were not taxed. Another, equally unlikely, solution would be for the producers to receive compensation for not producing fossil fuel on the lines of “set aside” schemes often applied in agriculture. There are already a few schemes of this type designed to protect carbon sinks such as rain forests. Such issues are very complex and highlight a core feature of the oil market: the competition over rents between producers and consumers. Consumer governments would prefer to capture the rents involved via domestic taxation or equivalently by cap and trade systems. Producers would rather claim the rents for themselves by maintaining increasingly stringent constraints on investment and supply.

Finally, we revert to the apparent dissonance or disconnect between analysis of oil and other energy markets from an economic realist perspective and the climate change mitigation agenda. Can this be resolved? Essentially the difference between the two positions is about technology and policy – what policies will be adopted and how effective they will be. (This includes policy about technology and efficiency.) If climate change mitigation is taken as an imperative and policy-makers are expected to succeed, then the climate change perspective becomes also the realist perspective. But if the appropriate policies are not expected to be introduced, or are expected to be ineffective, then the dissonance re-emerges. One response is to ignore it. Another is to ask what feedbacks should be anticipated. One is to estimate the effects on global warming and the economic consequences and to include these within the realist perspective. Clearly, given the uncertainties, this would not be easy but, depending on the base case, they could be substantial. A second would be to anticipate policy change, as the situation develops. This is also not easy. The upshot is that it is extremely difficult to produce a consistent picture. This helps to account for the very wide range of views about the future of oil and international energy that seem to coexist. It also helps to account for the way in which changes in policy (and policy credibility) are likely to feed into energy markets and affect, amongst other variables, the oil price.

Notes

3. The use of natural gas in the transport sector may have many advantages (large availability of gas reserves, environmental impact) and the technology is well established. But CNG cars are still likely to make limited penetration in the transport sector due to infrastructure issues, size and weight of natural gas tanks, purchase cost, just to mention a few difficulties. There is also the issue of duplication of infrastructure costs and whether it is more effective to encourage a transition to a single type of technology, such as the electric/hybrid car.
4. For instance, in the UK’s Stern Review of 2006, the authors tried to put price tags to the climate change problem, arguing that mitigation is cheaper than adaptation and that the cost of non-action tends to rise exponentially.

5. In a recent analysis of global energy trends by BP, based not on BAU but on a judgment of the most likely path of development to 2030, the base scenario has CO\textsubscript{2} emissions about 35% above the IEA 450 scenario in 2030. A more aggressive policy scenario still ends up with a substantial gap of about 21% (BP 2011).

6. Taxation of petroleum products and oil substitution policies are not only limited to the OECD. For many net importers in developing countries, taxes on petroleum products constitute a main source of government revenue, ranging from 7% to 30% of total government revenues (Gupta and Mahler 1995).

References


