
THE PARADOX OF OIL

THE CHEAPER IT IS, THE MORE IT COSTS

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1. Introduction

It would be fair to say that the timing of the sudden drop in the price of oil since June 2014 took energy and financial analysts by surprise. After averaging around US\$110 per barrel since 2011 (IEA, 2013: 6), suggesting a ‘new normal’, the last six months have seen the price of oil fall to around US\$50 per barrel (as of February 2015). But although the timing of this price drop was not forecast by analysts with any precision, there are economic, geological, and geopolitical dynamics at play in light of which the price volatility we are seeing is not actually that surprising.

In my article ‘The New Economics of Oil’ (Alexander, 2014) – published a few months prior to the fall in price – I explained why expensive oil has a stagnating effect on oil-dependent economies, which I argued could lead to a drop in oil demand and thus a sharp fall in price.¹ I also explained why expensive oil can incentivise greater investment in production while disincentivising consumption, a dynamic that can increase oil production faster than demand and thereby generate short-term oil gluts that can also lead to price volatility, only via a different route.² Both of these dynamics go a long way to explaining the current state of oil markets. While the exact timing of the current fall in prices may have come as a surprise to everyone, including me, the phenomenon itself is quite comprehensible when one recognises the intimate connection between energy (especially oil) and economics. As we will see, the ever-present influence of geopolitics is shaping oil markets too.

What is so frustrating about the state of much oil commentary today is the tendency for analysts to focus on the immediate or short-term situation, often from a purely financial/economic perspective, neglecting the larger social, political, and environmental contexts in which oil

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¹ To quote from p. 9: ‘In short, as oil production slows or stagnates, oil prices may continue to increase until they reach an economic breaking point, crashing or destabilising economies, which would lead to a crash in oil prices; the low oil prices would then facilitate economic recovery, which puts more demand pressure on oil, leading prices to rise till economic breaking point, and so on and so forth. This cycle of bust-recovery-bust is what we may face in coming years and decades...’ (Alexander, 2014).

² To quote from p 5: ‘The peak oil position – at least, the most coherent iteration of its varieties – holds that when conventional oil reaches a plateau (and eventually declines), this will lead to an increase in price; but price increases make unconventional oils more financially viable, thus increasing their production and delaying a decline in overall production of liquid fuels’ (Alexander, 2014).

markets unfold. When those larger contexts are given due attention, it becomes clear that oil is a commodity that defies reductive analysis and which cannot be understood unless one looks through a multi-dimensional, interdisciplinary lens.

In this article I outline and analyse various explanations for why the price of oil has fallen so dramatically in recent months and present some considered but tentative hypotheses about what we can expect from the oil markets in coming years. I also hope to challenge the naive conclusion – drawn all-too-hastily in the mainstream media – that the drop in price somehow debunks the analytical framework of the ‘peak oil’ school (see, e.g., Sakya, 2015). Although it may sound counter-intuitive, cheap oil is actually a complicated function or symptom of peak oil dynamics, and far from solving oil problems, the drop in price is merely creating new problems of equal or greater weight, in ways that will be explained. Those who claim that the effects of cheap oil are ‘clearly positive’ are at best being simplistic and are at worst just plain wrong (see, e.g., *The Economist*, 2014a).

The main conclusion defended below is that so-called ‘cheap oil’ (at ~\$50 per barrel) is just as problematic as expensive oil (at \$100+ per barrel), but for very different social, political, economic, and environmental reasons. Just as expensive oil suffocates industrial economies that are dependent on cheap energy inputs to function, cheap oil merely propagates and further entrenches the existing order of global capitalism that is in the process of growing itself to death (Turner, 2014). The fall in prices also undermines the oil industry by scaring off capital investment in an age when the costs of establishing and drilling new fields is relentlessly on the rise (Kopits, 2014), due to declining energy returns on investment (Murphy, 2014). Cheap oil therefore is likely to retard mid-to-long term production, setting the scene for a foreseeable mid-range supply crunch that will soon enough push prices back up (see Kent and Faucon, 2015; Mushalik, 2015a).

Accordingly, we should not be fooled by this current period of depressed prices. As the world continues to replace the easy ‘conventional’ oil with ever-more marginal ‘unconventional’ oils (e.g. deepwater, shale oil, tar sands, etc.) and alternative ‘biofuels’, the laws of physics will forever be putting upward pressure on production costs. So despite currently depressed prices, it remains true to say that we live in an age of expensive oil, a position that might seem contradictory if interpreted superficially but which is actually accurate when interpreted in geological context: the low-hanging fruit is gone. The only way oil will remain cheap over the long term is if our economies are doing so poorly from a conventional growth perspective that we cannot afford for oil to be any more expensive, making oil demand weak and keeping prices deflated (see Meijer, 2014a).

Looking at the current situation from a different angle, cheap oil also makes renewable energy alternatives less ‘cost competitive’, which will have disastrous ramifications on climate change mitigation by dis-incentivising the necessary transition beyond fossil fuels at a critical time. This ecological issue is typically overlooked by those oil analysts who are blinded by the apparent, short-term economic benefits of cheaper oil. Herein lies the paradox of oil: the cheaper it is (economically), the more it costs (environmentally).

For these types of reasons I will argue that there is no ‘optimal’ price for oil in much the same way as there is no ‘optimal’ price for heroin. This analogy between oil and heroin may appear

like a polemical exaggeration, but I hope to show that it is, in fact, worryingly apt. When heroin is expensive, addicts cannot afford what they desperately need, or feel they need, and suffer accordingly. Expenditure on more worthwhile things is cut back in order to fund the increasingly expensive and debilitating addiction. But when heroin is cheap and readily available, the negative effects of addiction become even more pronounced through overconsumption, and the addiction only deepens as hopes of rehabilitation fade. Oil acts as industrial civilisation's own form of heroin, and whether it is cheap or expensive, addicts today are in as much trouble as ever.

2. The New Economics of Oil

Before focusing on the specific issue of the recent fall in prices, I will briefly describe the fundamental changes that have taken place over the last decade with respect to the relationship between oil demand, geology, and economic activity (for more detail, see Alexander, 2014). Only by understanding these changes can we begin to gain insight into the diverse forces that shape oil markets today.

Throughout most of the twentieth century oil supply was able to meet increasing demand without much trouble. Leaving aside the geopolitical oil crises of 1973 and 1979, cheap oil in the range of \$20-25 was readily available.³ Naturally, industrial economies came to rely on these cheap energy inputs and structured their societies accordingly, assuming energy costs would remain marginal and that economic growth trajectories could be maintained indefinitely. Around 2005, however, conventional crude oil production stagnated (Miller and Sorrell, 2014: 6) and the theory of 'peak oil' began being taken seriously by more people and more institutions (see Munroe, 2010).

Peak oil refers to the point where the 'rate' of oil extraction reaches its highest point ever. This point arrives not because oil is 'running out' but because the 'low-hanging fruit' (the easy-to-produce oil) has already been discovered and produced, leaving only the more marginal oil reserves. When the easy oil is gone, producers have to run faster and faster (or drill more and more, and in less ideal places) merely to stay in the same place (see, e.g., Likvern, 2012). Producing oil, that is, has diminishing marginal returns. Eventually the producers cannot maintain supply rates, and the flow of oil stops growing or peaks and eventually begins to fall, despite the fact there is still lots of oil left.

But this is not merely a geological phenomenon. In ways outlined below, the geology and the economics (and the geopolitics) become intertwined, forming a complex interrelationship, with various factors giving shape to the rise, peak, and decline of oil supply. The primary concern of the peak oil school is that the peak arrives while demand for oil keeps on growing. According to basic economic principles, a stagnating supply coupled with increasing demand would lead to a spike in oil prices, and this would place a huge financial burden on oil-dependent economies, with destabilising effects.

³ For historical data on the price of oil, see <http://www.wtrg.com/prices.htm>, accessed 10 January 2015.

As conventional oil supply began to stagnate in 2005 while global demand continued to increase, the price of oil began a steady incline, moving from its historic average of \$20-25 per barrel (where it sat even in the late 20th century) to over \$100 by 2008. This basic dynamic played out as the peak oil school predicted (see, e.g., Heinberg, 2003; Heinberg, 2011), even if the interplay between geology, economics, technology, culture, and geopolitics proved to be more complicated and nuanced than petroleum geologists and other analysts anticipated. Today conventional crude oil remains on what is often called a ‘corrugated’ or ‘undulating’ plateau (see Jackson and Smith, 2014), a phenomenon that has been acknowledged by mainstream institutions, including the International Energy Agency (see, e.g. IEA, 2010: 6; BBC, 2013). In other words, conventional crude oil seems to have peaked. Any gains from now on, if they occur, will be negligible.

Nevertheless, as the rate of conventional crude oil production stopped growing, the consequent rise in the price of oil made various unconventional oils more economically viable, facilitating their production and incentivising the development of new or more refined technologies (including ‘fracking’ techniques). What this meant was that global supply of oil was able to keep up with a growing global demand, delaying a ‘peak’ in overall liquid fuels.

But meeting this growing demand came at a huge cost and the intimate relationship between energy and economics became clearer. No longer could oil be considered a marginal cost of negligible economic significance to the processes of production. After a century of cheap energy inputs, industrial economies (especially the oil importers) found their dependence on oil to be an increasingly debilitating financial burden (Ayres and Warr, 2009; Murphy and Hall, 2011a; Ayres, 2014; Tverberg, 2015).

It is worth being clear about the extent of this financial burden. By 2012 the global economy was consuming around 90 million barrels of oil every day (mbpd), and when trying to maintain those levels of consumption the difference between oil at \$25 per barrel and oil priced over \$100 per barrel becomes hugely significant. To be precise, it constitutes an extra cost to the global economy of around \$7.2 billion dollars per day, or \$3.6 trillion dollars per year – money that would otherwise have been spent in the broader economy. If we look specifically at the United States – the world’s largest oil consumer – the rise in the price of oil from \$25 to over \$100 meant that the US was spending an extra \$600 million every day on oil imports, money that was not just being sucked into the energy sector but being sucked out of the national economy all together (see Alexander, 2014).

In light of these figures, it is not difficult to understand why 10 of the last 11 recessions in the United States have been associated with high oil prices (see Hamilton, 2011) or why the implosion of the global economy in 2008 correlated so closely with oil price spiking at \$147 per barrel (Hamilton, 2012; Murphy and Hall, 2011b). When oil gets expensive, everything dependent on oil gets more expensive, like transport, mechanised labour, industrial food production, plastics, among a host of other things. This pricing dynamic siphons discretionary expenditure and investment away from the rest of the economy – or out of the national economy altogether – causing debt defaults, economic stagnation, recessions, or even longer-term depressions (Tverberg, 2012). While it would be too one-dimensional to argue that expensive oil was the *only* cause of the global financial crisis (and the ongoing economic stagnation), it would be just as blind to deny the defining role expensive oil played both in the

global financial crisis and state of the deflated global economy today (see generally, Ayres, 2014).

3. The Two Principal Factors Influencing the Fall in the Price of Oil

Against this background the two principal factors influencing the fall in the price of oil over the last six months can be inferred with a degree of confidence. The first is a demand-side factor; the second, a supply-side factor. These are not mutually exclusive and in fact they have fed off each other to exacerbate their individual effects, hence why the fall in price has been so dramatic.

The demand-side factor influencing the price drop is that the global economy is deflated (see Hamilton, 2014; Mearns, 2014), in large part owing to several years of expensive oil, averaging over \$100 since 2011. As explained above, this has had a suffocating effect on expected growth trajectories. The EU and Japan economies remain very weak; China's growth is slowing; and the Russian economy is sinking quickly, all of which reduces oil demand, and expected demand (see Meijer, 2014b). When economic growth is strong, oil demand is high; when economies are weak, stagnant, or in recession, oil demand is weak.

When oil demand is weak while supply is maintained, however, basic economic principles dictate that the price of oil will fall, and this is precisely what we have seen. Another way to frame this demand-side point is to say that when oil is expensive, it becomes increasingly unaffordable, especially when wages stagnate, and this unaffordability induces 'demand destruction' which puts less pressure on oil supply chains. It could even be said that there is not so much a glut of cheap oil so much as there is a glut of consumers that cannot afford expensive oil (see Mushalik, 2015b). Consequently, the reduced pressure on the oil markets manifests in reduced prices. All this is perfectly comprehensible, even if the exact timing of the effects could never be predicted with any precision. Economics is not a hard science.

The second principal factor influencing the currently depressed prices can also be understood in relation to the prolonged period of expensive oil in recent years, but this time from the supply-side. Historically, the vast reserves of unconventional oil around the world (especially in the tar sands of Canada and Venezuela, and the shale oil plays in the US) have been under-exploited, because the capital expenditure needed to extract oil from them have been so great that it would have been 'uneconomic' to do so. But once conventional oil began to plateau around 2005, putting supply pressure on global oil markets, this induced the steady rise in the price of oil. As oil reached beyond \$100 and seemed to stabilise it suddenly appeared as if much more of these unconventional oils could be produced for a profit. This naturally provoked something of an investment frenzy, especially in the US and Canada, resulting in the significant 'up tick' in US oil production and the steady rise in Canadian tar sands production. Several years of 'manic drilling' (*The Economist*, 2014a) have resulted in a short-term 'glut' in oil supply, and whenever there is a glut in supply, prices inevitably fall. (Why the 'glut' is likely to be short-term is addressed further below). A recent boost in Libyan oil production has also has magnified this temporary oversupply (see Patterson, 2014).

It is worth highlighting the important interactions here between the demand-side and the supply-side dynamics. As we have seen, expensive oil places a burden on oil-dependent economies, making it difficult to maintain expected or desired growth trajectories and inducing demand destruction. But just as oil demand was weakening due to poor economic performance, the very same phenomenon of expensive oil was bringing new supply chains to the market. If these supply and demand dynamics were at play in isolation, they would have produced a drop in the price of oil. When they occur together – that is, when demand is being destroyed by expensive oil just as expensive oil is incentivising increased production – it should come as no surprise that at some point the markets would react. In the last six months or so, we have seen precisely that occur (see Berman, 2015).

4. Why Cheap Oil is a Mixed Blessing (and ultimately a Curse)

As noted in the introduction, the sudden and drastic fall in the price of oil has been widely interpreted as ‘good news’ for economies. In a superficial sense, this is quite an understandable reaction. While many people seem resistant to the thesis that expensive oil inhibits economic growth, more people seem willing to accept the thesis (which is the flip side of the same coin) that cheap oil is good for economic growth. In an age of deep economic uncertainty and widespread economic instability, anything that is perceived to be good for growth is generally regarded as something worth celebrating. Unfortunately, the implications of cheap oil are far more complicated and by no means so positive.

It is certainly true that cheap oil makes conventional economic growth easier than if oil was expensive, so if returning to historic growth trajectories is considered the ultimate goal, then the celebration of the falling price of oil is justified, so far as it goes. But the following analysis unpacks the situation in more detail and fleshes out some of the intricacies in this situation in order to show why cheap oil is likely to cause as many problems as it solves.

The first thing to note is that, irrespective of the current market price of oil, the energy return on investment (EROI) of oil is in terminal decline (Murphy, 2014). We must not forget that it is ‘net energy’ that is the important measure of energy supply, not total barrels extracted and consumed. Due to declining EROI, it is possible that oil production can increase in gross supply while net energy from oil can be flat or in decline.⁴ Indeed, this would disguise the ‘peak’ in useful energy supply from oil. Could we be at that point now even though total liquid fuels still seem to be creeping upward? It is hard to be sure, but it is important that we put our minds to this subtle phenomenon, because it is on its way, if not already upon us.

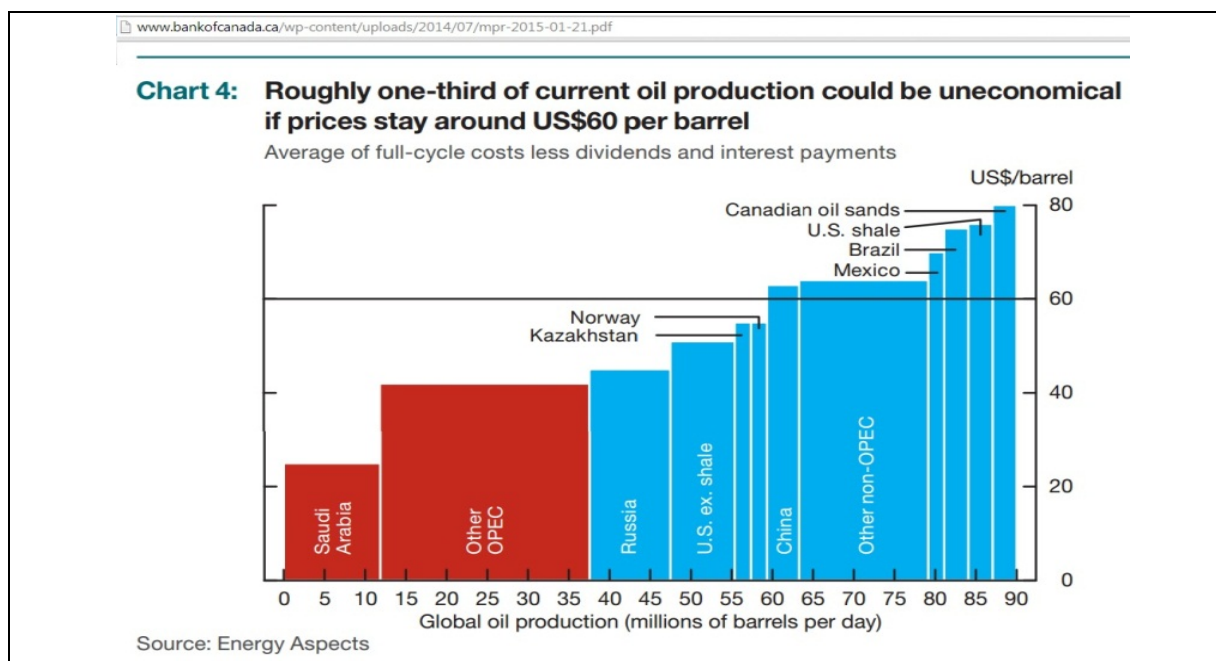
The increasing financial costs of production, however, are easier to quantify. Oil’s declining EROI translates as increasing costs of production, especially in new oil fields. According to a recent analysis (Kopits, 2014: 43), capital expenditure in the large oil firms has been rising at

⁴ This could happen as high-EROI conventional oil is replaced with low-EROI unconventional oil. Suppose, for example, the world at one time produces 90 mbpd with an EROI of 30:1 (meaning that 3 mbpd were invested in order to produce 90 mbpd, giving a ‘net energy’ surplus of 87 mbpd). Suppose, a few years later, the world produces 95 mbpd, but of that oil, 60 mbpd has EROI of 20:1, and 35 mbpd has an EROI of only 5:1 (meaning that 10 mbpd were invested to produce 95 mbpd, giving a ‘net energy’ surplus of 85 mbpd). In this case, gross oil production would have increased, obscuring the fact that ‘net energy’ has actually declined.

11% per annum since 1999. When the price of oil was hovering above the \$100 mark, it made economic sense to invest and produce many of these unconventional oils, because despite the increasing costs of production, it seemed a profit could still be made. But now that oil has dropped to around \$50 per barrel, a large proportion of this new production no longer seems profitable.

For example, the Monetary Policy Report of the Bank of Canada (2015) recently reported as follows:

Based on recent estimates of production costs, roughly one-third of current production could be uneconomical if prices stay around US\$60, notably high-cost production in the United States, Canada, Brazil and Mexico (Chart 4). More than two-thirds of the expected increase in the world oil supply would similarly be uneconomical. A decline in private and public investment in high-cost projects could significantly reduce future growth in the oil supply, and the members of the Organization of the Petroleum Exporting Countries (OPEC) would have limited spare capacity to replace a significant decrease in the non-OPEC supply.



In much the same vein, a recent report in the *Financial Times* (see Raval, 2014) concludes that the Canadian oil sands have a break-even price of \$80 per barrel, US shale plays and other areas of tight oil around \$76; Brazil's deep water fields are thought to require \$75 to break-even and Mexican projects around \$70. If these estimates are even roughly accurate, the recent price drop to around \$50 per barrel means that all these technically recoverable oil resources may become vulnerable to their own high (and increasing) production costs. Needless to say, profit-seeking businesses will not produce oil that costs \$70+ if they can only sell it for \$50 (see Carroll and Klump, 2013).⁵

⁵ Again, this was anticipated in Alexander (2014: 6): '...it is no good having vast technically recoverable resources if producing them is uneconomic. Furthermore, if the price of oil were to drop to some extent – perhaps due to a further downturn in an already struggling global economy – this could also make some currently profitable shale holdings unprofitable, which soon enough would reduce shale production.'

Of course, significant portions of the ‘costs of production’ occur in the early stages of setting up a field for drilling, which means that most of the *current projects* already have ‘sunk costs’. Because of this, most of those projects are not going to stop producing in the short term. But at \$50 or \$60 per barrel, many if not most *new* unconventional oil projects may not be profitable, and investors and oil companies alike are already beginning to show signs of caution or withdrawal. Notably, in November 2014, there was a 40% drop in new oil and gas permits in the US, which is being attributed to the lower price of oil (Hays, 2014). Similarly, since October 2014, rigs in the US have fallen by 34% (see Mushalik, 2015d; Inman, 2015a; Inman, 2015b), according to the Baker Hughes index. The foreseeable consequences, as reported in the *Economist* (2014a), are as follows:

A rash of bankruptcies is likely. That, in turn, would bespatter shale oil’s reputation among investors. Even survivors may find the markets closed for some time, forcing them to rein in their expenditure to match the cash they generate from selling oil. Since shale-oil wells are short-lived (output can fall by 60-70% in the first year), any slowdown in investment will quickly translate into falling production.

A different article in *The Economist* (2014b) is even more explicit:

Wood Mackenzie, a research consultancy, estimates that the ‘break-even price’ of American projects is clustered around \$65-70, suggesting many are vulnerable (these calculations exclude some sunk costs, such as building roads). If the oil price stays at \$70, it estimates investment will be cut by 20% and production growth for America could slow to 10% a year. At \$60, investment could drop by as much as half and production growth grind to a halt.

This is hugely significant, especially when it is recognised that the growth in US shale oil and Canadian tar sands in recent years has been essentially the only thing that has disguised peaking production of liquid fuels in the rest of the world (Mushalik, 2013). In fact, the current oil situation, which some are claiming debunks ‘peak oil’ may in fact be announcing its arrival. Conventional oil production is already on a corrugated plateau that almost certainly represents the highest ‘peak’ it will ever reach, but it could be that the current supply and demand dynamics mark the onset of peak ‘liquid fuels’. As oil analyst, Ron Patterson (2015), notes:

Peak oil will be the point in time when more oil is produced than has ever been produced in the history of the world, or ever will be in the future of the world. It is far more likely that this period will be thought of as a time of an oil glut rather than a time of an oil shortage.

Could it be that 2015-17 will be the oil ‘glut’ that marks the peak in ‘liquid fuels’? If cheap oil is in the process of jeopardizing future production, as it seems to be doing, and/or if the ‘shale boom’ peters out in the next year or two (Energy Watch Group, 2013; Heinberg, 2013; Hughes, 2013; Hughes, 2014; Mushalik, 2014) this near-term peak could indeed eventuate. A new study conducted by Goldman Sachs (see Adams, 2014) concludes that the lower oil prices means that \$1 trillion of oil investment funds are now at risk of being withdrawn from projects, and this would reduce production by 7.5 million barrels of oil per day over the coming decade. Since that study was undertaken prices have fallen further. Even before the price slump, in fact, the biggest oil companies were shelving expansion plans and shredding operations with profit margins too tight to justify (Gilbert and Scheck, 2014; Tverberg, 2014). Maintaining current production looks like it is going to be a Herculean task.

Nevertheless, the foreseeable consequence of a production and investment drop will be a tightening of global oil supply, thus increasing the price of oil, especially if demand increases at the same time. This upward pressure, of course, could potentially bring some of the high-cost producers back online, although investors will be more cautious and funds will be harder to come by, for fear of another price collapse. Furthermore, if the economy cannot accommodate a return to expensive oil, we may see a subsequent price slump, yet again, and a further production drop for the reasons just outlined. This is a volatility that we can expect to see in coming years and decades. It is too simplistic to suggest that lower prices mean that oil troubles are over. They are merely challenging oil-dependent economies in new ways, primarily by threatening to render huge amounts of existing production 'uneconomic'. At the World Economic Forum in 2015, the chief economist of the International Energy Agency, Fatih Birol (as quoted in Mushalik, 2015c), described the oil situation as follows:

In 2015 we expect oil and gas upstream investments to decline \$100 billion or 15%. And the big chunk of it will come from the high cost areas. And this will have implications, not perhaps immediately but for 2016-17. And if this comes together with a stronger demand this will have strong implications for the price and the markets.

Another issue that needs to be borne in mind is the economic instability that arises in oil-exporting nations when the price of oil drops so suddenly and deeply. Significant exporters such as Russia, Iran, Iraq, and Venezuela are highly dependent on high oil prices to balance their fiscal budgets (see Herszenhorn, 2014). In October 2014 the International Monetary Fund assessed what oil price different governments needed to balance their budgets, and drew some disturbing conclusions: Russia needs oil at \$101 per barrel; Iran needs \$136; Venezuela and Nigeria need \$120 (see Viscusci, Patel, and Kennedy, 2014). When we recognise that oil and gas make up 50% of Russia's federal budget, it becomes clear that a drop in price from \$110 (June 2014) to \$50 (February 2015) more than halves that oil revenue stream. Nobody knows what Putin might do, for example, if he finds himself with his back against the wall. More generally, if cheap oil means extreme economic hardship for exporters, this could well provoke social discontent and political instability. We see the geological and economic issues quickly become infused with the geopolitics.

There are further geopolitical complexities and speculations concerning the recent fall in the price of oil. For instance, there is some speculation that Saudi Arabia desires these lower prices because cheap oil can be expected to undermine competition in global oil markets – especially the US shale plays and Canadian oil sands, both of which require higher prices to maintain existing production over the long term (see Meijer, 2014a; Solomon and Said, 2014; Critchlow, 2015). Saudi Arabia for decades has been the so-called 'swing producer' that increased or decreased production as necessary to stabilise the price of oil where it could. Recently, however, Saudi Arabia has made it clear that it has no intention of reducing its production to push the price of oil higher (Defterios, 2014). It knows that cheap oil will undermine its competition.

Furthermore, the prospect of cutting Saudi production would raise further concerns about its effect on oil prices. According to the secretary general of OPEC, Abdalla Salem el-Badri: 'If we cut production then there will be spare capacity and producers will not invest, or postpone projects. The market will rebound back higher than the \$147 we saw in 2008' (as quoted in Critchlow, 2015).

Perhaps most importantly, with cheap oil Saudi Arabia is able to punish or put pressure on some of its (and the US's) geopolitical enemies, including Iran and Russia – two oil exporters that are much harder hit by \$50 oil than the wealthier Saudi Arabia (see, e.g. Mazzetti, Schmitt, and Kirkpatrick, 2015). As of early 2015, the Russian economy seems particularly weak and unstable, and there is some speculation that the US has colluded with Saudi Arabia to flood the markets for this very purpose (see, e.g., Elliot, 2014; Whitney, 2014; Topf, 2015), even if this hurts US shale producers. In fact, some analysts argue with plausibility that oil markets, in our neoliberal era, provide a means for the US government and the broader 'Transnational Elite' to insidiously wage economic war, especially against Russia (for more detail, see Fotopoulous, 2014). It is very difficult to know how far these geopolitical influences are shaping the oil markets – and space does not permit a more elaborate analysis – but there certainly seems to be more than plain 'supply and demand' issues at play.

It seems to me that the geology is fundamental, which then enters a dialectical relationship with the economics, leaving the very real geopolitical tensions and strategies to play out against that background. As usual, the environmental issues tend to be ignored.

5. The Environmental Costs of 'Cheap' Oil

The analysis above has focused primarily on the central role energy plays in economic processes, touching also on a couple of important geopolitical issues. The environmental impacts of oil consumption are too often left out of this picture. Not only does oil consumption facilitate the depletion of natural resources and the devastation of biodiversity as a result of ever-expanding, globalised economies, perhaps most importantly, we now know that the consumption of oil and other fossil fuels contributes directly to climate change (IPCC, 2013; Hansen and Kharecha, 2008).

Analysts tend to try to deal with these issues in isolation, exemplified most strikingly by Fatih Birol. On the one hand, his position as chief economist of the IEA demands that he does all he can to ensure that enough affordable oil is supplied to global markets in such a way that facilitates stable economic growth. In fact, that is essentially the reason the IEA was formed, in the wake of the 1973 oil crisis. On the other hand, Birol sees the world continuing its addiction to fossil fuels in such a way that is locking humanity into decades of high carbon living. The implications of this on climate change will be disastrous, as the chief economist acknowledges. He seems to be torn apart by the contradiction of trying to facilitate conventional (oil-dependent) growth economics in the grim context of climate change.

At least Fatih Birol is forthright enough to acknowledge the intractable problem posed by this situation, even if he still tries to address the problems in isolation. Environmentalists often fail to understand how destabilising it would be, from a conventional economic perspective, to swiftly and significantly reduce oil consumption. Economists, however, are often too quick to celebrate the economic benefits of cheap oil, neglecting to mention the fact that cheap oil will incentivise increased fossil fuel consumption at a time when the world's climate scientists are crying out that we must swiftly move away from fossil fuels (IPCC, 2013).

According to carbon budget analyses (e.g., Carbon Tracker 2013), between 60-80% of known fossil fuels reserves must be left in the ground if the world is to have a good chance of keeping temperature rises less than 2 degrees above pre-industrial levels. Climate scientists Kevin Anderson and Alice Bows (2011) have shown that in order to keep within a fair share of the carbon budget, the wealthier nations need to decarbonise their economies by 8-10% per annum over coming decades. Guess what would happen to the price of oil if oil availability was reduced by 8-10% per annum as a climate change response strategy? Even reducing availability at 3-4% per annum would produce a price spike to unprecedented highs and probably crash many economies just like in 2008. But cheap oil only makes continued consumption of oil more affordable, while at the same time making renewable energy alternatives less price competitive. In this light, cheap oil is a catastrophe for climate-response strategies. As the *Financial Times* reports: 'falling oil prices threaten to make economies more carbon-intensive and less energy efficient' (Wolf, 2014; see also, Zumbun, 2015).

The reality is that if a peak and decline in liquid fuels is not imposed upon us for geological-economic reasons, we should nevertheless be embracing it voluntarily for reasons of climate mitigation. Of course, I do not claim that this climate-response strategy is likely. I only claim that the challenge of climate change clearly shows that the question of how to deal with a peak and decline of oil supply is more relevant today than ever before.

These points ultimately highlight the incoherence of talking of 'cheap oil'. The only reason it can be considered 'cheap' is because the environmental costs of oil consumption are 'externalised'. If the costs of climate change, biodiversity loss, pollution, and resource depletion were built into the price of oil, there is no way it would be 'cheap'. And what of the social and economic costs that will be borne by future generations? In decades to come, as climate change wreaks havoc on global food systems and increases the severity and regularity of extreme weather events, how will today's language of 'cheap oil' be received? I suspect that \$50 oil will be seen for what it is – something that came at far too great a cost.

This, once more, is the paradox of oil: the cheaper it is, the more it costs.

6. Conclusion

What, then, lies ahead for oil markets? The short answer is that nobody really knows. There are too many economic, geopolitical, technological, and social variables at play for any certainty. Black swans could lie around every bend in the river. The unpredictable actions of OPEC have significant implications: will they cut production after their next meeting? It is anybody's guess. There is also the ever-present possibility of ongoing geopolitical disruptions, as evidenced especially by the instability in several oil rich nations, such as Iraq, Iran, and Russia. If a new war broke out in any of these areas, or if Russia's economic decline intensifies, markets would be thrown into further turmoil. This could push prices back up very quickly, but high prices could assist the producers of non-conventional oil that need high prices to make any money. However, the point I have been labouring is that those high prices could again squeeze the life out of oil-dependent economies and place further obstacles in the way of 'economic recovery'. Another global financial crisis would only overturn the oil markets again, as happened in 2008, leading to a pricing collapse. There is also the threat of the 'carbon bubble' bursting, if

shareholders in fossil fuel companies begin to worry that their shares could become 'stranded assets' should nations or the international community decide to take climate change seriously (see Alexander, Nicholson, and Wiseman, 2014).

In light of all this, my view is that we should expect continued price volatility. That may sound like 'hedging my bets' but the fact is that the oil situation is so unstable that cycles of 'bust-recovery-bust' are the most likely future we face. It could well be that we will see a further fall in the price of oil, although claims of \$20 oil (see Worstall, 2015) seem very unlikely to be realised. If oil ever fell to this price it would necessarily be short-lived, for the reasons outlined above: many unconventional producers need prices of \$70+ per barrel simply to break-even. Indeed, the IEA recently reported that 'a price rebound... seems inevitable' (see Kent and Faucon, 2015). Where to? Again, no one can be sure, but the high production costs of unconventional oil suggest that a reasonable 'floor' for oil prices in the mid-to-long term (within a couple of years) may be in the \$80+ range – higher if the shale boom goes bust or if war or political instability enters the scene more significantly. But remember, part of my argument is that there is no 'safe operating space' for oil prices. The 'floor' of oil prices is likely to be too high (for the economy); just as the 'ceiling' is likely to be too low (for the climate). We live in paradoxical times indeed.

What we do know is that the EROI of oil is in terminal decline, and it is this geological reality which means that there will forever be upward pressure on the price of oil, and that is forever going to put pressure on oil-dependent, growth-orientated economies. As Murphy and Hall argue: 'increasing the oil supply to support economic growth will require high oil prices that will undermine that economic growth' (Murphy and Hall, 2011a: 52). This is the world we now live in.

In the introduction to this article I stated that there is no 'optimal' price for oil. It should now be clearer what I meant. In an age of increasing capital expenditure on new oil fields, due to declining EROI, oil needs to be sufficiently expensive for oil supply to keep up with demand. But when oil is too expensive, economies that rely on cheap energy inputs cannot function and demand dries up, reducing the price of oil. Some analysts argue that there is a 'narrow ledge' (Nelder and Macdonald, 2011) where the price of oil is high enough to procure the necessary investments and production but not so high as to inhibit so-called 'healthy growth' of the economy. That may have been the case in recent history, but my suspicion is that this 'narrow ledge' has itself now crumbled away. There is no longer an 'optimal price' that falls within such a ledge. Oil is now *either* too cheap to procure ongoing investments and production *or* too expensive for oil-dependent economies to function well (perhaps even *both* too cheap to meet demand *and* too expensive for growth). When these issues are placed in the context of climate change and the need to transition beyond fossil fuels, it becomes clear that there is no such thing as cheap oil.

In short, industrial civilisation now finds itself between a rock and a hard place; or, to change the metaphor, we now find ourselves in 'checkmate', with nowhere to move. Our only option is to start playing a different game – a game 'beyond oil' – a choice we should have made many years, if not decades, ago. Unfortunately, building a post-petroleum civilisation (Trainer, 2010; Alexander, 2012) would require a bravery and boldness that we have hitherto lacked. Can we yet muster the courage?

The challenge, admittedly, is to find ground between naive optimism and despair.

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