The possible effects on developing country economies of a rise in oil prices in case of military action against Iran[1]

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Abstract

Recent discussions on nuclear facilities in Iran have set the regime in Iran on a possible collision course with the US, EU and the UN. While the latest US intelligence is more cautious, several commentators have speculated that there could be a military strike in the near future. This briefing paper suggests that a military strike on Iran's nuclear facilities could have major economic and social effects. Apart from the humanitarian and developmental effects in Iran itself, and in addition to the costs of a military strike itself, there are likely to be substantial effects on developing countries, particularly on poor, oil importing countries in Africa.

This briefing paper suggests that an oil pice rise of a third for a period of two years following a possible strike on Iran is a credible scenario. The oil price is currently around USD 90 and the consensus forecast for 2008 is USD 75 per barrel and we are expecting an increase of 25 USD per barrel from USD 75 to 100 USD per barrel in 2008 as a result of a strike. This scenario reflects the importance of Iran in the oil market and geographically in the region. The expected price increase is very similar to oil price changes in previous conflicts. Current oil prices may have already incorporated future disruption of oil supplies.

The expected increase in the price of oil may reduce world GDP by around 1%, worth around USD 480 billion. Sub–Saharan African GDP would also decline by 1%, worth around USD 7 billion. The negative effects on HIPC countries (who have recently secured a 40 billion debt relief deal) would also be 1% of their GDP and worth around USD 2.8 billion – domestic demand (and therefore poverty) is expected to fall substantially more. We estimate that the loss would be up to 10% of the recent debt relief settlement for the group of HIPC countries. Poorer oil importing countries suffer more than richer oil importing countries, because poorer countries tend to use comparatively more oil to produce the same level of output and they tend to be current account constraint. Some oil exporters will have better opportunities due to higher oil prices but there is a major question mark whether they will be able to use such opportunities and spend oil rents well.

A review of a number of quantitative studies show there are significant negative expenditure effects due to oil price increases. Overall, we find that both poorer and richer households suffer from oil price increases, but the poor tend to suffer more than the richer households due to direct effects, because data for several countries indicate that the poor tend to spend a large share of their income on oil and oil products, and indirect effects, because for several countries more expensive transport costs affect the poor more. Negative expenditure effects will affect livelihoods of the poor. Previous work has found a link between income and mortality and so it is likely that a rise in oil prices will lead to more deaths in those countries that are most affected by increased oil prices.

Introduction

Recent developments related to the discussions on nuclear facilities in Iran have set the regime in Iran on a possible collision course with the US, UK, and other countries. While the latest US intelligence is more cautious, several commentators have speculated that there could be a military strike in the not so distant future. This briefing paper suggests that a military strike on Iran's nuclear facilities could have major economic and social effects. Apart from the humanitarian (as an example, there were 600,000 deaths in 3 years of the Iraq conflict, from 2003 to 2006) and development effects in Iran itself, and in addition to the costs of military strikes (for example, the US has spent so far USD 448 on the war in Iraq[2]), there will be substantial effects on developing countries, particularly on poor, oil importing countries in Africa.

Although the 1990 Gulf crisis caused higher oil prices for only a short period, the implications for developing countries were neither insignificant nor short term. The increase in oil prices had an economic impact on oil-importing developing economies. Oil import bills increased because imported volumes did not adjust as the short run price elasticity of demand for petroleum products is very low. More expensive oil imports had to be covered by a greater proportion of export revenues with the result that the balance of payment deficit increased. Higher oil prices were passed on domestically, albeit with different lags, and this tended to raise the inflation rate. This affected economic growth rates.

This briefing paper analyses the potential impact of an increase in oil prices on developing countries which may result from possible military action against Iran. The first step in estimating these effects involves building a credible scenario for the effects that a military strike may have on oil prices. We examine the possible impact on the price of oil given Iran's key position in the oil markets. We also analyse what happened to the price of oil in similar military conflicts previously (e.g. 1991 Gulf war and Iran Iraq war). A baseline scenario for the price of oil is USD 75 as this is the consensus forecast. We think that the most credible scenario is an increase towards USD 100 per barrel for a period of two years (this is in line with recent commentaries, see e.g. *Financial Times* of 22 October 2007).

As a second step, we analyse the effects of an increase in the price of oil on the world economy and developing countries in particular. We provide a brief theoretical review and survey empirical results based on computable general equilibrium modelling. We expect that poorer and oil-importing countries will be affected more by an increase in the price of oil. Exporters could benefit from this shock if they are able to manage the rents from the oil windfall and if they can avoid past mistakes such as Dutch disease. We examine the potential impact on GDP in developing countries and the distributional impact within them. We also examine indirect links to poverty such as health and mortality rates and compare the impact with recently agreed packages of debt relief.

Several analyses of the effects of oil price increases exist, see e.g. World Bank, 2000 and 2005; World Bank / ESMAP, 2005; and IMF 2005. An ODI Briefing Paper in March 1991 analysed the impact of the Gulf crisis on developing countries and suggested that the crisis affected a large number of developing countries. While there had been a considerable

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[2] See http://www.fas.org/sgp/crs/natsec/RL33110.pdf

response to the crisis, the distribution of assistance was highly selective. This briefing puts the analysis in the current context of a possible strike on Iran and includes new findings that have become apparent since the Gulf war of 1991:

- There is new information on the relationship between military conflicts and changes in oil prices, although the new information gained will never be enough to predict oil prices changes precisely;

- There have been further changes in the production structures including the use of energy, suggesting that the size of effects are likely to be less than previously thought, especially in developed countries;

- More and better equilibrium models have been developed to simulate oil price changes; and

- There is more household level survey evidence on the distributional effects of oil price changes. We find that all households including poor households tend to suffer from oil price increases and in most of the countries for which studies are available, the poor suffer more than the richer households. While some of the poorer segments were more isolated from oil price shocks, now, due to their changing consumption patterns, they are increasingly reliant on oil products directly or indirectly.

What might happen to the oil price in the case of military action against Iran?

A military strike on Iran's nuclear facilities is likely to affect the world price of oil which will in turn affect incomes, balance of payments, employment and well-being in a range of developing countries. A first step in understanding these effects involves building a credible scenario for the effects of a military strike on oil prices.

Possible channels of impact

A scenario of increased oil prices will depend on several uncertain factors:

- How much does a military strike disrupt oil supply;
- How would a military strike affect uncertainly in financial markets?

A military strike will disrupt the supply of oil. It is likely that oil tankers need to avoid passing through the Straits of Hormuz or Malacca causing delays throughout the supply chain of refined products. Iran's production would most likely come to a halt which will directly affect the balance of supply and demand for oil. The magnitude of the shock is likely to be substantial because Iran is currently the 4th largest producer of crude oil in the world (at 4 million barrels a day, a share of 5.5%) and Iran has the second largest reserves (around 9.5% of total world reserves). In addition, Iran's jurisdiction covers the Straits of Hormuz[3] and

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3 The world's most sensitive pressure point connects the Gulf of Oman with the Persian Gulf. Iran and the United Arab Emirates front the strait, which is 21 miles across at its narrowest point. As many as 17 million barrels of oil pass through the straits every day, much of it destined for the United States, Western Europe, and Japan.

Malacca[4]- the most important chokepoints[5] in the world. Close to 30 million barrels per day (Fattouh, 2006), or 40% of total production, is transported through those straits. Oil tankers can avoid the Strait of Malacca but only at very high cost and longer journey times. It is virtually impossible to divert oil transit away from the Strait of Hormuz, although it might be possible to try to safeguard the transit route.

The effects of the oil supply disruption could be temporary depending on the way other countries react. For instance, the effects could be mitigated by the use of OECD oil reserves, or Saudi Arabia can compensate for the loss in Iranian production, but we expect that they are willing to increase production only gradually.

The second effect of a military strike is likely to work through the financial markets. A military strike may cause panic in the oil market as countries would compete for oil access causing oil prices to overshoot to very high levels for a short period. This is particularly true in a situation of tight supply and demand conditions with few stocks, so that a small disruption has large effects. This will introduce further volatility in the market with possible large price hikes.

Range of oil price changes due to military action

Uncertainty and panic is likely to drive price increases in the short term. In the medium term, it will depend on the length of the military conflict, and the role of Saudi Arabia. In the long-term there is unlikely to be a major impact on oil prices. There are two ways to obtain a possible range of price increases: 1) modelling studies and 2) examining three previous oil price shocks during similar conflicts.

First, economic modelling studies can predict possible effects of changes in oil supply on prices. For instance, the World Bank's Global Economic Prospects 2006 simulate an oil supply disruption of 2 million barrels per day. This is half the capacity of Iran (and about the same disruption as occurred after the Iranian revolution), and hence a likely estimate. Because the supply capacity cannot be changed substantially in the short-run, the simulations assumed there would be a significant price increase of a third in the first and second year before going back to the baseline. Hill (2006) argues that as Iran's export is 3 times the daily global surplus of one million barrels, ceasing export entirely would create a shortage in the global oil market and would immediately send the world price to USD 90 a barrel, or USD 100 if the situation worsens (IEEJ). At the time of the publication (2006), the world price per barrel of crude oil was around USD 54, so the price increase was estimated to be in the 40-50% change.

Secondly, we can look at what happened during military conflict in the past. There are at least three such instances (see also chart 1).

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4 The very narrow strait connects the Indian and Pacific oceans between western Malaysia and the Indonesian Island of Sumatra. The growth of Asian economies has made the Strait of Malacca one of the world's most critical shipping lanes. More than 50,000 cargo ships pass through these waters every year and account for more than 20 percent of the world's maritime trade.
5 A choke point is a sensitive junction in the world's geography where even a minor attack could lead to substantial political and economic shockwaves.

Chart 1

Major Events and Real World Oil Prices, 1970-2005
(Prices adjusted by CPI for all Urban Consumers, 2005)
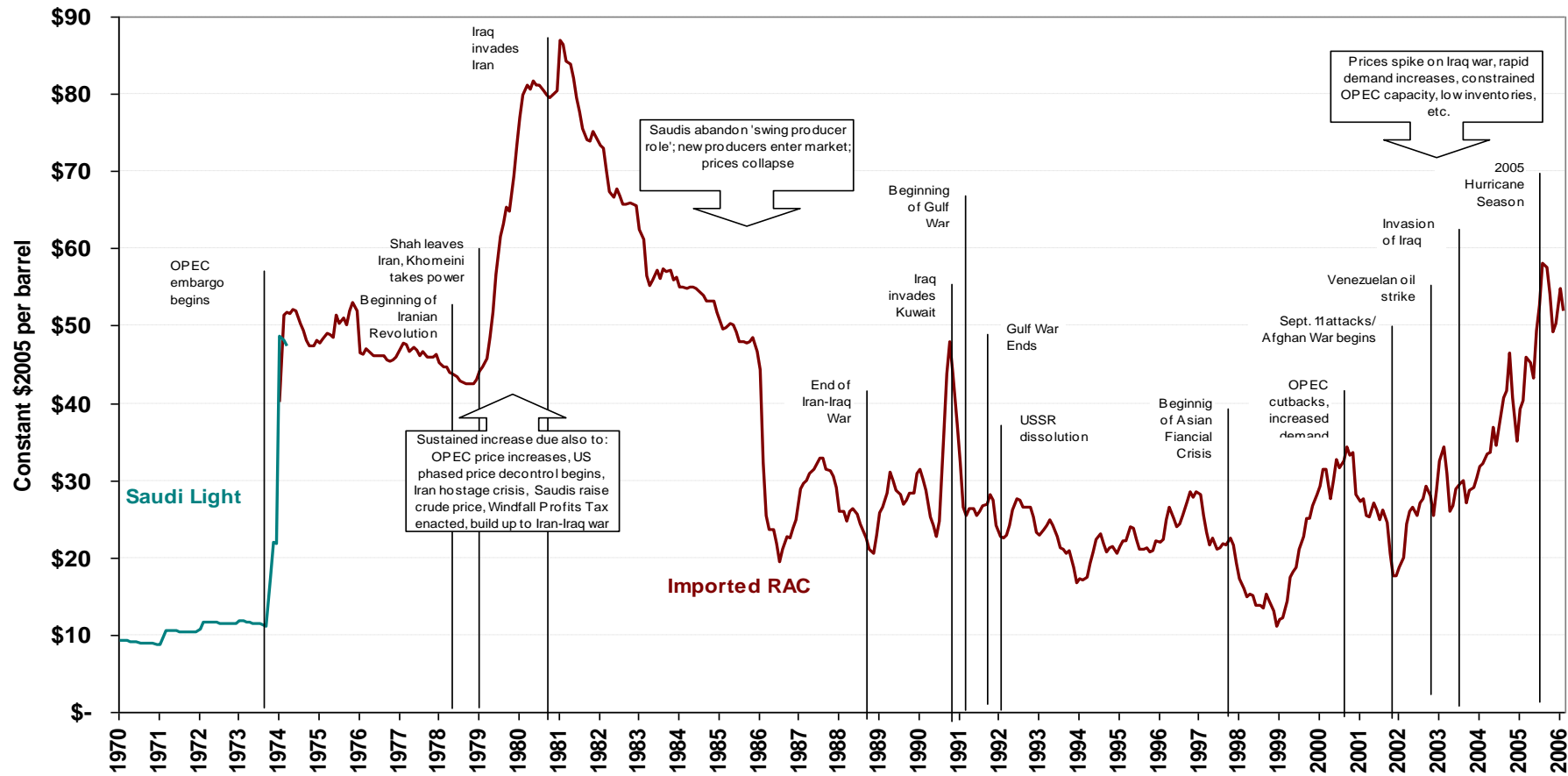
Source: IEA

Iraq / Iran War 1980-1988. The combination of the Iranian revolution and the Iraq/Iran War led to a more than doubling in crude oil prices from USD 14 in 1978 to USD 35 per barrel in 1981. Twenty-five years later Iran's production is only two-thirds of the level reached under the government of Reza Pahlavi the former Shah of Iran.

Gulf War 1991. When Iraq invaded Kuwait, the price of oil was 21 USD per barrel. Five months after the conflict began, it peaked at 44 USD per barrel (it lasted for one month), but when the US military action took place the price was already back at 30 USD per barrel. When the war ended, the price of oil was similar to the levels before the conflict at 20-22 USD per barrel (EIA). Although at the peak the oil price had more than doubled, the average price during the conflict increased to 28 USD per barrel, equivalent to an increase by a third.

War against Afghanistan and Iraq 2002-2003 - Before the war against Iraq, the price of oil had fallen sharply thanks to slow economic growth after the 9/11 terrorist attacks. The level was around 17 USD per barrel. Soon the oil price increased by 40% to USD 26 per barrel during the war in Afghanistan. Indeed, the price of oil peaked just before the US invaded Iraq with a price of oil around 35 USD per barrel, but when the military conflict started (Oct 2001), it dropped to 30 USD. In April 2003 the price of oil was 25 USD per barrel. The average price of oil during the conflict was 30 USD per barrel which was slightly above the average price of the last six months before the conflict at 27 USD.

It is possible to argue that markets have already discounted a military strike against Iran because oil prices have increased as threats to Iran have continued[6]. If that is true then the average on future markets for 2008, which is 75 USD[7] is a sensible baseline[8] for our analysis. We expect oil price to rise above these levels for a period of two years following a military strike by a third to around 100 USD per barrel.

It is unlikely that oil prices will remain very high (e.g. in the range of 150-200 USD per barrel) for a long time. The reason is that historically, Saudi Arabia (and North Sea oil) has been a swinger in the market because they can increase oil production. It is not in Saudi Arabia's interest to sustain high prices for very long time as this induces the development of alternative technologies and sources. The chart shows that Saudi Arabia's role as a swinger helped to lower prices in two major events, Iran-Iraq war and the Gulf War. We therefore assume that oil supply disruptions will be temporary for a period of two years assuming that Saudi Arabia is not likely to fill supply capacity immediately and only over the long-run.

Box 1: A scenario for oil prices following a military strike on Iran

The oil price will increase by a third. This is equivalent to an increase of 25 USD per barrel, from USD 75 per barrel forecasted by future markets in the next year to a new level of 100 USD per barrel. This is an average price rise and will last for two years. It is likely that a military strike induces an oil price hike with increases fading afterwards. This scenario reflects the importance of Iran in the region and in the oil market and is similar to oil price changes in previous conflicts.

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[6] One example that this may have happened come from the recent observation (Iraq) that oil prices rose significantly when Turkey threatened to attack the Kurds in Iraq.

[7] With standard deviation of 23 which means that there is a 70% likelihood that the future price of oil lies within the range of 52-98 USD per barrel.

[8] For 2009 the average future market is 71 USD per barrel. For 2010 is 70 USD per barrel.

The current context of high oil prices

The oil price averaged USD 30 a barrel in 2003, USD 40 a barrel in 2004 and USD 56 a barrel in 2005 and USD 66 a barrel in 2006. Oil prices have now (chart 2) reached historically high levels for a wide variety of reasons– although there has been a drop from the highs at the end of November 2007. On the demand side, the rise of China and India and global growth has led to a sustained increase in the demand for oil – and such increased demand is not likely to dissipate soon. On the supply side, there have been various disruptions. Short-term stocks are low, and there are seasonal variations (cold winters). The oil price is priced in US dollars and the recent price rises do not provide a good picture of actual costs faced by countries using other currencies because the dollar has devalued significantly recently. OPEC further suggests that speculation in oil markets has driven up oil prices by USD 20. Finally, the market may have already incorporated some concerns about the US-Iran stand-off on nuclear facilities.

Chart 2 Oil prices (world average, weekly January – November 2007)
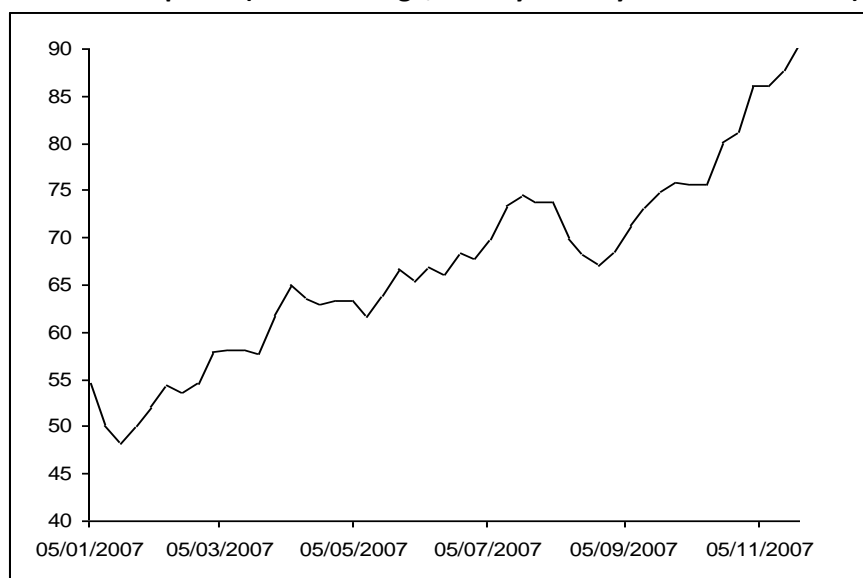
Source: IMF; weighted average of world oil prices.

Some suggest that these factors together paint a precarious situation and that if something serious were to happen it would be difficult to understand what would happen to oil prices, with some suggesting oil prices reaching 150-200 USD per barrel for a short period. Our forecast assumes an average oil pirce increase of 33 per cent for two years after which the oil price will return to the consensus forecast, but there is a possibility that when prices would increase substantially more the use of economic modelling may not be accurate requiring different types of scenario analysis.

Just as several factors have contributed to an increase in oil prices, an oil price increase is not the only shock that countries currently face and a strike on Iran may do more than just increase the oil price. In particular, the prices of many non-oil commodities have risen significantly recently. This means that only looking at experiences of countries in the past will not provide an accurate picture of how the rise in oil prices may have affected developing countries, unless there is an attempt to isolate the effects of the oil price increase alone. In the coming sections we attempt to isolate the effects of an oil price increase.

The economic and social effects of an oil price increase

How do oil prices affect economies

Higher oil prices affect the global economy through a variety of channels: balance of payments, prices, production, financial markets and structural change. First of all there will be a transfer of income from oil consumers to oil producers. As the propensity to spend of those who lose income (energy consumers) is generally larger than the propensity to spend of those who gain income (energy producers), there will be a fall in demand. There will also be a transfer from oil importers to oil exporters. The sign of the impact on individual countries will depend in part on whether they are net oil importers or exporters. The transfer is from oil importing countries to oil exporters and oil exporters tend to expand demand only gradually. Because oil exporters tend to save more and consume less than oil importers, this might induce a reduction in demand.

For oil importers, an oil price increase will most likely raise the value of imports unless a fall in demand for oil more than offsets the price increase (but this is unlikely given the price inelastic demand for oil, especially in the short-run). This will affect the balance of payments and puts downward pressure on the exchange rate. If the government subsidises oil prices then government debt will increase directly. For oil exporters, there will be an improvement in the balance of payments and foreign reserves but a key question is to what extent oil producers can use additional revenues appropriately.

An oil price change will affect price levels, production, incomes, investment and employment. An increase in the price of energy inputs will push up cost of production and will put pressure on profit margins. As the oil intensity of production in advanced countries has fallen over the past three decades, the supply side impact for a given increase in oil prices can be expected to be less than in the past. However, oil intensity of production has declined less in developing countries and oil intensity is still higher in developing countries, so the impact may be closer to that in the 1970s. The impact on the price level, inflation and price volatility will depend on the degree of monetary tightening and the extent to which consumers seek to offset the decline in their real incomes through higher wage increases, and producers seek to restore profit margins. These responses can create a wage-price spiral, as was the case, for example, during the oil shocks in the 1970s. Households and businesses in the non-oil sector will cut expenditure – because real disposable incomes decline - a deflationary effect.

There will be direct and indirect impacts on financial markets. Actual as well as anticipated changes in economic activity, corporate earnings, inflation, and monetary policy following the oil price increases will affect equity and bond valuations and currency exchange rates. Volatility is also expected to increase which will have effects on the real economy and put investment decisions under strain.

Finally, depending on the expected duration of price increases, the change in relative prices creates incentives for suppliers of energy to increase production (to the extent that there is scope for doing so) and investment, and for oil consumers to spend less.

The effects of oil price increases: What do the models say?

The effects of the first oil price shock in the 1970s cut the industrialised countries' GDP by up to 2-3 per cent. However, the impact of an oil price increase on economic growth is expected to be less now. General equilibrium models provide useful global estimates of the effects of oil price shocks. They are also able to cover indirect effects, e.g. they capture the effects on developed countries that will affect demand for developing country products and services indirectly.

The World Bank's Global Economic Prospects 2006 simulated a disruption in supply of 2 million barrels per day. It assumed that the market has little spare capacity in the short-run, so that there would be significant price increases for a few months before easing of. There would be an increase of a third in the first and second year before returning to the baseline. This scenario is very similar to our own scenario.

Table 1   The effects of an oil price increase

	Year 1	Year 2
% oil price increase	34	28
GDP (% change)		
World	-1.0	-1.5
High Income	-0.7	-1.3
Middle Income	-1.6	-1.6
Large low Income	-1.7	-2.8
Low income current account constraints	-0.3	0.1
Current account (% of GDP)		
World	-1.1	-0.5
High Income	-1.1	-0.7
Middle Income	-0.9	-0.2
Large low Income	-1.9	-0.2
Low income current account constraints	-1.2	0.9

Source: World Bank (2005)

The oil price shock leads to a decline in world GDP of 1.5 per cent in part because of the increased inflation. Interest rates are assumed to be flexible and would increase to offset some of the inflationary effects. Developing countries are hit hardest because of higher energy intensities and greater inflationary effects. The poorer countries tend to be current account constraint, and in these countries domestic demand would decline by 2.7 per cent to compensate for the rise in the value of oil imports. The World Bank argues that a drop in domestic demand will have serious effects on poverty (p.19).

IMF (2005) uses the MULTIMOD model to simulate an oil price rise to USD 80 per barrel (from USD 45 per barrel, the level it was then, and hence a change of three quarters). This would reduce industrial country growth by between 0.5 and 0.75 percentage points. The effects on developing countries would be double that by around 1 to 1.5 per cent, but for some countries, it could be close to 3 per cent. This would be the case if external financing was an issue, the shocks were persistent, or confidence was adversely affected. The IMF

regards the effects as non-negligible but more limited than following the 1970s shocks which reflects the changes in the global environment, oil intensity and policy credibility over the past two decades. Table 2 shows that the effects are greatest for HIPC countries who would find it hard to absorb any impact of rising oil prices.

Table 2 The effects of an oil price increase on GDP of net oil importing countries

	Effect of increase of USD 35 (around 75% in 2005) Percentage change in GDP	Our scenario: 30-40% change in oil price Percentage change in GDP
Total	-0.8	-0.4
Sub Saharan Africa	-0.9	-0.5
Central and Eastern Europe	-0.8	-0.4
CIS and Mongolia	-1.0	-0.5
Developing Asia	-0.8	-0.4
Western Hemisphere	-0.8	-0.4
Newly industrialised Asia	-0.7	-0.4
HIPC	-1.7	-0.9

Source: IMF (2005)

Note: The estimates in the column "Our scenario" are assumed to be half of those in the first column because the percentage change in the oil price is assumed to be around half – this is only a crude first order approximation.

The IMF (2005) also examined the effects of rising prices on oil exporters. Windfalls were up to USD 280 billion in 2004, but the bulk went to Kuwait, Saudi Arabia and Nigeria. As a share of GDP, low-income countries received a larger export windfall, but governments captured a smaller part of that windfall than in more advanced economies. The IMF argues this is because of less efficient tax systems and governance issues in poorer oil exporting countries. However, there was also some evidence that the windfall was associated with a more favourable fiscal stance and reduction in public debt in developing country exporters.

There are several further estimates. According to an analysis by the International Energy Agency, the effect of a sustained USD 10 per barrel increase in oil prices would reduce world GDP, other things being equal, by at least 0.5 per cent in the following year. Recent IMF models suggest that a 10 per cent rise in the price of oil reduces growth by 0.1-0.2 percentage points, so that an average price increase of USD 25 per barrel would cut world income by 0.3-0.7 per cent.

It is therefore likely that our price scenario would cut world and African growth by an average of 1 per cent. In absolute values, an estimated 1 per cent decline in world GDP is worth around USD 480 billion. A 1 per cent decline in sub–Saharan African GDP is worth USD 7 billion. The effects on HIPC countries (who have secured a 40 billion debt relief deal) is also 1 per cent and worth around USD 2.8 billion.

The effects of oil price increases: Country effects

The World Bank / ESMAP (2005) developed a simple methodology to examine the different effects at country level complementing the region-wide results of CGE models. It calculates the direct impact of higher oil prices on incomes based on the ratio of the net imports to GDP. With a zero price elasticity of demand for oil and oil products, a rise in the oil price will change GDP by as much as the change in the value of net imports.

The calculation assumes that there are no adjustments to the oil shock, and that the response is entirely through a reduction in absorption, rather than a reduction in reserves or increase in borrowing. Economies can also adjust to large changes. If the price elasticity of demand for oil is not completely inelastic, the demand for oil would be lower and the pressure on the balance of payments would be less and the effect on GDP would be smaller.

Oil importers are vulnerable to increases in oil prices and the degree of vulnerability will depend on their energy intensity. Analysis for a large number of countries (table 3) shows that a sustained USD 10 per barrel price increase (which represents a 42.5 per cent increase in the model, similar to the scenario we use in this briefing) would lead to a loss of GDP of 1.47 per cent for the poorest countries (those with GDP per capita of less than USD 300). The highest income group (with GDP per capita over USD 9000) would suffer a loss of 0.44 per cent of GDP.

According to the study, some of the lowest income countries suffer a shock of up to 4 per cent of GDP. Those that are likely to suffer (by more than 3 per cent of GDP) most from higher oil prices include:
- Lesotho,
- Togo,
- Swaziland,
- Ghana,
- Honduras,
- Moldova; and
- Nicaragua

Countries with losses estimated to be more than 1 per cent of GDP include:
- Ethiopia,
- Burundi,
- Malawi,
- Niger,
- Mozambique,
- Nepal,
- Mali and
- Burkina Faso.

Statistical evidence suggests a small but significant negative association between per capita GDP and the ratio of net oil imports to GDP, so that lower income oil importers suffer systematically more from the direct impact of higher oil prices on the balance of payments than higher income oil importers.

**Table 3 Percentage change in GDP by a USD 10 per barrel increase in oil prices
(a 42.5 per cent shock)**

Per capita Income (USD)	% Change in GDP
Net oil importers	
<300	-1.47
>300 and < 900	-0.76
>900 and < 9000	-0.56
>9000	-0.44
Net oil exporters	
<900	+5.21
>900 and <9000	+4.16
>9000	+1.50

Source: World Bank / ESMAP (2005)

Net exporters will experience a substantial improvement in the balance of payments as a result of higher oil prices. The lowest income group (less than USD 900 per capita income) would enjoy a 5 per cent improvement in GDP. However, there is evidence that while domestic spending is relaxed, a large share of the revenues is also saved (IMF, 2005). Further, much of the net increase in revenue will accrue directly to the treasury through royalty and other payments, so that the fiscal management of the extra revenues will determine the impact on the economy. The challenge for these countries is to use the extra resources well. Benefits will depend on their institutional framework and their ability to manage oil rents. Poorly targeted spending may increase the rate of domestic inflation, especially where the local absorption capacity is low, and this will raise the risks of a "natural resource curse" or a "Dutch disease". As a general rule, rents from finite natural resources should be invested in other types of capital (physical, human, etc) in order to raise productivity. Poorer and less well governed oil producers are less likely to do so. Historically, oil exporting developing countries such as Angola, DR Congo and Nigeria have failed to utilise oil revenues sensibly and these are precisely the countries that would get increased revenues. Collier (2007) suggests natural resources rich countries are stuck in a natural resource trap and suffer from Dutch disease effects and are more likely to enter into conflict. Of course, some countries, such as Botswana or Chile have managed natural resource revenues well, but it remains questionable to what extent the poorest net oil exporters will be able to gain in the long-run.

Countries are more vulnerable if they are oil importers, if a high proportion of their energy consumption is oil, if their GDP is highly energy intensive and if they are current account constraint. In other words, a country is more vulnerable to oil price increases when they are not self sufficient in oil production, when they cannot diversify from oil and when they are relatively energy inefficient. It is therefore useful to examine the following index

Oil vulnerability index = (oil imports / total oil use)*(total oil use / total energy use) * (total energy use / GDP)

Appendix 1 provides the index for a list of countries using the most recent data (2006 where possible). Some of the poorest countries such as Sierra Leone, Mauritania, Moldova, Nicaragua and Togo are amongst the most vulnerable.

The overall message is that beyond the losses for the word economy as a whole, oil importers are obviously more vulnerable to higher oil prices. Specifically, this section suggests that *poorer* oil importing countries suffer *more* than *richer* oil importing countries, because poorer countries tend to use comparatively more oil to produce the same level of output and they tend to be current account constraint. Some oil exporters will have better opportunities due to higher oil prices but there is a major question mark whether they will be able to use such opportunities and spend oil rents well.

The effects of oil price increases: Poverty effects

High oil prices not only affect average incomes, but they will also affect the expenditure of poor households. For countries where relevant data are available, oil prices affect expenditure of poor households disproportionally more.

There are several links between oil prices and the poor.

At the macro level oil price changes would reduce the world's growth rate and that of many individual countries. Such a slowdown in economic growth may affect the poor more than the rest of the economy depending on whether the average elasticity of the 'dollar a day'' poverty rate to the growth rate[9] is greater than 1 in absolute terms. Oil price changes also cause price instability and instability may have a greater effect on more vulnerable groups such as the poor.

At the micro level, oil prices have direct and indirect effects on households. This micro level effect depends on whether governments control such prices, and if they do, whether they decide to pass on all or only some of the rise in imported product prices. When the government passes on less than the full price increase it has to bear the financial burden of the implicit subsidy, and this will have macroeconomic consequences in terms of reduced expenditure on other items, which could have benefited the poor.

Some estimate India currently spends USD 17.5 billion or 2 per cent of GDP on fuel subsidies to keep oil prices low.[10] Some of this is progressive, e.g. a kerosene subsidy is used more by the poor, but other subsidies are regressive, e.g. the richer half of the Indian urban consumers captures three-quarters of the benefits of subsidised LPG. The amount spent on subsidising oil products may be diverted (as was the case for the kerosene subsidy) and never reach the poor, and could have been spent more directly on the poor. Reform to oil price structure may lead to protests such as in Indonesia (1998), Nigeria (2000) and Yemen (2005).

In some countries prices are liberalised (a fifth of 45 developing countries surveyed by the IMF), or fully passed on (a third of 45 developing countries surveyed by the IMF). Because some petroleum products (notably gasoline, LPG and kerosene) are purchased directly by households, oil price increases will be felt very soon. The extent to which this affects different income groups depends on the relative importance of oil products in household budgets. If poorer households spend a relatively bigger proportion on oil products than richer households, oil prices increase will affect the poor more.

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[9] *Pro-poor Growth*. M. Ravallion. World Bank Policy Research Working Paper, 3242. 2004.
[10] *Economist*, Too hot to touch, Nov 29th 2007

The evidence shows there are significant overall expenditure effects. For instance, IMF (2006) suggests that a 20 per cent increase in oil prices leads to a 1 per cent rise in household expenditures in Mali, 0.85 per cent rise in Pakistan and 3.4 per cent in Ghana. The difference between expenditure effects in Mali and Ghana results from higher oil subsidies and the fact that households in Ghana consume more oil products. For instance, the kerosene budget share is 3.5 per cent in Ghana, compared with 1.45 per cent in Mali.

Household surveys also provide information on the extent that poorer households consume certain oil products. For example, a study on Yemen examines the effects of a possible price increase of petroleum equivalent to USD 15 a barrel. This price increase raised the cost of acquiring a standard bundle of goods by 14.4 per cent for the bottom decile, while the increase for the top decile was only 7.1 per cent (World Bank / ESMAP, 2004). They suggest that such an increase in price is regressive, taking into account the direct and indirect effects.

There are several examples for other countries. These show that there is a pattern in terms of direct effects of oil prices on poorer households. The data in table 4 show that kerosene is used most intensively by lower income households. The share of kerosene in total expenditure declines as income rises. This is true for both rural and urban households in South Africa, Vietnam, Guatemala, Ghana, Nepal and India. The kerosene share in expenditure can be as high as 3 or 4 per cent of total household expenditure for the lowest quintiles but hardly more than 1 per cent for the top quintile. These data can be used to examine the direct effects of kerosene prices. A price increase of a third (similar to our scenario) would lead to an increase in expenditure of up to 1.3 per cent of household expenditure for the poorest households, while for the highest expenditure groups the loss would be closer to 0.1 to 0.5 per cent.

Table 4 Shares of Kerosene Expenditure in Household Expenditure by Quintile Group

	South Africa	Vietnam	Guatemala	Ghana	Nepal	India
Urban						
Q1	4.17	0.54	0.31	1.62	2.36	1.9
Q2	2.12	0.73	0.03	1.15	1.8	1.98
Q3	1.29	0.81	0.04	0.77	2.12	1.75
Q4	0.64	0.72	0	0.62	1.78	1.43
Q5	0.11	0.35	0	0.42	0.76	0.75
Rural						
Q1	3.58	0.7	0.78	3.23	1.07	1.23
Q2	2.9	0.5	0.57	2.38	1.06	1.16
Q3	2.56	0.49	0.4	1.9	1.06	1.12
Q4	2.51	0.35	0.32	1.7	0.96	1.1
Q5	1.38	0.35	0.2	1.28	0.97	0.99

Source: World Bank / ESMAP (2005)

A further important effect on households is indirect. An increase in the price of oil will affect the cost of living of households through non-fuel expenditures, especially those on transport and food, but which are clearly affected by higher fuel prices. Table 5 shows how the *indirect* effects of higher oil prices affect poorer and rural households disproportionally through the effects on transport costs in Pakistan.

Table 5 Effects on household expenditure of a 33 per cent increase in transport fuel costs (Pakistan)

% change

	Urban	Rural
Q1	1.9	1.9
Q2	1.8	1.7
Q3	1.7	1.5
Q4	1.2	1.0

Source: World Bank / ESMAP (2005)

IMF (2006) and World Bank / ESMAP (2001) provide further evidence on the distributional impact of oil price increase using household surveys and input-output tables. A study for Iran showed that a 300 per cent increase in energy prices leads to a 2 per cent decrease in real incomes. Poorer households are hit harder than richer households, especially in rural areas (3.1 per cent for poor households compared with 1.9 per cent for rich households).

In Pakistan, a 33 per cent increase in gasoline and diesel prices increased the cost of living by 0.85 per cent. The impact is higher for urban households (0.90 per cent) than for rural (0.79 per cent). In both areas, the poor are hardest hit as they face a 1.15 per cent increase in expenditures.

In Mozambique, the lowest quintile would face a slightly higher impact than other quintiles except the rich. The impact is higher for urban households than rural households.

There has been contrasting evidence on the distributional consequences of oil price changes using CGE model simulations. Models for South Africa and Indonesia show that oil price increases are progressive but only slightly (World Bank, 2005). However, a more recent CGE study for South Africa (Essama-Nssah *et al.* 2007) estimates that a 125 per cent increase in the price of crude oil and refined petroleum reduces employment and GDP by 2 per cent, and reduces household consumption by approximately 7 per cent. It also increases inequality between rich and poor, with the poorer segment of the formal labour market hit in the form of declining wages and increased unemployment. Unemployment affects low and medium-skilled workers in the services sector, while the income of the highly skilled rises as their consumption is less skewed toward food and other goods affected oil price changes.

The general conclusion from these studies is that oil price increases have significant direct effects on household expenditure (see studies in countries such as Mali, Pakistan and Ghana), depending on the level of oil subsidies and oil consumption patterns. Oil price increases affect expenditure of poorer and rural households disproportionally (e.g. Iran, Pakistan and Mozambique) both directly because the share of oil products in expenditure by the poor is higher, and indirectly because of the greater effects from higher transport costs. A recent general equilibrium model for South Africa further indicates that oil price increases raises inequality.

The effects of oil price increases: health effects

Income is one of the most important determinants of health and good health contributes to income. Over the past decades, income growth contributed to improvements in under-five mortality rates, adult mortality rates, as well as life expectancy. The contribution of GDP over 1960-1990 reduced male adult mortality rate (by 25 per cent) and under-five mortality rate (by 17 per cent). Income growth contributed 20 per cent to the increase in life expectancy. At the same time, different countries with similar level of incomes achieved widely disparate results in mortality rates and life expectancies. For example, at a GNP per capita of USD 600, life expectancy is 69 years in Honduras, whereas it is 51 years in Senegal.

Pritchett and Summers (1996) found that infant mortality falls with rising income with an elasticity centring around 0.2 (on the basis of 58 developing countries), while others (Tandon, 2005) find a slightly higher elasticity (0.7) on the basis of 36 Asian countries. They show the following table.

Table 6 Thousands of deaths avoided (each year) if income was 1 per cent higher (permanently)

	Infant	Child <5	Infant	Child <5
Elasticity	0.2	0.2	0.4	0.4
All developing countries	16.5	26.3	33.0	52.6
Africa	4.9	8.2	9.9	16.5
Latin America	1.2	1.7	2.3	3.4

Source: Pritchett and Summers (1996), Table 10

We use the results of these simulations to provide an estimate of the increase in infant and child deaths as a result of increases in oil prices. The increase in the oil price by a third reduces Africa's GDP by around 1 per cent. Using the lower elasticity estimate, a drop of 1% in income would increase infant deaths each year by around 5,000 in Africa alone and child deaths by around 10,000. Of course these estimates are average, and in some countries the effects could be relatively bigger because they are more sensitive to income changes or income changes might be bigger.

The effects of oil price increases: effects on debt and balance of payments

The response of different economies to an oil price rise depends on the structure of imports, the strength of the current account, changes in private and official resource transfers, the degree of domestic demand management, and access to external financial assistance. A country can respond to the higher prices by heavy borrowing and/or a depletion of foreign reserves, or it can limit imports in order to reduce the balance of payments deficit and maintain foreign reserves (especially in current account constrained countries).

Although access to external financing can ease the short-term problem of paying for costlier imports, in the medium and long term, higher trade deficits and a higher external debt will cause problems of adjustment for the economy. Adjustments may include reductions in imports which can have welfare, growth and distributional implications. As mentioned, oil

price increases lead to a transfer of funds from oil exporters to oil importers. Many of the importing countries will see a deterioration in their balance of payments. Among the most affected countries are those countries whose previous debt was partly written off by the G8 countries.

The World Bank member countries approved USD 37 billion worth of debt relief for 17 countries at the end of March 2007. The 40-year debt cancellation deal begins 1 July, covering debts accumulated before January 2004 of those countries that have completed the Heavily Indebted Poor Countries initiative (HIPC). The countries include Benin, Bolivia, Burkina Faso, Senegal, Guyana, Tanzania, Mozambique, Nicaragua, Niger, Mali, Rwanda, Ethiopia, Honduras, Ghana, Uganda, Zambia and Madagascar. The World Bank / ESMAP (2005) estimated the direct GDP effects of a USD 10 increase in oil prices. The value of a USD 10 increase in terms of increased oil bills for selected HIPC countries is around USD 1 billion. We estimate on this basis that a USD 30 increase will lead to a decline of USD 3 billion, which is 10 per cent of the total value of debt relief for the list of selected HIPC countries in table 7.

**Table 7 GDP Effects after a price increase of 30 USD
by selected HIPC country**

HIPC country	Effects on GDP (in USD million)
Bolivia	-49
Nicaragua	-305
Senegal	-14
Benin	-84
Zambia	-140
Ghana	-666
Tanzania	-244
Madagascar	-218
Uganda	-175
Burkina Faso	-140
Mali	-175
Rwanda	-54
Mozambique	-244
Niger	-75
Ethiopia(excludes Eritrea)	-313
Total	-2897

Source: Own calculations based on World Bank / ESMAP (2005)

The IMF (2005) estimates the (balance of payments) financing gap in the absence of policy and other adjustments for 111 member countries due to rising oil prices (rising by around 40

per cent, so similar to our scenario). They argue that the aggregate financing gap for the 111 countries amounts to USD 29 billion in 2005, equivalent to 0.5 per cent of those countries' combined GDP. China and India account for over one third of the total gap in U.S. dollar terms. More than 20 countries have a financing gap exceeding 2 percentage points of GDP. These include small island economies (9) and African counties (7).

Hence it is likely that there will be quite a number of small island states and African countries that will be faced with a financing gap due to increased payments for oil imports. Increased payments on oil will partly offset the benefits of aid flows, particularly in non-oil producing African countries and small island economies.

Conclusions

This briefing considered what would happen to the economies of developing countries if the oil price increases as a result of a possible US-led attack on Iran related to nuclear facilities. We are not forecasting whether or not there will be a strike. We only estimate what could be a possible effect on oil prices if such as strike were to happen. This briefing paper suggests that a military strike on Iran's nuclear facilities could have major economic and negative distributional effects. Apart from the humanitarian[11] and development effects in Iran itself, and in addition to the costs of military strikes itself[12], there are likely to be substantial effects on developing countries, particularly on poor, oil importing countries in Africa.

This briefing uses a scenario that the oil pice rises by a third, which is an increase by 25 USD per barrel, from USD 75 (the consensus forecast for 2008) to 100 USD per barrel, due to a military strike. Oil prices will be higher for a period of two years, although it is possible that the effects are higher initially than towards the end. This scenario reflects the importance of Iran in the oil market and the region and is similar to oil price changes in previous conflicts. Some price changes may have already been partly factored in by the market.

We suggest that a possible war on Iran leads to an oil price rise which reduced world GDP by 1 per cent, worth around USD 480 billion, and sub–Saharan African GDP by 1 per cent, worth USD 7 billion. The effects on HIPC countries (who have secured a recent 40 billion debt relief deal) is also 1 per cent and worth around USD 2.8 billion. We estimate that for all HIPC countries, the loss would be up to 10 per cent of their debt relief settlement. We find that poorer countries are more vulnerable to oil price increase because they are relatively more oil intensive.

We surveyed a number of quantitative studies showing that there are significant negative expenditure effects due to oil price increases. We also find that especially poorer and rural households tend to suffer more from oil price increases than richer households in part because they spend a larger share of their incomes on oil. We suggest that a worse economic outlook will affect the livelihoods of the poor adversely and that lower incomes will lead to an increase in child mortality.

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[11] Conflict in Iraq has killed more than 600,000 people since the US-led war starting in March 2003, according to a Lancet study.
[12] So far the US has allocated USD 448 billion to the war on Iraq, see
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Appendix 1 Oil vulnerability index

Oil vulnerability index (2006) = (oil imports / total oil use)*(total oil use / total energy use) * (total energy use / GDP)

From least vulnerable to most vulnerable to oil price changes

Countries	Oil imports / total oil use (is negative for net oil exporters)	Oil use / energy use	Energy use (volume)/ GDP	Oil vulnerability index (2006)
Congo, Republic of	-44.5	0.1	16076	-82701
Libya	-6.4	0.8	12842	-64768
Gabon	-20.6	0.6	4200	-55443
Kuwait	-8.8	0.5	12198	-51230
Saudi Arabia	-4.4	0.6	18755	-50186
Angola	-31.8	0.6	2713	-49631
Oman	-15.1	0.2	12451	-45060
Azerbaijan	-5.8	0.3	23118	-39094
Qatar	-9.3	0.3	15069	-35895
Yemen	-4.8	0.6	11840	-33639
Nigeria	-6.4	0.6	8407	-30961
Algeria	-6.7	0.4	12263	-30229
United Arab Emirates	-6.3	0.4	12386	-27707
Kazakhstan	-5.5	0.2	30987	-26467
Iran	-1.6	0.5	32140	-23814
Venezuela	-4.0	0.4	14301	-20714
Ecuador	-2.0	0.9	9417	-17382
Syria	-1.0	0.6	22633	-15214
Turkey	-6.2	0.2	8644	-10017
Trinidad and Tobago	-3.3	0.1	30371	-8826
Vietnam	-2.8	0.2	17937	-7988

Russia	-1.6	0.2	25968	-7628
Sudan	-2.8	0.7	3460	-6605
Cameroon	-2.4	0.5	4403	-5468
Colombia	-1.4	0.4	8398	-4418
Mexico	-0.9	0.6	7665	-3836
Turkmenistan	-0.4	0.3	32592	-3521
Congo, Dem Rep of	-1.5	0.8	2663	-3258
Tunisia	-3.2	0.1	10673	-3136
Malaysia	-0.5	0.4	15858	-3111
Argentina	-0.6	0.3	11869	-2225
Bahrain	-0.4	0.2	26183	-1563
Egypt	-0.1	0.4	21315	-1020
Indonesia	0.0	0.4	13158	-200
Bolivia	0.0	0.4	17687	236
Chad	1.0	1.0	455	459
Peru	0.3	0.5	6339	892
Brazil	0.3	0.5	7924	1034
Côte d'Ivoire	0.5	0.4	6081	1100
Mali	1.0	0.7	1704	1148
Romania	0.5	0.3	10990	1508
Lesotho	1.0	0.4	3689	1613
Uganda	1.0	0.5	3991	1822
South Africa	0.5	0.2	18546	1843
Uzbekistan	0.1	0.1	114427	1941
Botswana	1.0	0.4	4612	1951
Czech Republic	0.9	0.2	11090	2105
Poland	0.9	0.2	10034	2135
Slovakia	1.0	0.2	11558	2152
Burkina Faso	1.0	0.8	2648	2208
Croatia	0.6	0.4	8803	2236

Bangladesh	1.0	0.2	9702	2295
Zambia	1.0	0.2	12050	2330
Guatemala	0.7	0.7	5092	2387
Mozambique	1.0	0.1	20092	2413
China	0.5	0.2	21989	2481
Niger	1.0	0.6	4196	2582
Swaziland	1.0	0.4	7007	2583
Zimbabwe	1.0	0.2	11140	2586
Tanzania	1.0	0.5	5132	2696
Central African Republic	1.0	0.8	3447	2726
Chile	0.9	0.4	8369	2869
Ethiopia	1.0	0.5	5720	2996
Uruguay	1.0	0.4	7472	3262
Albania	0.7	0.4	11390	3306
Costa Rica	1.0	0.4	8099	3392
Nepal	1.0	0.5	7517	3572
Latvia	1.0	0.5	7572	3586
India	0.7	0.3	16465	3615
Rwanda	1.0	0.8	4623	3898
Ghana	0.8	0.5	9938	3906
Kenya	1.0	0.6	6994	3955
El Salvador	1.0	0.6	6443	4035
Madagascar	1.0	0.6	6817	4288
Pakistan	0.8	0.3	15932	4348
Malawi	1.0	0.4	10849	4443
Namibia	1.0	0.5	8791	4521
Guinea	1.0	0.7	6234	4642
Paraguay	1.0	0.1	44805	4786
Estonia	0.9	0.5	11931	5068
Morocco	1.0	0.6	8958	5076

Philippines	1.0	0.5	10024	5117
Lithuania	0.9	0.6	9323	5142
Ukraine	0.8	0.1	50560	5153
Bulgaria	1.0	0.2	25353	5516
Burundi	1.0	0.8	7490	5639
Togo	1.0	0.4	14968	5724
Thailand	0.7	0.5	16522	5869
Mauritius	1.0	0.8	7931	6218
Honduras	1.0	0.6	11667	6734
Gambia, The	1.0	0.9	7428	6863
Georgia	0.9	0.5	15982	7047
Dominican Republic	1.0	0.9	8320	7168
Sierra Leone	1.0	0.7	11359	8372
Nicaragua	1.0	0.7	12398	8877
Armenia	1.0	0.4	25141	9737
Jordan	1.0	0.7	17988	12396
Mauritania	1.0	1.0	15814	18034
Moldova	1.0	0.5	38778	19268

Source WDI 2007