©*The Pakistan Development Review*
53:3 (Autumn 2014) pp. 255–273

Macro-economic Policies and Energy Security—Implications for a Chronic Energy Deficit Country

INAYAT U. MANGLA and JAMSHED Y. UPPAL

The paper assesses the energy sector's foreign exchange requirements for meeting energy consumption and for capital expenditures, and identifies its implications for the country's macroeconomic policy and management. We develop a conceptual model for projecting the energy sector's long-term requirements for foreign exchange. The model indicates that the country's chronic dependence on oil imports is likely to expose the economy to high and volatile oil prices. A fundamental issue for Pakistan is how the energy projects requiring large inflows of foreign capital and technology will be financed. The main implication of our analysis is that there will be continuing pressure on the country's foreign exchange resources. The demand for foreign exchange by the year 2024-25 is projected to be US$ 20-21 billion without the FDI in new power generation. However, when we include the requirements of foreign exchange for capital expenditure, the total FX requirements are in the range of US$ 23-24 billion. An implication of the country's chronic energy deficiency is that the macroeconomic policies, particularly the foreign exchange rate policy, need to be redefined to reflect the projected demands on hard currencies and their expected scarcity value. It is likely that Pakistan will remain dependent on foreign imports to meet its energy requirements for a long time and will need to generate commensurate foreign exchange resources to ensure long-term energy security.

JEL classification: E66, F37, Q43
Keywords: Macroeconomic Policy, Exchange Rate Policy, Energy Security

1. INTRODUCTION

Pakistan's energy crisis, despite being a focus of political, technical and economic analyses and discussions, seems to be continuing unabated. Not with standing the fact that there have been numerous studies that have identified critical issues and the available options in the energy sector, the energy deficit seems to be ever-increasing. An issue that has been overlooked in this debate relates to how the energy sector's foreign exchange requirements for meeting current consumption and for capital expenditures for creating domestic capacity would be financed. This paper seeks to address this question, and follows up with identifying its implications for the country's macroeconomic policy and management.

Inayat U. Mangla <inayat.mangla@wmich.edu> is Professor of Finance, Western Michigan University, Kalamazoo, Michigan, USA. Jamshed Y. Uppal <uppal@cua.edu> is Associate Professor of Finance, Catholic University of America, Washington, DC, USA.

In order to address the energy crisis, the government is planning and implementing various structural measures, such as increasing share of renewable energy production, diversification and rebalancing of the energy production mix, reducing oil intensity, and exploring fossil fuels [Pakistan (2013); NEPRA (2013)]. However, the energy infrastructure and production projects are heavily capital and technology intensive. They necessitate foreign investment with concomitant foreign exchange liabilities for repatriation of returns and the principle. Moreover, the gestation periods for such measures to make a substantial impact is generally quite long. In addition to the increasing energy demand in the country, volatile oil prices pose another challenge that call for physical and financial strategies for hedging price risk. Such strategies, however, also require substantial foreign exchange resources [Bacon and Kojima (2008); Daniel (2001)].

It is likely that Pakistan will remain dependent on foreign imports to meet its energy requirements for a long time [Ahmed (2007)], and will need to generate commensurate foreign exchange resources to ensure long-term energy security. The paper addresses the implications for macro-economic policies given the country's chronic dependence on imported energy and continuing pressure on its foreign exchange resources. More specifically, the study first rigorously establishes the above *chronic energy deficit* hypothesis. Second, it elaborates the logical consequences of this condition for the demand for foreign exchange. Third, the paper discusses implications for macro-economic strategies, in particular, with respect to the foreign exchange regime and related interest rates, foreign trade, and domestic and foreign direct investment policies. We make international comparisons of macro-economic policies adopted by countries which face secular energy deficits comparable to Pakistan. After discussing various policy alternatives, the paper concludes with some recommendations.

With regards to the continuing energy crisis in Pakistan, there have been a number of academic studies and policy papers on the subject [e.g., Alahdad (2012); Ghayur (2007); Malik (2008, 2010); Siddiqui (2004); Kugelman (2013)]. The major focus of these studies has, however, been on basic long-term structural measures designed to reduce oil consumption over the long run, achieve energy portfolio diversification away from oil-fired power generation, improve energy efficiency, and demand management. These strategies provide the potential to reduce exposure to high and volatile oil prices, but do not address the long-term fundamental problem of *energy poverty*. In general, there is a dearth of studies on the implications of energy deficit for macro-economic policies for the energy-importing developing countries. Other studies deal with the impact of energy shortages on the macro-economies, energy production strategies, and demand management. For example, see Finleya (2012), Bielecki (2002), Pandey (2006), Labandeira and Manzano (2012) and Munasinghe (1984). On the contrary there have been a number of studies with respect to oil exporting and developed countries [IMF (2003); IMF (2012); Sturm, *et al.* (2009)] that examine the macro-economic policy options for oil surplus countries. Moreover, the policy options and alternative strategies have to be country specific and must take into account the country's economic and industry structures. Therefore, this paper is likely to contribute significantly to the development of a long-term economic strategy to enhance energy security for Pakistan.

2. BACKGROUND ON THE OIL SECTOR

Pakistan is an oil producer, but the domestic production of crude oil meets only 16-20 percent of the total consumption. Importing crude oil, high-speed diesel, fuel oil and other petroleum products fills the remaining 80-84 percent of demand. The oil prices in the international markets steadily increased since 2001; over 2001-2013 the crude prices increased five times. Though the consumption of petroleum products only increased marginally, the rise in the petroleum prices brought the country's current account under strain. The share of import bill for petroleum products in current account balance increased from 23 percent to 35 percent in last twenty years. The increase in the world oil prices, particularly in 2004-2008, led the government to roll back its deregulation policy and exert a greater control on the sector, with a view to protecting the consumer from the brunt of full pass-through of the international prices. The government uses direct and indirect price controls (moral suasion) to keep oil products and LPG prices low for the benefit of the consumers. It results in domestic prices being below the prevailing international prices.[1] This implicit price ceiling reduces the quantity of LPG imports; consequently a shortage results, and a "black market" emerges with end-users paying higher prices. The Oil and Gas Regulatory Authority (OGRA) sets the price ceilings through official notification. The price is based on the Arab Gulf fuel ex-refinery/import-parity price, and other charges include customs and excise duty, sales tax, other levies and a distribution margin.

Following the sharp rise in the world oil prices during the 2004-2008 period, the government took several steps to protect consumers by imposing a cap on the domestic sale prices [MPNR (2005)]. The policy of providing relief to the consumers was also implemented by reducing the petroleum development levy (PDL) which overtime was reduced to zero. In 2004, the government also started to pay a 'price differential claim' (PDC) to compensate the oil companies for the lower price charged to the consumers, particularly for kerosene and diesel oil. The oil policy therefore not only led to the government subsidising oil consumption, but also resulted in reducing the tax revenues accruing to the government. Over time, the policy has had a substantial negative impact on the fiscal position of the government. Despite the government's efforts to provide subsidies to cushion the increases in international oil prices, the increase in the end-user domestic prices has led to fierce protests. There have been numerous strikes and price increases at the pump have been challenged in the courts. On the other hand, the energy policy quite predictably has resulted in continuing energy shortages manifested as blackouts of unprecedented duration and frequency. It is said that one of the major causes of the ruling PPP government's defeat at the polling booth in May 2013 has been its failure to satisfactorily address the energy crisis. Besides the government, the oil companies have also been blamed for exploiting the situation and profiteering at the expense of the public.

Another factor exacerbating the energy crisis has been the rising demand for energy fuelled by robust economic growth over 2002-2007; the average real rate of

[1]For example, the ceiling was about US$300 per ton, against international LPG prices exceeding US$500 per tonne at times. In April 2006, wellhead LPG prices were increased from Rs 17,000 (US$283) per tonne to Rs 20,200 (US$337).

growth was 6.22 percent over this period. Besides the energy sector the transport sector is another main user of the petroleum products. The demand for petroleum products from this sector was attenuated somewhat by a large scale substitution of gasoline and heavy fuel oil with natural gas. The conversions were the result of government's pricing structure, which created financial incentives in its favour. A record number of gasoline powered vehicles were switched to CNG to the point that Pakistan had the third largest number of CNG vehicles in the world, with 63.3 percent of the vehicles running on CNG.[2]

Pakistan has been so far self-sufficient in natural gas, but the gas reserves are depleting at a fast rate and gas shortages have started to appear. Pakistan's reserves-to-production (R/P) ratio stood at slightly less than 35 years in 2004. At the end of 2012 it is estimated to be only 15.5 years.[3] As such, the country's import of natural gas (LPG) will become substantial in the near future. This will be true particularly as the Iran-Pakistan gas pipeline becomes operational, though it stands a very small chance because of the non-availability of finance as per the recent announcement of the Iranian government. The price gap between the government's implicit ceiling on LPG prices and corresponding import-parity prices has contributed to supply shortages. Although in the recent years the government has raised the price of gasoline in order to partially offset the lower prices of kerosene and diesel, the net subsidy has been large and has contributed to fiscal deficits.

Management of the demand side has also been lacking. The policies to discourage use of large automobiles, air-conditioners and other power-guzzling appliances have been either absent or non-effective. Nominal energy conservation campaigns have mostly relied on public exhortations without much effect on consumer behaviour. Steps to combat energy pilferage and payment delinquencies have also not yielded the desired results, partly because of the ability of the opposition groups and vested interests to block such moves by the government.

The impact of energy crisis on the macro-economy is also well documented in the academic literature, financial press and government policy documents. The Planning Commission estimates that as a result of losses from power and gas shortages, the average GDP growth rate of Pakistan's economy has decreased by 3-4 percent since 2010 onward [NEPRA (2012)]. Technical experts on the energy industry, like Zahid Hussain (ex-CEO of OGDC), Shahid Sattar of Planning Commission and others, are on record drawing a grave outlook for the energy sector. At a seminar held at PIDE in May 2013, Sattar said that the Planning Commission estimates show that the power sector deficit will balloon to Rs 742 billion ($7.4 billion) in the current financial year. The circular debt has touched around the Rs 600 billion-mark, while the overall losses may touch Rs 2,000 billion up to June 30, 2013. Pakistan is currently spending two percent of GDP on the power sector, which needs to be jacked up to 4-4.5 percent on an immediate basis to cater to the demand. In order to end the power crisis, Pakistan will have to focus on nuclear civil energy and the production of electricity through coal. A visiting senior fellow at PIDE, Alahdad, attributed the prevailing condition to lost opportunities,

[2] IANGV (International Association for Natural Gas Vehicles). Current Natural Gas Vehicle Statistics.
[3] BP Statistical Review of World Energy 2013.

prohibitive delays, implementation performance and reform reversals. "The story of Pakistan's energy sector is symptomatic of virtually all sectors of the economy. At the micro level, the decision-making in the sector remains inherently flawed, and policy initiatives are reduced to shooting in the dark." The overwhelming evidence from energy analysts points to the absence of coordinated policy formulation as a fundamental issue. Alahdad identified coordinated policy formulation as a fundamental issue and advocated adopting the concept of Integrated Energy Planning and Policy Formulation (IEP) and the institutional structure, which supports it [also see a recent monograph, Alahdad (2012)]. Rashid Amjad pointed out that the integration of energy plans with economic objective remains weak. Stagnation in exports is well documented in recent years, e.g., see Haque (2011).

According to *the Economist* (2013), "Not charging consumers for electricity has created a big problem for Pakistan. At the end of 2012 the country's stock of energy-industry debt was $9.1 billion—about 4 percent of GDP—according to a report funded by the United States Agency for International Development (USAID) and carried out by the national Planning Commission. The same USAID–backed report claims power shortages retard economic growth by at least 2 percent a year. The situation is deteriorating as the debt mountain grows. Riots break out each summer in protest." The basic fact remains that the integration of energy policy plans with macro-economic objectives has remained weak since late 1970s and early 1980s. Pakistan export sector growth has not managed to offset the rising oil import bill, resulting in high levels of energy subsidies to the magnitude of Rs 1,400 billion with little progress to show.

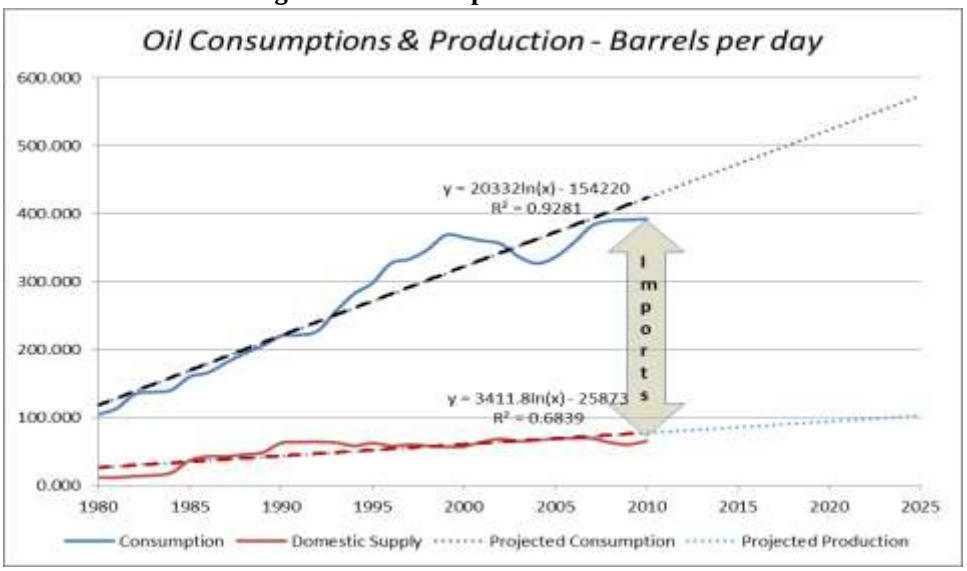
To add to the energy woes, unfortunately, the deteriorated security situation in Pakistan has led to a significant decline in foreign investment in the energy sector as well as in the overall economy. It is appalling to note that in a globally integrated economy and a global liquidity environment in recent years, net foreign direct investment in Pakistan for 2008-13 are USD 5.4, 3.7, 2.2, 1.6, 0.8 and 1.8 billion for each year. The net foreign inflows in oil and gas development and exploration declined by 11 percent to $560 million in 2013, as compared to $629 million in the previous fiscal year. The oil and gas sector contributed 39 percent to the FDI during FY13 as compared to 77 percent in 2012, mainly due to the worsening law and order situation in Balochistan and Khyber Pakhtunkhwa (KPK), where exploration activities witnessed contraction. However, it is encouraging to see a fresh inflow of FDI in the energy sector in 2014 of $1.2 billion (*Business Recorder* February 2, 2014).

Meekal (2012) has summed up this current situation as "a never-ending energy crisis that has crippled growth and employment prospects, especially in the SME sector which is the main-stay of the economy in terms of value-addition, employment, living standards and exports." Realistically speaking, any decent/worthy economist of our generation would be hard pressed to declare the Pakistan's macroeconomic situation in general and energy policy in particular as "satisfactory and sustainable." Borrowing a famous political phrase from President Clinton campaign in 1992, "it is the economy, stupid," we argue in this paper that Pakistan's macroeconomic policies are inherently inconsistent, *ad hoc* and have significantly contributed to the current crisis in energy, and other sectors of the economy.

3. PAKISTAN'S CHRONIC ENERGY DEFICIENCY

Figure 1 below conveys our *chronic energy deficit* hypothesis by making a comparison of the country's long-term domestic production and consumption and presents a picture of long-term import dependency. The figure also shows fitted trend lines for the two series using logarithm functions; estimated equations for time (t) are also reported. Detailed statistics on the domestic consumption and production are provided in Table A-I in the Appendix.

Fig. 1. Oil Consumption and Production



As the figure indicates, the consumption-production gap has grown from 83,000 to 327,000 barrels of crude oil per day from 1980 to 2010. The historic average compound annual growth rate (CAGR) of consumption has been 3.51 percent p.a., compared to 1.75 percent p.a. for the domestic production. As a matter of fact, the domestic production has been at a virtual standstill level since the early 1990s.

As a result of the persistent consumption-production gap, the country has become chronically dependent on oil imports, rendering the economy as greatly exposed to high and volatile oil prices. Yépez-García and Dana (2012) lay down the key indicators of a country's vulnerability to higher and volatile oil prices. These include a greater share of oil imports in percent of gross domestic product (GDP), a high proportion of oil usage in the primary energy supply, and a rise in oil imports and expenditures over time. When we examine such indicators in relation to Pakistan, as is shown in Table 1, they indicate a high degree of the country's vulnerability.

As the Table shows, over the last ten years, the oil imports have increased from 2.7 percent of the GDP to over 6 percent in current USD terms, while these have increased from 2.4 percent of the country's GDP (in constant USD) to about 10 percent in recent years. As a percentage of total imports, the oil imports have doubled to about 35 percent over the ten year period. More importantly, oil import expenditure, as a

percentage of exports, has increased from 18 percent to 57 percent. An important factor has been that the country's exports, which are the main component of the country's capacity to pay for imports, have not kept pace with the oil import requirements. The last column in the Table points out to the other aspect of the country's vulnerability, i.e., increasing reliance on the imported oil sources for power generation, the percent of total electricity production from furnace oil increasing from about 16 percent in year 2003-04 to over 35 percent for year 2011-12, and is expected to be higher for the year 2012-13.

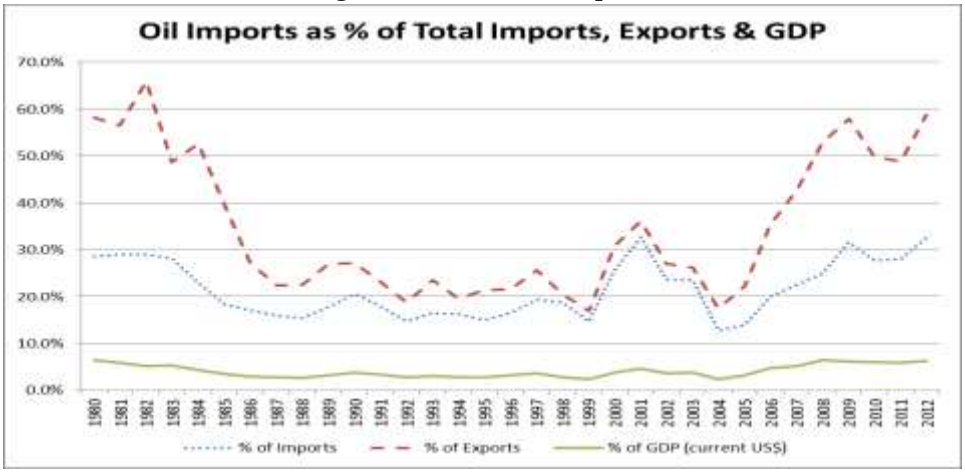
Table 1

Petroleum and Products Imports as Percentage of Key Indicators

Year	% of Exports	% of Imports	% of GDP (Constant 2005 US$)	% of GDP (Current US$)	Electricity Production from Oil Sources
2003-04	18.3%	16.6%	2.4%	2.7%	15.7%
2004-05	24.5%	18.7%	3.5%	3.6%	15.9%
2005-06	36.0%	23.8%	5.4%	5.4%	20.3%
2006-07	42.5%	27.2%	6.3%	5.8%	28.6%
2007-08	51.4%	29.7%	8.5%	7.3%	32.2%
2008-09	52.5%	31.6%	8.0%	6.1%	35.4%
2009-10	53.2%	33.5%	8.1%	6.5%	38.0%
2010-11	48.6%	34.3%	9.2%	7.0%	35.2%
2011-12	58.2%	35.5%	10.4%	6.8%	35.4%
2012-13	56.8%	35.3%	9.8%	6.1%	n.a.

A longer-term picture of the Pakistan's oil imports in relation to imports, exports and the GDP is depicted in Figure 2. As the figure shows, the oil imports have assumed an increasing role in the economy. More pertinently, as a growing percentage of exports, the oil imports have come to claim a large share of the export earnings, which have been on the rise since 2004 in particular. However, the figure also shows that in the 1980s the country experienced a similar rise in the oil imports relative to exports. It seems that the reliance on oil imports is a more fundamental and long-term problem.

Fig. 2. Pakistan's Oil Imports



4. ENERGY PROJECTS AND THE CAPITAL EXPENDITURE REQUIREMENTS

A fundamental reason for Pakistan' chronic deficiency in the energy sector is the fact that the country is lacking resources. There are no major oil deposits, and unexploited hydro-electric sites are limited and small. Due to political choices regarding the nuclear weaponry and technology in the past, driven by security concerns, the options of building new nuclear plants for civilian use also seem to be limited in view of the associated international concerns. The recent China-Pakistan Nuclear Reactor deal (WSJ, Oct. 16, 2013) involves Pakistan acquiring two large nuclear power reactors (1000 MW each) from China and will cost $9.1 billion. Notwithstanding the opposing international stance, the capital investment will need to be serviced, which will require additional foreign exchange earnings. There are prospects for coal based energy plants, mainly based on Thar Coal Field, but these are still shrouded in technological and financial uncertainties. However, besides the constraint of natural resources, another constraint involves financing energy projects that require large inflows of foreign capital and technology, even if there is a miraculous expansion in the country's resource endowment. This financial constraint has not been addressed adequately in previous studies on Pakistan.

There are various projects and structural measures in the planning and implementing stages relating to an increasing share of renewal energy production, diversification and rebalancing of the energy production mix. This will reduce oil intensity and exploration for fossil fuels [see for example, Pakistan (2013); NEPRA (2013)]. However, the energy infrastructure and production projects are heavily capital and technology-intensive that will necessitate large initial foreign investment as well as subsequent foreign exchange outflows on account of repatriation of returns and the principle. Moreover, the gestation periods for energy projects are generally quite long, which increases the final capital costs due to interest that would accrue during the period of construction.

The Capital expenditure (CAPEX) requirements for energy projects vary depending on the individual country, type and technology of plant. The US Energy Information Agency (EIA) provides estimates of the "overnight" capital required for various types of energy projects.[4] These costs, summarised below, indicate that a power project will call for a capital cost in the range of $2.1 to $8.3 billion in the USA. Capital costs for developing countries are much lower, but still substantial compared to their resources.

As a reference we can consider India's Ultra Mega Power Projects (UMPP). These are a series of ambitious power projects planned by the Government of India to provide "power for all" by the end of the Eleventh Five-Year Plan (2007–2012). The UMPPs would create additional capacity of at least 100,000 MW. The projects, with an average capacity of 4000 MW are estimated to cost approximately INR15,000 crores, roughly equivalent to USD 2.5 billion each.

[4]The term "overnight" refers to the cost of the project as if it would be constructed 'overnight' and no interest was incurred during its construction.

Table 2

Overnight Capital Cost ($/kW)

Type of Plant	Min	Max	Average
Coal	2,934	6,599	4,416
Natural Gas	676	7,108	2,132
Uranium	5,530	5,530	5,530
Biomass	4,114	8,180	6,147
Wind	2,213	6,230	4,222
Solar	3,873	5,067	4,374
Geothermal	4,362	6,243	5,303
Municipal Solid Waste	8,312	8,312	8,312
Hydroelectric	2,936	5,288	4,112

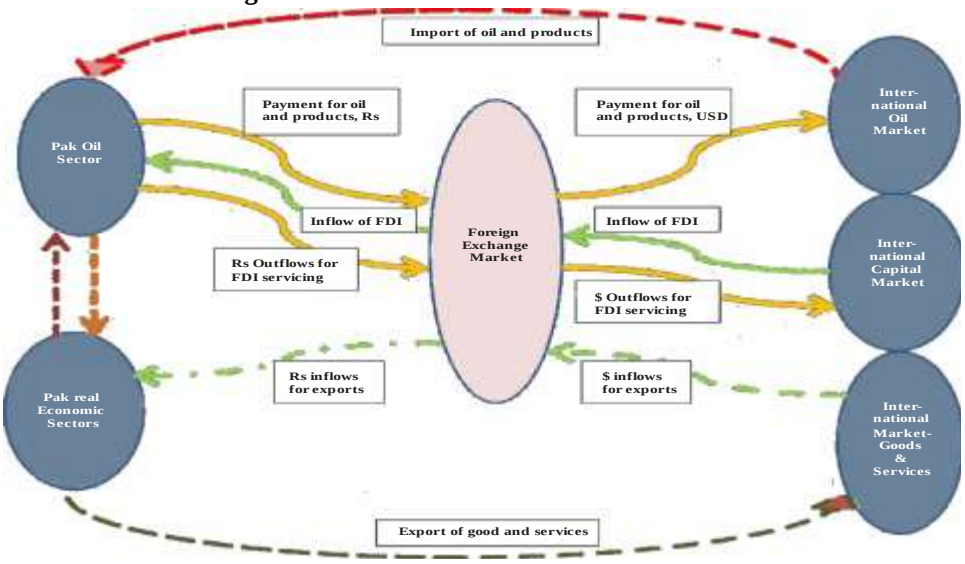
Source: US Energy Information Agency, http://www.eia.gov/forecasts/capitalcost/

As discussed in the previous section, it is likely that Pakistan will remain dependent on foreign imports to meet its energy requirements in the future and the country will need to generate adequate foreign exchange resources to secure its energy needs. We can then proceed to develop a simple model for estimating the country's foreign exchange requirements.

5. PROJECTION OF FOREIGN EXCHANGE REQUIREMENTS

The main implication of the country's chronic dependence on imported energy is a continuing pressure on its foreign exchange resources. In this section, we develop a conceptual model for projecting the demands on the foreign exchange resources given the energy sector's long-term reliance on imports and foreign direct investment in building new power capacity. The conceptual model is schematically presented in Figure 3.

Fig. 3. Oil Sector Inflows and Outflows of FX



Our model for projecting future FX requirements is a two-sector model: the energy sector and the rest of the economy. The energy sector imports oil and incurs payment obligations in foreign exchange. Besides oil and related imports, the energy sector also requires foreign exchange that can materialise as FDI for plant, equipment and technology. The inflow of FDI, however, creates obligations to service the capital investments; if these are debt inflows, it would involve interest and repayments of the principal. If these are equity investments, we will need to repatriate profits to the investors' commensurate with their expected risk adjusted returns as well as provide for possible liquidation. In addition, there would be obligations such as payments for royalties, management and licensing fees, etc. These three kinds of foreign exchange transactions are shown in Figure 3 as solid lines. As far as the non-energy sector is concerned, we, for this exercise, may assume that the import of goods and services are paid for by this sector's matching exports. Thus, any increase in the FX earnings from exports of goods and services, would be offset by additional imports of goods and services other than oil. These transactions are depicted in the figure as dotted lines. This simplification allows us to focus on the oil sector's FX requirements, which are relevant to the present analysis.

6. MODEL SIMULATION RESULTS AND PROJECTIONS

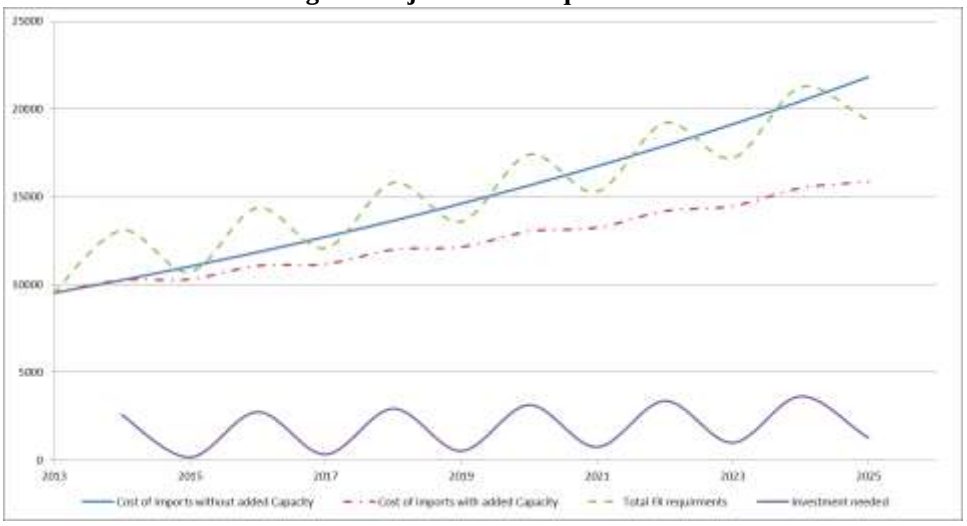
Given the simplified model for the oil sector's FX flows in Figure 3, we conduct a simulation exercise under certain simplifying assumptions and stylised facts as explained below.

Our starting points are the country's current GDP, its oil consumption, production and import levels. We assume as a base case that the country would target a 6 percent per annum real growth rate in its GDP, and that the oil consumption is a direct function of the GDP. This implies that the country's energy intensity is held constant, though it can be argued that it may increase or decrease as incomes rise. At the first pass, we hold the current domestic production of oil as constant, which allows us to determine the quantity and the value (assuming constant oil prices) of the oil imports. Next, the required quantity of oil imports (in M tons) is converted into TWh (tera watt hours) per year. We assume that the country would invest in the energy sector each year to create additional power capacity that would be adequate to meet the annual addition in import requirements. The additional capacity is created at an assumed overnight cost of $2,000 per KW (base case). We assume that the new power generating capacity comes on stream in the following year, which will help to attenuate the import bill in the following year. Thus, the foreign exchange required as FDI is projected. The final calculation involves determining the servicing obligations resulting from the FDI, which are assumed to be 10 percent of the projected cost per year, as a base case. Working with these assumptions, we project 13 years into the future up to year 2025. Our projections are, however, based on the assumed growth rates and are, therefore, subject to related limitations.

The results of the simulation are presented in Table A-II (in the Appendix) and are shown in Figure 4. The results show that, by increasing domestic production capacity, the oil sector is able to reduce its FX requirements, compared to when no new capacity is added. The demand for foreign exchange by the year 2025 is projected to be US$ 21.8 billion without FDI in new power generation; this demand with the FDI forthcoming will

be curtailed to US$ 15.8 billion, a saving of about 27 percent. However, when we include the CAPEX foreign exchange requirements, the total FX requirements are in the range of US$19-21 billion, essentially eliminating these savings. The main conclusion that can be drawn from our simulation is that the oil sector is likely to remain a substantial net user of the foreign exchange resources. Table A-IV contains results from simulating foreign exchange requirements for the year 2025 under various assumptions regarding rate of growth, FDI servicing and the required CAPEX per KW capacity.

Fig. 4. Projected FX Requirements



7. IMPLICATIONS FOR MACRO-ECONOMIC STRATEGIES

The country's chronic energy deficiency has broad implications for macro-economic policies and management with respect to: the foreign exchange regime, interest rates, foreign trade, savings, and domestic and foreign direct investment policies. The energy deficiency, and its logical consequences for the demand for foreign exchange in particular, have implications for exchange rate policies; see e.g., Mangla (2011) and Ahmad (2009).

Pakistan has experienced a real growth rate of about 4.1 percent per annum over 1991-2010, which is not much higher than the *Hindu growth rate* of 3.5 percent.[5] As a comparison, the economy of India has been growing at a rate of around 6-8 percent since economic liberalisation began in the 1990s. The energy deficiency directly affects the economic growth rates and can be a binding constraint on the country's growth. In order to achieve a growth rate unconstrained by energy availability, the country must be able to import its energy requirements and/or expand its domestic energy production through capital investment. Either way, the country would require foreign exchange resources. As we have shown in the previous sections, the energy sector is likely to remain a net user of

[5]The 'Hindu rate of growth' is a derogatory term referring to the comparatively low annual growth rate of the socialist economy of India before 1991. At the same time, Pakistan grew by 5 percent, Indonesia by 6 percent, Thailand by 7 percent, Taiwan by 8 percent, and South Korea by 9 percent. The term was coined by Indian economist Raj Krishna and popularised by Robert McNamara.

foreign exchange funds. Thus, the logical way out is to expand the export capabilities and making export expansion central focus of the growth strategy.

In 2000, Pakistan officially moved away from the managed exchange rate to a floating exchange rate regime and can be categorised as managed floater per its official pronouncements.[6] IMF's *de facto* classification of exchange rate regimes, as of July 31, 2006, however, notes that, "the regime operating *de facto* in the country is different from its *de jure* regime," and categorises Pakistan as following "other conventional fixed peg arrangements". A study by Rajan (2011) examining the exchange rate regimes in Asian countries over 1999-2009 period finds that, "Pakistan seems to operate rather ad hoc adjustable pegs." However, it finds insufficient evidence for the existence of any systematic exchange rate fixity, but notes a high degree of influence of the US dollar and negligible influence of the other currencies for Pakistan, suggesting that the country manages its currency against the US dollar.

Considering that the energy sector is central to the economic growth and shall likely remain import dependent, the FX policy needs to be redefined to reflect the projected demands of hard currencies. The FX rate, which would reflect its expected scarcity value, will be helpful in expanding exports and curtailing domestic consumption of oil and related products. Contrary to the above logical implication, there is empirical evidence that the Pakistani rupee "suffers from chronic overvaluation," [Ahmad (2009)]. There is also empirical support for Pakistan's economy as a victim of the *Dutch Disease*, an affliction caused by unrequited transfers and foreign aid.[7] Under this condition, remittances cause an appreciation of the real exchange rate, and loss of competitiveness of Pakistan's exports sector and at the same time increase share of the non-tradable sector in the economy. Makhlouf and Mughal (2011), Javaid (2009) and Ahmed (2009) find empirical support for the Dutch Disease hypothesis for Pakistan.

The exchange rate has to be consistent with the reality of the country's chronic energy deficit. This implies that the exchange rate should not only reflect its fair value notwithstanding the Dutch Disease, but may also be tilted in favour of the export sector. The current managed-float seems to be focused on the overall balance of payment, aimed at keeping a stable level of foreign reserves. Yet, the country has experienced declining foreign exchange reserves over the recent years. In order to create a fair playing field for the export sector, the managed-float regime should instead be focused on the current account balance minus the transfer payments. Such a policy would imply a higher FX rate compared to the rate prevailing under the current policy; i.e., a depreciation of rupee compared to its current value. Periodic capital account shocks, e.g., in 2013, are evidence to the adjustment of the Pakistani rupee. There would be a concurrent and steady buildup of foreign exchange reserves that may prove beneficial in other ways. First, it would exert a beneficial impact on the exports and at the same time a stronger dollar will also discourage excessive import consumption and help with energy demand management. Second, a steady increase in the FX reserves would provide more confidence to the foreign investor, which may be critical to attracting the needed FDI to the country. Third,

[6]See Janjua (2007) for details on the history of exchange rate regimes in Pakistan.

[7]The term originally referred to natural resource discovery, but has been used with reference to "any development that results in a large inflow of foreign currency, including a sharp surge in natural resource prices, foreign assistance, and foreign direct investment."

increases in the FX reserves would help to sterilise foreign exchange inflows, curbing inflation in the country. Fourth, a steady increase in FX reserves commensurate with the growth in the country's exports and GDP is also required to support trade transactions.

Exchange rate policies followed by China and India, two oil importing countries, have led to a steady increase in their foreign exchange reserves, which are currently reported at $3,557 and $281 billion respectively (until recently Indian reserves exceeded $300 billion). There is a consensus that China manages its currency to be undervalued in pursuit of an export led growth strategy. The steady increase in the Indian FX reserves also points out to a slight undervaluation of the INR.

Another aspect of the exchange rate policy relates to its volatility. As Engel and Hakkio (1993) explain, the system of fixed but adjustable rates, as followed by Pakistan, introduces a new kind of volatility: volatility caused by the expectations of exchange rate realignments. By eliminating the market's uncertainty about the future exchange rate, a system of absolutely fixed exchange rates reduces *normal* volatility. However, when the rates are fixed but adjustable, the market knows that realignment may occur and the speculation around the magnitude and timing of the realignment will be reflected in exchange rate volatility. Therefore, between realignments, exchange rate volatility will tend to be within normal limits, but around the time of realignments it can be extreme. If the equilibrium rate continues to trend upward or downward, then the incidence of realignment increases, and with it the incidence of extreme volatility also rises.

From the point of view of the foreign investor, a volatile and steadily weakening currency is an anathema to FDI. With larger FX reserves the float managers are in a stronger position to dampen volatility, absorb short-term shocks, and thus reduce FX economic and transaction exposure for the foreign investor.

In addition to the exchange rate policy within the managed-float regime, there are implications for the monetary and fiscal policies. Inflation and interest rates differentials are main determinants of the FX rate, which are affected by monetary and fiscal policies. Fundamental macro-economic relationships link saving gaps, public deficits and current account deficits. It is quite basic that exchange rates would be strengthened by subduing inflation and curtailing fiscal deficits. However, from the perspective of meeting the energy sector's projected FX requirements, a prudent management of the monetary and fiscal policies assumes greater significance.

Monetary policy can also be helpful by maintaining higher real interest rates. Due to historical inflation rates well in excess of nominal interest rates, the real interest rates in Pakistan have tended to be negative. Partly because of this, in addition to the adverse security situation, Pakistan has not been the beneficiary of foreign capital flows to the same extent as other emerging countries. India, for example, has been able to capitalise on the global liquidity resulting from quantitative easing policies followed by major developed countries.

As a case in point, India's central bank recently raised policy interest rates for the fourth time in six months to fight high inflation, while pulling away from the emergency measures recently put in place to support the slumping rupee. In a related move, RBI started subsidising some of the cost of hedging against currency risk in foreign currency deposits and loans. The programme has raised $10 billion since then; the interest rate of about 4 percent on the NRI deposits has been so attractive that some international banks

have even been offering loans to non-residents (WSJ, Oct 24, 2013). Thus, measures to reduce FX risk with guarantees for repatriation and against restriction/partial blocking of FX funds would be necessary for attracting foreign direct and portfolio investment.

In addition to the monetary and fiscal policy measures that are consistent with the long-term dependence on imported energy, institutional and governance measures will need to be addressed; these issues have been extensively discussed, e.g., see [Uppal (2011)]. Non-economic measures, such as ensuring political stability and security, in support of FDI and foreign portfolio investment have been thoroughly discussed in the literature and there is a body of good practices that are recommended for creating a suitable environment.

8. CAPITAL ACCOUNT AND MACROECONOMIC POLICY

Finally, a few observations on the capital account and the macroeconomic policy are warranted. Theoretically, the opening of the capital account should improve the country's access to private foreign capital, *ceteris paribus*, but because of domestic security and economic and political concerns, the inflow of private capital has significantly fallen over 2009-2013. Haque (2011) has demonstrated that although capital outflows were not a major cause of the decline in foreign exchange reserves during Pakistan's economic crisis of 2008, the open capital account and rupee convertibility have made the country more vulnerable to outside shocks. Haque further identifies three areas where policy-makers in Pakistan face serious challenges, i.e., (i) macroeconomic management, (ii) controlling tax evasion, which the Pakistani rupee's convertibility has made easier, and (iii) minimising the real cost of portfolio investment to the country.

The movement of capital and international trade are two indicators of global integration. The magnitudes of these two flows relative to Pakistan's GDP provide a good indication of its degree of global integration. Unfortunately, Pakistan's scores on both these accounts have continuously deteriorated. The ratio of foreign trade (i.e., exports plus imports) to GDP for Pakistan fluctuated between 40 and 45 percent during 2004-08, but fell sharply to less than 35 percent in 2009 and continues to fall in recent years. On the contrary, India's trade ratio gradually rose to about 50 percent of GDP, which was initially of the same order of magnitude as Pakistan's; India has become more globalised in its trade sector.

An open capital account also calls for a more vigilant macro-economic management because of a potential for economic disruption and increased vulnerability to external shocks. As Reinhart and Rogoff (2008) note: "Periods of high international capital mobility have repeatedly produced international banking crises, not as famously as they did in the 1990s, but historically," (p. 8). Similarly, Rodrik and Subramanian (2008) observe that "countries that grow more rapidly are those that rely less and not more on foreign finance; and in turn foreign capital tends to go to countries that experience not high, but low productivity growth." Haque notes, "The high dependency on foreign sources to finance domestic investment has made Pakistan's economic performance highly vulnerable to outside factors. There is little question that this dependency will have to be reduced and domestic savings rate drastically raised if economic growth in Pakistan is to reach levels comparable to the rapidly growing Asian economies."

In summary and in looking at the broader picture, it is the trade deficit, rather than the decline in capital flows, that is the basic cause for loss of foreign exchange reserves. Thus, energy deficit and concomitant foreign exchange liabilities will require a significant boosting of Pakistan's exports. In recent years the country has come to rely on foreign remittances to meet import requirements. These inflows are, however, a mixed bag as alluded before. In addition, recent global economic developments, such as tapering off the quantitative easing and recent volatility in emerging economies, FX volatility and capital account deficits and higher interest rates in the BRICs economies are not good omens for the Pakistan's economy and its trade sector.

9. SUMMARY AND CONCLUSIONS

Pakistan's economy is greatly exposed to high and volatile oil prices when compared to commonly used economic indicators of a country's vulnerability; these include a greater share of oil imports in a percent of gross domestic product (GDP), a high proportion of oil usage in the primary energy supply, and rising oil imports and expenditure over time. It is likely that Pakistan will remain dependent on foreign imports to meet its energy requirements for a long time to come and will need to generate commensurate foreign exchange resources to ensure long-term energy security. An issue which has been investigated in this analysis relates to how the energy sector's foreign exchange requirements for meeting current consumption and for capital expenditures for creating domestic capacity would be financed. This paper has tried to address this question and identify its implications for the country's macroeconomic policy and management.

The paper addresses the implications for macro-economic policies given the country's chronic dependence on imported energy and continuing pressure on its foreign exchange resources. The basic fact remains that the integration of energy policy plans with macro-economic objectives has remained weak. Pakistan's export sector growth has not managed to offset the rising oil import bill. To add to the energy woes, the deteriorated security situation in Pakistan has led to a significant decline in foreign investment.

We have proposed a *chronic energy deficit* hypothesis by developing a model for projecting the energy sector's long-term requirements for foreign exchange. An analysis of the country's long term import and capital inflow requirements presents a picture of long-term import dependency. As a result of the country's chronic dependence on oil imports, the economy will remain greatly exposed to high and volatile oil prices.

A fundamental issue for Pakistan is how the energy projects requiring large inflows of foreign capital and technology would be financed. The energy infrastructure and production projects are heavily capital and technology intensive, and will necessitate large initial foreign investment as well as subsequent foreign exchange outflows on account of repatriation of returns and the principle. It is this financial constraint, which has not been addressed adequately in previous studies. The main implication here is that there will be a continuing pressure on the county's foreign exchange resources. Any increase in the FX earnings from exports of goods and services in the normal course is likely to be offset by additional import of goods and services other than oil.

We conducted a simulation exercise, which shows that when we include the required FDI for the CAPEX, the oil sector requires additional net inflows of FX resources 6 percent to 18 percent above the base case. The demand for foreign exchange by the year 2024-25 is projected to be US$ 20-21 billion without the FDI in new power generation. However, when we include the CAPEX foreign exchange requirements, the total FX requirements are in the range of US$ 23-24 billion.

The country's chronic energy deficiency has broad implications for macro-economic policies and management with respect to the foreign exchange regime and foreign direct investment policies. Our analysis suggests that the FX policy needs to be redefined to reflect the projected demands on hard currencies. The FX rate, which would reflect its expected scarcity value will be helpful in expanding exports and curtailing domestic consumption of oil and related products. Moreover, Pakistan's economy is likely afflicted by the *Dutch Disease,* which is an affliction caused by unrequited transfers and foreign aid, and leads to appreciation of the real exchange rate and weakening of the competitiveness of Pakistan's exports sector. Therefore, our exchange rate policy has to be consistent with these realities.

APPENDIX

Table A-I

Pakistan's Oil Consumption (Thousand Barrels Per Day)

Year	Petroleum Consumption	Domestic Oil Supply	Consumption-Production Gap	Domestic Production %
1980	104.000	11.200	92.800	10.8%
1981	113.000	11.200	101.800	9.9%
1982	134.000	13.200	120.800	9.9%
1983	137.000	14.200	122.800	10.4%
1984	140.000	18.200	121.800	13.0%
1985	159.672	36.200	123.472	22.7%
1986	165.748	42.109	123.639	25.4%
1987	180.425	42.070	138.355	23.3%
1988	194.201	45.144	149.057	23.2%
1989	205.635	48.031	157.604	23.4%
1990	220.051	62.039	158.012	28.2%
1991	221.059	63.341	157.718	28.7%
1992	227.210	63.675	163.536	28.0%
1993	256.420	62.549	193.871	24.4%
1994	282.170	57.651	224.519	20.4%
1995	298.094	61.948	236.146	20.8%
1996	326.903	57.624	269.279	17.6%
1997	333.036	59.560	273.476	17.9%
1998	346.835	57.843	288.992	16.7%
1999	368.569	56.572	311.997	15.3%
2000	365.014	56.763	308.252	15.6%
2001	360.125	63.374	296.750	17.6%
2002	355.895	67.931	287.964	19.1%
2003	336.599	64.330	272.269	19.1%
2004	326.846	66.592	260.255	20.4%
2005	336.186	68.126	268.060	20.3%
2006	357.077	69.257	287.820	19.4%
2007	382.259	68.687	313.573	18.0%
2008	389.752	62.604	327.148	16.1%
2009	390.935	59.846	331.089	15.3%
2010	392.300	64.898	327.402	16.5%
CAGR	**3.51%**	**1.75%**		

Table A-II

Projected Foreign Exchange Requirements for the Oil Sector – USD Million

Year	Without New Capacity	Capital Cost	With Added Capacity	For FDI Servicing	Total (Incl. CAPEX)
2013	9,525	0	9,525	–	9,525
2014	10,254	2,581	10,254	258	13,093
2015	11,027	155	10,298	274	10,726
2016	11,846	2,745	11,073	548	14,366
2017	12,714	329	11,166	581	12,076
2018	13,634	2,929	11,993	874	15,797
2019	14,610	524	12,142	926	13,592
2020	15,644	3,137	13,028	1,240	17,404
2021	16,740	744	13,238	1,314	15,296
2022	17,902	3,370	14,189	1,651	19,210
2023	19,134	991	14,469	1,750	17,211
2024	20,439	3,631	15,495	2,114	21,240
2025	21,823	1,268	15,853	2,240	19,362
Average	15,481	1,867	12,767	1,148	15,781

Table A-III

Total FX Requirements for the Year 2025 (USD Million)
(Projections under Different Assumptions)

Annual Growth Rate		FDI Servicing Cost		CAPEX Cost (per KW)	
3%	$13,350	4%	$18,017	$ 1,250	$ 18,046
4%	15,073	6%	18,466	$ 1,500	18,485
5%	17,066	8%	18,914	$ 1,750	18,923
6%*	19,362	10%	19,362	$ 2,000	19,362
7%	21,995	12%	19,810	$ 2,250	19,800
8%	25,005	14%	20,258	$ 2,500	20,239
9%	28,435	16%	20,706	$ 2,750	20,677

* Base case.

REFERENCES

Ahmed, H. (2009) Capital Flows and Real Exchange Rate Overvaluation—A Chronic Ailment: Evidence from Pakistan. *The Lahore Journal of Economics* 14:SE, 51–86.

Ahmed, Meekal (2010) Blaming the IMF. *The News International*, January 20.

Ahmed, Meekal (2011) An Economic Crisis State? In M. Lodhi (ed.) *Pakistan: Beyond the 'Crisis State.'* Karachi: Oxford University Press.

Ahmed, Meekal (2012) *The IMF and Pakistan (A Road to Nowhere).* Islamabad: Pakistan Institute of Development Economics.

Ahmed, Mukhtar (2007) Meeting Pakistan's Energy Needs. In R. M. Hathaway, B. Muchhala, and M. Kugelman (eds.) *Fueling the Future: Meeting Pakistan's Energy Needs in the 21st Century*. Washington, DC: Woodrow Wilson International Center, 17–18.

Alahdad, Z. (2012) *Pakistan's Energy Sector: From Crisis to Crisis—Breaking the Chain.* PIDE Monograph Series. Islamabad: Pakistan Institute of Development Economics.

Bacon, R. and M. Kojima (2008) Energy Security: Coping with Oil Price Volatility. *ESMAP Special Report* 2005/08. The World Bank Group, Washington, DC, USA.

Bielecki, J. (2002) Energy Security: Is the Wolf at the Door? *The Quarterly Review of Economics and Finance* 42, 235–250.

British Petroleum (2013) *BP Statistical Review of World Energy 2013*. London: British Petroleum. http://bp.com/statisticalreview.

Daniel, J. A. (2001) Hedging Government Oil Price Risk. (IMF Working Paper, WP/01/185).

Engel, C. and C. S. Hakkio (1993) Exchange Rate Regimes and Volatility. *Economic Review*, Federal Reserve Bank of Kansas City, Q III, 43–58.

Finleya, M. (2012) The Oil Market to 2030—Implications for Investment and Policy. *Economics of Energy and Environmental Policy* 1:1.

Ghayur, A. and E. Ahmad (2008) Decube Framework: An Introduction to a New Energy Modelling and Planning Process for Sustainable Utilisation of Pakistan's Energy Resources. *The Pakistan Development Review* 46:4, 499–515.

Haque, I. (2010) *Pakistan: Causes and Management of the 2008 Economic Crisis* (Global Economic Series No. 22). Penang, Malaysia: Third World Network.

Haque, I. (2011) The Capital Account and Pakistani Rupee Convertibility: Macroeconomic Policy Challenges. *Lahore Journal of Economics* 16(Sept.), 95–121.

IANGV (2013) Current Natural Gas Vehicle Statistics. *International Association for Natural Gas Vehicles*. http://www.iangv.org/current-ngv-stats/

IMF (2003) *Fiscal Policy Formulation and Implementation in Oil-Producing Countries*. J. M Davis, R. Ossowski, and A. Fedelino (eds.) International Monetary Fund, Washington, DC.

IMF (2012) *Macroeconomic Policy Frameworks for Resource-Rich Developing Countries.* International Monetary Fund, Washington, DC.

Janjua, M. A. (2007) Pakistan's External Trade: Does Exchange Rate Misalignment Matter for Pakistan? *The Lahore Journal of Economics* (Special Edition) (September 2007), 125–154.

Javaid, S. H. (2009) Dutch Disease Investigated: Empirical Evidence from Selected South-East Asian Economies. State Bank of Pakistan (Working Paper Series No. 31).

Kugelman, M. (2013) Pakistan's Energy Crisis—From Conundrum to Catastrophe? *The National Bureau of Asian Research – Commentary*, March 13.

Labandeira, X. and B. Manzano (2012) Some Economic Aspects of Energy Security. (Working Papers 09-2012) *Economics for Energy*. Available at: http://www.eforenergy.org/docpublicaciones/documentos-de-trabajo/WP092012.pdf

Makhlouf, F. and M. Mughal (2013) Remittances, Dutch Disease, and Competitiveness: A Bayesian Analysis. *Journal of Economic Development* 38:2, 67–97.

Malik, A. (2008) *How Pakistan is Coping with the Challenge of High Oil Prices.* Islamabad: Pakistan Institute of Development Economics.

Malik, A. (2010) Oil Prices and Economic Activity in Pakistan. *South Asia Economic Journal* 11:2, 223–244

Mangla, I. (2011) Reconstructing the Performance of Pakistan's Political Economy: Another Paradigm. *Lahore Journal of Economics* 16:Sept., 31–70.

MPNR (2005) Brief on Pricing of Petroleum Products, November 10. Islamabad: Ministry of Petroleum and Natural Resources. http:/www.mpnr.gov.pk/ pricing%20formula.php.

Munasinghe, M. (1984) Energy Strategies for Oil Importing Developing Countries. *National Resource Journal* 24, 351–368.

NEPRA (2013) *State of Industry Report 2012*. National Electric Power Regulatory Authority, Government of Pakistan, Islamabad.

Pakistan, Government of (2013) *National Power Policy*. Islamabad: Ministry for Water and Power.

Pandey, R. (2006) How Can India Achieve Energy Security? *Economic and Political Weekly* 41:4, 303-306.

Rajan, R. (2011) Management of Exchange Rate Regimes in Emerging Asia. (ADBI Working Paper 322). Tokyo: Asian Development Bank Institute.

Reinhart, C. M. and K. S. Rogoff (2008) This Time is Different: A Panoramic View of Eight Centuries of Financial Crises. Cambridge, MA: National Bureau of Economic Research. (Working Paper No. 13882).

Rodrik, D. and A. Subramanian (2008) Why Did Financial Liberalization Disappoint? (Mimeo). Harvard University and Peterson Institute for International Economics.

Siddiqui, R. (2004) Energy and Economic Growth in Pakistan. *The Pakistan Development Review* 43:2, 175–200.

State Bank of Pakistan (n.d.) *Annual Reports: 2008-2012*. Karachi: State Bank of Pakistan.

The Economist (2013) Pakistan Electricity Crisis (Long, Hot Summer). June 8th 2013.

Uppal, J. (2011) Government Budget Deficits and the Development of the Bond Market in Pakistan: Issues and Challenges. *Lahore Journal of Economics* 16:Sept., 159–98.

WSJ (2013a) China-Pakistan Reactor Deal Spurs Concern. *Wall Street Journal*, October16, 2013. http://online.wsj.com/news/articles.

WSJ (2013b) India's Central Bank Programme Brings in Billions. *Wall Street Journal*, October 24, 2013. India Real Time: http://blogs.wsj.com/indiarealtime/2013/10/24\ indias-central-bank-program-brings-in-billions/?mod=wsj_streaming_latest-headlines" \ t "_blank.

Yépez-García, R. A. and J. Dana (2012) Mitigating Vulnerability to High and Volatile Oil Prices: Power Sector Experience in Latin America and the Caribbean. Washington, DC: World Bank.