THE IMPACT OF REDUCING ENERGY SUBSIDIES ON ENERGY INTENSIVE INDUSTRIES IN EGYPT

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Abstract

This paper investigates the impact of reducing energy subsidies in Egypt on energy intensive-industries applying a partial equilibrium approach. It first selects a sample of sectors and industries that depend heavily on energy products, and then measures the impact on profitability per ton of production in these industries, holding other factors constant. The paper finds that energy-intensive industries in the Egyptian economy benefit the most from subsidized energy products either directly or indirectly. Finally, it concludes that increasing prices of petroleum products (including natural gas) and electricity can be absorbed by such companies without having to raise prices proportionally. In other words, energy-intensive industries have flexible options to adjust to subsidy reduction in the sense that they can choose either not to raise prices, due to higher profitability ratios, or increase them in ways that do not exceed the actual increase in cost.

ملخص

تقوم هذه الورقة بتقييم أثر تخفيض دعم منتجات البترول والغاز الطبيعي على الصناعات ذات الاستخدام الكثيف للطاقة، وذلك من خلال تطبيق منهج توازن جزئي. وتبدأ الدراسة باختيار عينة من القطاعات والصناعات التي تعتمد بكثافة على منتجات الطاقة، ثم تقيس التأثير على الربحية لكل طن من الإنتاج في هذه الصناعات، بافتراض ثبات العوامل الأخرى. وقد وجدت الدراسة أن الصناعات كثيفة الاستخدام للطاقة في مصر تستفيد استفادة كبيرة من منتجات الطاقة المدعومة بصورة مباشرة أو غير مباشرة. وخلصت إلى أن الشركات في هذه الصناعات تستطيع استيعاب الزيادات في أسعار منتجات البترول والغاز الطبيعي، ومن ثم أسعار الكهرباء الناتجة عن تخفيض الدعم دون الحاجة لزيادة أسعار منتجاتها النهائية بنفس القدر. أي أن استجابة هذه الشركات لتخفيض الدعم تتسم بالمرونة؛ حيث تستطيع الإبقاء على أسعار منتجاتها دون تغيير، نظرا لارتفاع معدلات ربحيتها، أو رفع الأسعار ولكن بما لا يتجاوز الزيادة الفعلية في التكلفة.

1. INTRODUCTION

Subsidies are a major item in government expenditures in Egypt. Recent figures indicate that these subsidies exceeded 23 percent of total budget spending in 2005/2006 (more than LE 50 billion), around 74 percent of which was allocated to energy products (excluding electricity).

Due to the rapid increase in oil prices over the past two years,[1] the subsidy bill of energy products has quadrupled. Such increase has posed a critical challenge for the fiscal authority in Egypt. Political and economic considerations have restrained the government from restructuring the existing subsidy system despite its inefficiencies. Starting FY 2005/2006, the fiscal authority has recorded such subsidies *explicitly* in order to reveal the true burden of subsidizing petroleum products and natural gas.

This paper investigates the potential impact of reducing energy subsidies in Egypt on energy-intensive industries. A partial equilibrium approach is applied to assess such policy. Specifically, it examines the effect of subsidy reduction on energy-driven sectors, under different scenarios of increasing prices of energy products. The effects are assessed through selecting a sample of sectors and industries that depend heavily on energy products, and then measuring the impact on profitability per ton of production in selected industries, holding other factors constant.

The paper is organized as follows. Following the introduction, section 2 discusses the concept of subsidy in addition to the rationale behind the energy subsidy system. Section 3 examines the characteristics and challenges of energy subsidies in Egypt. It also assesses the fiscal burden of energy subsidies on government budget. The partial effect of energy subsidy reduction is analyzed in section 4. Finally, section 5 sums up the main findings of the study and their policy implications.

2. SUBSIDY: CONCEPTUAL FRAMEWORK

2.1 What is a Subsidy?

Technically, it is quite difficult to agree on a unique definition of the term subsidy. As discussed below, it may be understood either in a narrow or broad sense (Schrank 2003). Moreover, the definition differs according to contextual use. The one adopted in free trade

[1] The average price of crude oil went up by 16.1 percent in 2003, by 30.4 percent in 2004, and by 37.8 percent in 2005 (BP 2006).

zones differs significantly from definitions used by governments, World Trade Organization (WTO), the Organization of Economic Cooperation and Development (OECD) and the United Nations agencies.

In economic literature, subsidy is defined as any action or measure that keeps either consumer prices below market levels, or producer prices higher than market levels (Irrek 2002). The term subsidy is referred to as a *monetary grant* given by government to keep the price of a good lower for consumers, or higher for producers, since this is considered to be in the public interest.[2] This support is given either directly or indirectly, in the sense that it is used to reduce costs for either consumers or producers by giving direct or indirect support to a particular sector/group (Myers and Kent 2001). Furthermore, subsidy is the opposite of a tax, albeit it can also be provided through a reduction of the tax burden.

2.2 Explicit versus Implicit Subsidies

Broadly, subsidies are divided into two categories applying either a narrow or a broad definition of the term subsidy. The narrow definition refers to explicit budgetary subsidies, while the broad one includes implicit support as well. Implicit support (subsidies) encompasses all measures that are not shown in government accounts.

The terms explicit and implicit subsidies are sometimes used as synonyms to the terms *direct* and *indirect* subsidies, respectively (Legeida 2001). However, such usage lacks accuracy as explicit subsidies are sometimes allocated directly or indirectly.[3] Also, some forms of implicit subsidies are allocated directly or indirectly. It is also important to note that explicit subsidies are sometimes accompanied by implicit subsidies. For instance, the government might provide firms with subsidized energy inputs and at the same time encourage them through tax exemption. This makes the distinction between explicit and implicit subsidies not always clear (Valdes 1988).

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[2] The term sometimes extends to include assistance granted by others, such as individuals or non-government institutions. However, the latter form of assistance is more usually described as charity.

[3] This case is clear if we look at the Egyptian subsidy system where many explicit subsidies are provided directly and indirectly. For instance, the state budget directly subsidizes the General Authority for Supply Commodities (GASC) and indirectly subsidizes other economic authorities as the state budget continues to finance their deficits.

Fiscal and economic costs[4] differ markedly for explicit and implicit schemes of subsidy (Dodson and Paramo 2001). Moreover, there is a problem measuring the cost of subsidy system as it is a complicated system, given the range of delivering subsidies whether in cash or in kind (Kumar and Alderman 1989). The desirability of using either implicit or explicit subsidies is constrained by different social, economic and political factors. Implicit subsidies seem a desirable option for governments since they do not sometimes imply any marginal fiscal cost to them. Governments may achieve lower prices for goods and services through affecting the incentive system without bearing any explicit budgetary fiscal cost (Valdes 1988).

2.3 Rationale and Effectiveness of Energy Subsidy

2.3.1 Rationale behind the subsidy system

Although economic theory has not provided an adequate answer or prescription for the questions of what the state should not do or do and how best to do it, it provides valuable guidance for such questions. As a mechanism of state intervention, the rationale for subsidy is established upon the need for correcting market failures. Thus, the subsidy system (implicit or explicit) is justified based on efficiency and equity considerations.

As argued, the state is often required to subsidize services that the market will not provide, or provides insufficiently. As a rule, the provision of purely public goods—where the marginal cost of an additional unit of consumption is zero—is fully financed by the state. For other goods and services where the market would under-provide them, there is call for some form of government intervention.[5] In this respect, subsidy would be justified on efficiency grounds. However, subsidy is not always justified by efficiency considerations but also because of lack of access to services by poor households and vulnerable groups of society (Saunders and Schneider 2000). Hence, the state should seek to target the provision of these services to such groups on the basis of equity considerations.

For energy activities, it has been argued that free markets do not operate efficiently and effectively, since they do not take into account social, economic and environmental benefits

[4] Fiscal costs are those paid by government whether or not they have been shown in government accounts, while economic costs are the benefits foregone from other forms of allocation. Specifically, economic costs are the cost of income transfers that some or a segment of society makes to another segment(s) of society (Valdes 1988).

[5] These goods and services—called semi-private or semi-public—may be subject to significant external benefits or costs (positive and negative externalities) such as education and health.

and costs that might be associated with such activities. Therefore, free energy markets might malfunction in various ways. The problem of over-production and pollution is a typical example of such failure. Also, markets are said to fail when disadvantaged groups of society have limited access to modern energy. In both cases, governments have a responsibility to intervene to protect air quality and provide everyone with access to modern energy (Pershing and Mackenzie 2004).

Although energy subsidies are a widespread practice, they vary significantly in type and magnitude according to product and country. Subsidies on energy products are used widely by governments to achieve a range of policy objectives. For instance, in developed countries governments consider regional employment objectives as a key justification for subsidies on production (Pershing and Mackenzie 2004). For the EU countries, government intervention in the energy sector is justified on the basis of supply security since the oil crisis of the 1970s, environmental improvement and stimulating particular sectors of the economy or segments of the population (EEA 2004). The rationale for intervention in the energy market is different in developing economies and economies in transition where energy consumption subsidies are often used to guarantee that all members of the population, particularly the poor, have access to a minimum level of energy consumption. This objective justifies subsidized pricing policies of energy products in most developing countries. Furthermore, subsidies are also justified on the basis of encouraging industrial growth through low cost energy (Saunders and Schneider 2000).

2.3.2 Subsidy system limitations

In economic literature, it has been argued that unless subsidies, as a mechanism of intervention, are introduced to overcome market failure, they might lead to loss of economic efficiency manifested in different forms. Specifically, expansion in production of less efficient industries emerges as a result of subsidies on consumption at the expense of other more efficient industries (Saunders and Schneider 2000). Likewise, subsidies to producers result in less efficient economic operations and investments, as the case of coal production in several OECD countries in which subsidies have hindered efforts to improve productivity (UNEP 2002).

As argued, lower prices of energy due to subsidies expand consumption of energy products beyond its efficient levels (Saunders and Schneider 2000). Furthermore, energy subsidies affect negatively the adoption of certain advanced technologies as they might make certain old-fashioned technologies more economically attractive. Theoretically, lower end-user prices as a result of subsidies lead to higher energy use and reduced incentives to save or use energy more efficiently. Moreover, lower end-user prices of energy products discourage producers to develop and invest in energy projects[6] (UNEP 2002). Price ceilings below market levels may need an administratively costly rationing system. In most cases, rationing systems have not been efficient in reaching target groups.[7]

Direct subsidies in the form of grants or tax exemptions create a challenge for government finances, since they increase the fiscal burden on the budget. For example, according to IMF estimates, the Iranian government's direct spending on energy subsidies amounted to 8 percent of its budget in the late 1990s. Similarly, in Hungary gains of improving energy use jumped from $5–10 million to $80 million per year after consumer price subsidies were removed in 1997 (UNEP 2002). It is also argued that increasing energy use due to subsidies either boosts demand for imports or reduces energy exports. This harms the balance of payments and energy supply security because of increasing the country's dependence on imports. The Indonesian government, for example, estimates that energy subsidies cost the country $16 billion in lost export earnings (UNEP 2002).[8]

Therefore, the literature has outlined the characteristics of an effective/well-functioning subsidy system (UNEP 2004). The key characteristics of such a system are as follows:

- ***A well-targeted system*****:** it should be directed only to those who are intended and deserve to receive subsidies (target groups).
- ***Efficiency*****:** it should not undermine incentives for suppliers or consumers to provide or use a service efficiently.
- ***Cost effectiveness*****:** subsidy programs should be justified based on costs/benefits yardsticks.
- ***Practicality*****:** resources for subsidies should be affordable and the administrative cost of running subsidy programs should be reasonable.

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[6] For instance, lower prices of energy products discouraged investment in modernizing the electricity sector in India because firms consider the adoption of old-fashioned technology economically attractive. This is a common phenomenon in several developing countries (UNEP 2002).

[7] For details, see the case of India where subsidized oil products are rationed (UNEP 2002).

[8] In Indonesia all subsidies had almost been phased out by 2003 except for about one percent of GDP in outlays for kerosene.

- ***Transparency*****:** information on the amount of government funds spent on subsidy and on subsidy recipients should be disclosed.
- ***Transitory*****:** subsidy programs should be designed in such a way as to avoid consumers and producers becoming overly dependent on such support.

Such conditions or characteristics are the basis in discussing the effectiveness of energy subsidy. The absence of one or more characteristics implies a lack of an efficient and effective subsidy system. Country experience shows that inefficient subsidy programs lacked a timeframe, where they have started as temporary and ended with a permanent, costly system of subsidy. Similarly, a subsidy system is said to be not effective if it does not reach its target groups.

2.3.3 Magnitude of world energy subsidy

Subsidies in most OECD countries are producer subsidies that often take the form of direct payments or support for research and development. For developing countries, most subsidies go to consumers via price controls that keep end-user prices below market level or even below total cost of production (UNEP 2002).

In fact, there is a problem in quantifying subsidies for the world as a whole due to differences in concepts and measurements. This makes most available figures and studies relatively inconsistent and outdated. In 1992, the World Bank estimated world subsidies on fossil-fuel consumption from under-pricing alone at around $230 billion per year. Net global consumption subsidies are also estimated at $235 billion per year. In 1997, the World Bank estimated annual fossil-fuel subsidies at $48 billion in twenty of the largest countries outside the OECD and $10 billion in the OECD (UNEP 2002). Subsidies on the consumption of fossil fuels in developing and transition economies are estimated at US$50 billion in 1995-1996, or 1.3 percent of their GDP (Saunders and Schneider 2000).

Despite increasing reliance on market-based pricing mechanisms, energy subsidies remain significant in developing countries (Legeida 2001). They were estimated at about two-thirds of global energy subsidies. Nonetheless, per capita subsidies in developed countries (OECD) are almost 2.5 times those in developing countries (non-OECD) (see table 1).

Table 1. The Cost of Annual Energy Subsidies (1995-1998, $US billion)

	OECD Countries	Non OECD Countries	Total
Coal	30	23	53
Oil	19	33	52
Gas	8	38	46
All fossil fuels	57	94	151
Electricity	Na	48	48
Nuclear	16	Nil	16
Renewable and end use	9	Nil	9
Non payments and bail out	0	20	20
Total	**139**	**256**	**395**
% of global energy subsidies	35%	65%	100%
Per capita subsidies ($/cap)	88	35	44
Per capita GDP ($/cap)	23,132	3903	7316

Source: Pershing and Mackenzie (2004).

Subsidy rates differ by products as shown in table 2. Clearly, end-user prices are highly subsidized in oil-exporting countries since the estimated rate of subsidy as a percentage of reference price reaches 80 percent in Iran, 57.6 percent in Venezuela, 32 percent in Russia and 27.5 percent in Indonesia, while it is much lower in non-oil producing countries like South Africa (6.4 percent), China (10.9 percent) and India (14.2 percent).

Table 2. Estimated Rate of Subsidy* (% of Reference Price) in a Sample of Countries**

	South Africa	Venezuela	Kazakhstan	China	Russia	India	Indonesia	Iran
Gasoline	0.0	26.6	0.0	0.0	9.3	0.0	0.0	59.4
Auto diesel	0.0	35.9	0.0	0.0	0.0	0.0	40.2	93.9
LPG	0.0	26.1	0.0	0.0	0.0	31.6	0.0	89.7
Kerosene	2.0	4.9	0.0	0.0	0.0	52.6	55.2	89.5
Light fuel oil	0.0	19.3	0.0	0.0	1.5	0.0	45.5	82.3
Heavy fuel oil	0.0	39.4	0.0	0.0	0.0	0.0	7.8	88.1
Electricity	20.3	63.0	56.6	38.2	42.0	24.2	0.0	48.1
Natural gas	0.0	85.6	55.7	18.7	46.1	22.5	28.4	77.8
Steam coal	8.1	91.9	20.7	8.3	0.0	13.1	0.0	0.0
Cooking gas	0.0	-	2.7	73.1	0.0	42.3	0.35	0.0
Total	**6.4**	**57.6**	**18.2**	**10.9**	**32.5**	**14.2**	**27.5**	**80.4**

Source: IEA 1999.

* These numbers are weighted by the gross calorific value of all energy used.

** Reference price indicates full production costs including all costs of transport, refining and distribution.

3. ENERGY SUBSIDIES IN EGYPT: CHARACTERISTICS AND CHALLENGES

In Egypt, the government considers the subsidy system as a primary mechanism to reach a reasonable level of equitable income distribution.[9] Therefore, the rationale for the subsidy system in Egypt is justified primarily by equity concerns as in most developing countries. Table 3 shows fuel[10] subsidies as a percentage of GDP in 2004 in a sample of developing countries including Egypt. It indicates that Egypt is a leading country in subsidizing fuel products (excluding natural gas) compared to other developing countries. As table 3 shows, the share of subsidy to GDP is to some extent positively correlated with the level of per capita income in the sample.[11] However, per capita consumption of energy products (fuel and electricity) in Egypt is lower compared to many Arab countries and other developing countries (figure 1). Per capita energy use in Egypt is lower than in Algeria, Jordan, Lebanon, Syria, lower and upper middle income countries and is even lower than the MENA region. Levels of per capita energy consumption in Egypt are only higher than in Yemen, Sudan, Morocco and least developed countries (LDCs) (see figure 1).

Table 3. Fuel Subsidies as Percentage of GDP

Country	GDP per Capita (Current US$) 2004	Fuel Subsidies (% of GDP) (2004)
Bolivia	1,073.7	2.2
Ghana	498.4	2.2
Jordan	1,836.4	3.6
Mali	409	2
Sri Lanka	1,133.5	2.1
Egypt	**1284.4**	**4.6**
Yemen *	517.2	2.19
Indonesia	1,260.5	3
India **	543.2	0.25
Nigeria **	463.0	3.5

Source: World Bank, *World Development Indicators* (WDI) online database; and Nwafor, Ogujiuba, and Asogwa (2006)

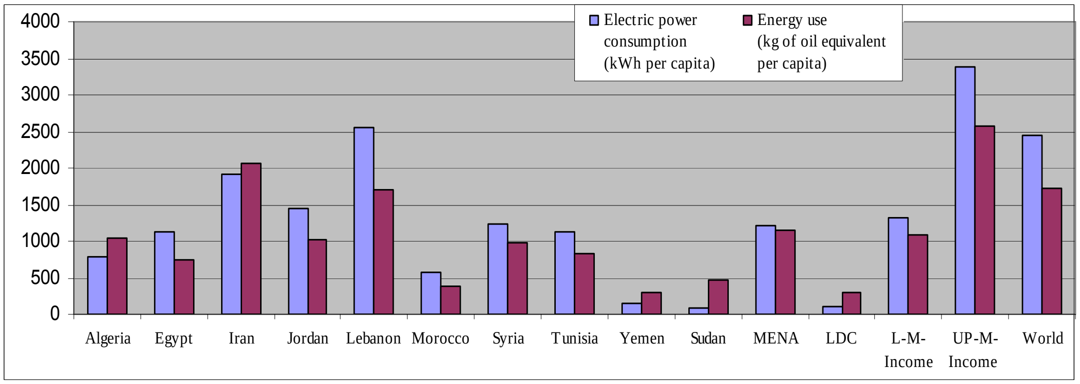
*Figures refer to 2002. ** Figures refer to 2003.

[9] For more details, see the declared objectives of subsidies as revealed in the budget statements.

[10] Because the term fuel is a broader concept as it includes petroleum products, natural gas and wood, the author will specify what items are included when the term comes up in the text.

[11] The correlation between percentage of subsidies and GDP per capita is significant with a positive sign and moderate value (0.53) for the existing sample.

Figure 1. Per Capita Use of Energy



Source: World Bank, WDI online database.

While levels of per capita energy consumption in Egypt are relatively low compared to other developing countries,[12] energy use in production is less efficient. The estimates of oil intensity[13] figures in Egypt are about 3 times higher than in Indonesia and 1.5 times higher than in Brazil, Nigeria, India, China and South Korea (see table 4). Although oil intensity has declined by half over the last 30 years in developed countries and by one-third in developing countries, it is increasing in Egypt (FICCI 2005). Such figures indicate inefficient consumption of energy products by the industrial sector. Highly subsidized prices of energy products have contributed partially to such inefficient use (IDSC 2005a).

Table 4. Oil Intensity in a Sample of Developing Countries

Country	1999	2000	2001	2002	2003
Brazil	0.19	0.16	0.20	0.21	0.19
Egypt	0.27	0.27	0.28	0.31	0.34
Nigeria	0.26	0.24	0.27	0.23	0.22
China	0.22	0.23	0.21	0.21	0.21
India	0.25	0.24	0.23	0.22	0.19
Indonesia	0.11	0.11	0.11	0.11	0.11
South Korea	0.23	0.21	0.22	0.20	0.18
Thailand	0.31	0.30	0.33	0.31	0.29

Sources: FICCI (2005).

In the Egyptian context, subsidies on energy products (excluding electricity) are defined as "subsidies given to the Egyptian General Petroleum Corporation (EGPC) that keep prices of energy products below international prices (prices paid to foreign partners), i.e. the difference between the price paid to the foreign partner and that paid by consumers whether

[12] It is argued that differences in energy consumption among countries are a result of three key factors, namely, the levels of urbanization, economic development and per capita income (Dzioubinski and Chipman 1999).

[13] Oil intensity is defined as the number of barrels of oil required to generate $1000 of GDP (FICCI 2005).

households, businesses or the government sector,[14] in addition to other costs." [15] Specifically, subsidy on energy products includes subsidies allocated to liquefied petroleum gas (LPG), gasoline (80 and 90), kerosene, diesel, fuel oil and natural gas. The Egyptian government subsidizes energy products through a mix of explicit and implicit subsidies.[16] Until the FY 2004/2005 energy subsidies were not recorded in the state budget and therefore were considered an implicit form of subsidy. Starting FY 2005/2006, subsidies on energy products (excluding electricity) [17] have been recorded in the budget, and are no longer implicit (see table 5).

The fiscal cost of subsidies on energy products (petroleum products and natural gas) was estimated at LE 20.2 billion in FY 2004/2005, and LE 40 billion in 2005/2006 (5.6 percent of GDP) and the same figure was reported in the budget statement for the FY 2006/2007. This significant increase in subsidies can be attributed to the rapid increase in oil prices. Despite this significant share, figures do not include subsidies on the share of the Egyptian General Petroleum Corporation (EGPC).[18] Adding subsidies to the share of EGPC doubles the volume of such subsidies.

Table 5. Allocation of Subsidies in Egypt's State Budget (2002-2007) (LE billion)

Year	Figures of the state budget		Petroleum products and natural gas subsidies (2)	Total subsidies
	Total subsidies (1)	Petroleum products and natural gas subsidies as recorded		(3)= (1+2)[(2002-2005)] (3)=(1) [(2005-2007)]
2002/2003	6.9*	0	**16.1	23.0
2003/2004	10.3*	0	**21.7	32.0
2004/2005	13.8*	0	**20.2	34.0
2005/2006	52.6	40.0	40.0	52.6
2006/2007	53.7	40.0	40.0	53.7

Source: The People's Assembly, Egypt (2003 and 2004 and various issues).

* Actual figures. ** Figures for energy subsidies that are not recorded in the state budget are obtained from the year-end report of the Budgeting and Planning Committee of the People's Assembly, Egypt.

[14] This definition is based on the state budget statement for the fiscal year 2005/2006 and the People's Assembly Budgeting and Planning Committee reports for 2002/2003 and 2003/2004.

[15] There are other forms of cost incurred by EGCP such as transportation and taxes.

[16] This definition is based on reports of the Budgeting and Planning Committee, the budget year-end reports of 2002/2003 and 2003/2004.

[17] Subsidies allocated to electricity estimated at LE 3.7 billion in 2005, are still implicit (see the budget statement of 2005/2006).

[18] The EGPC considers that domestic prices paid by consumers cover the cost for its share. Thus, the concept of subsidies used does not include subsidies on such share. However, this approach is inconsistent with the concept of economic cost since it ignores the opportunity cost of the EGPC share.

Subsidy figures for 2005/2006 will change if calculations are based on international prices as shown in table 6, as subsidies[19] exceed LE 58 billion. As indicated in the table below domestic prices of LPG are highly subsidized where the subsidy ratio[20] is around 93 percent. Similarly, subsidy ratio for products such as natural gas, gas oil and kerosene reaches up to 79 percent.

Table 6. Total Subsidies on Energy Products based on International Prices 2005/2006

Products	Total consumption (000 Ton)	Domestic prices LE/Ton	International prices LE/Ton	Differences in prices LE/Ton	Amount of subsidies LE million	Domestic prices/ international prices (%)
	(1)	(2)	(3)	(4)= 3-2	(5)=4x1	
LPG	3,380	200.0	2,740	2,540.0	8,585.20	7.3
Gasoline 92	34	1,912.8	3,020	1,107.2	37.64	63.3
Gasoline 90	1,892	1,338.0	2,465	1,127.0	2,132.28	54.3
Gasoline 80	765	1,243.8	2,455	1,211.2	926.57	50.7
Kerosene	503	507.0	2,465	1,958.0	984.87	20.6
Gas oil (diesel)	9,362	668.7	2,440	1,771.3	16,582.91	27.4
Fuel oil (Mazout)	8,443	293.2	1,160	866.8	7,318.39	25.3
Natural gas	22,470	289.7	1,260	970.3	21,802.64	23.0
T o t a l	**46,849**				**58,370.50**	

Sources: Author's calculations based on data from the Ministry of Petroleum (various issues).

The largest share of subsidies in the FY 2005/2006 is allocated to natural gas (40.6 percent), diesel (27.5 percent) and biogas (21 percent) as shown in table 7. Whereas, the lowest share of subsidies goes to the consumption of kerosene (1 percent), gasoline (4 percent) and mazout (5 percent). However, in 2006/2007 subsidies allocated to diesel, mazout and gasoline have been significantly increased. Diesel subsidies became a dominant item that accounts for 38 percent of total subsidies while subsidies allocated to natural gas declined to 21.1 percent of total subsidies compared to 40 percent in 2005/2006 budget.[21]

[19] Value of subsidies = total consumption * (International prices - domestic prices).

[20] Subsidy ratio = (1-domestic prices/international prices)

[21] For more details see the state budget statement for FY 2006/2007.

Table 7. Percentage of Subsidy to Energy Products Items (2005/2006)

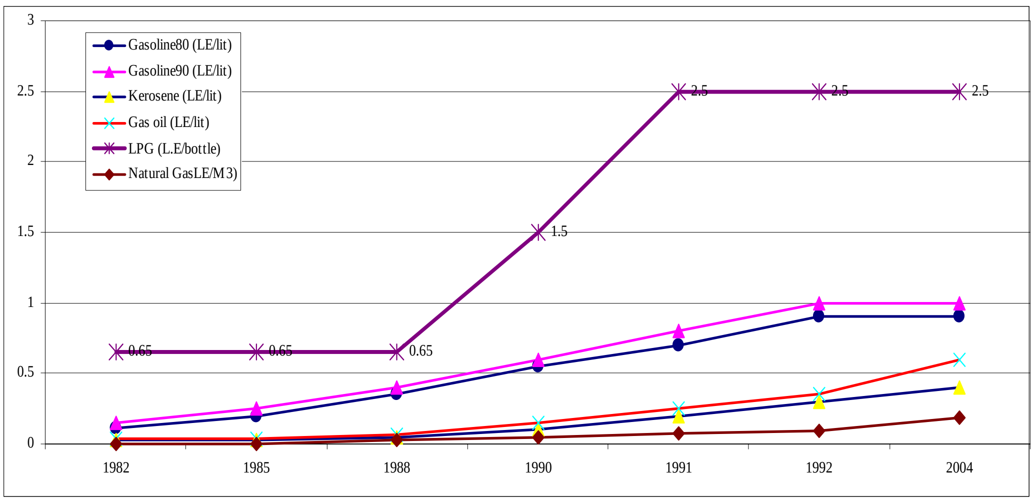
Items	Amount of Subsidies (in LE billions)	%
Natural gas subsidy	8,963.3	40.6
Biogas subsidy	4,731.4	21.4
Difference of Diesel (solar) prices	6,074.9	27.5
Fuel oil (mazout) price difference	1,108.2	5.0
Gasoline price differences	976.5	4.4
Kerosene price difference	223.8	1.0
Total	**22,078.10***	**100.00**

Source: Ministry of Finance (various issues).

* These figures are the projected value of subsidies, while the actual figures for the same fiscal year reported by the budget statement 2006/2007, has reached LE 40 billion.

Over the past two decades, domestic prices of energy products have been relatively stagnant. Prices of energy products have seen changes in different directions, where some items such as gasoline (80 and 90) were increased smoothly until 1992 and then stayed unchanged until July 2006. Changes in the prices of kerosene and gas oil during the period 1982-2006 are similar to those of gasoline prices (see figure 2). LPG has seen two main price movements over the past decades: from LE 0.65 per cylinder in 1977 to LE 1.5 per cylinder in 1990 and finally to LE 2.5 per cylinder in 1991. Although prices of energy products have remained relatively stagnant for a long period of time, the annual growth rate for most energy products has been estimated at 6-14 percent over the period 1982-2004, because of price jumps for most products as shown in figure 2.

Figure 2. Changes in Prices of Energy Products (1982-2004)



Sources: Ministry of Petroleum (various issues).

Despite this significant burden of energy subsidies in Egypt, the problem with the existing system lies not only in its fiscal cost but also in the extent of distortion resulting from changing market incentives. As argued, the opportunity cost[22] of energy subsidies seems more appropriate than the fiscal cost in evaluating the economic cost of such system (Gerner and Sinclair 2006). Moreover, reaching poor households or targeting groups of society has also been a challenging task for the effectiveness of such system. It has been argued that the energy subsidy system is costly both fiscally and economically and even fails to reach and benefit the poor (Helmy 2005). Figures of energy subsidies compared to other fiscal operations in the state budget reveal such inefficient use of resources. As shown in table 8, spending on energy subsidies reaches around 15 percent of total government spending and exceeds 6 percent of GDP. Compared to other fiscal operations in the state budget, allocations for energy subsidies are twice the sums spent on defense, 3 to 4 times the spending on health, and exceed that on education (see table 8).

Table 8. Energy Subsidies (Excluding Electricity) as a Percentage of Budget Fiscal Operations (2002-2007)

Year	Energy Subsidies (LE billion)	% of Total Expenditures	% of GDP	% of Social Protection Spending	% of Defense Spending	% of Education Spending	% of Health Spending
2002/2003	16.1	10.8	4.1	84.7	121.1	78.2	211.84
2003/2004	21.7	13.2	4.8	94.8	148.6	95.6	267.90
2004/2005	20.2	11.2	4.0	71.6	136.5	78.3	276.71
2005/2006	40	16.8	7.2	84.7	256.4	161.9	487.80
2006/2007	40	14.6	6.4	73.7	231.2	146.0	439.56

Sources: Author's calculations based on data from the Ministry of Finance.

Despite the adoption of the economic reform program in the early 1990s, the call for restructuring and reforming the existing subsidy system remained unheeded. This is because reforming the subsidy system has faced social resistance, owing in part to the perception that eliminating subsidies could adversely affect the poor, in addition to the implicit political cost that is taken into consideration. The next section examines the expected effects of subsidy reduction on energy-intensive sectors under different scenarios using a partial equilibrium approach.

[22] The calculation of opportunity cost differs for each item of energy products. For instance, the opportunity cost for natural gas is its long run marginal cost, and for oil products is the international price (Gerner and Sinclair 2006).

4. IMPACT OF SUBSIDY REDUCTION ON ENERGY-INTENSIVE INDUSTRIES

4.1 Assessment of Energy Subsidies Removal (Reduction): Methodological Issues

In economic literature, analyzing the impact of energy subsidy removal (reduction) is conducted basically through two distinct approaches: General equilibrium framework and partial equilibrium models. Both approaches consider the wide use of energy consumption and its impact on producers and consumers. In analyzing the impact of subsidy removal (reduction), general equilibrium models emphasize the extensive use of energy by all sectors of the economy. Such models assume that changes in prices of energy products affect many other sectors, and hence the ultimate effects on any sector depend on the response of others to the changes in the sector in question (Nwafor, Ogujiuba, and Asogwa 2006). General equilibrium models consider that treating energy sector in isolation of the rest of the economy might be misleading. Nonetheless, models that assess the impact of energy subsidy removal (reduction) using a general equilibrium approach are restricted in the sense that they operate with the single household or representative household assumption. Disaggregated models of government spending are scarce and thus disregard the socioeconomic setting of households and sectors (Nwafor, Ogujiuba, and Asogwa 2006). Such abstract framework affects the accuracy of results. On the other hand, partial equilibrium models do not account for variables in some markets since they do not account for inter-sectoral and indirect interactions as a result of price changes. Thus, researchers use the partial equilibrium approach to examine the direct effect of subsidy removal on a specific sector(s) such as energy intensive industries.

The literature[23] identifies three channels through which the impact of subsidy reduction can affect the welfare of individuals: (1) the increase in firms' energy bill; (2) increase in the cost of transportation; and (3) spending re-allocation in government budget.

The reduction of subsidies on energy products increases the energy bill of sectors particularly those relying heavily on petroleum products such as cement, fertilizers, electricity, paper, glass, iron and steel. Such higher prices increase the cost of production.

[23] Nwafor, Ogujiuba, and Asogwa (2006) review theoretical and empirical literature that examines the effect of subsidy removal.

This affects firms' profitability negatively and as a result prices of finished products of such sectors increase, [24] thus negatively affecting individuals' welfare.

The welfare of individuals is also negatively affected by changes in the cost of transportation. The reduction of subsidies increases prices of energy products and hence transportation, leading to an increase in the prices of passenger and goods transportation (Nwafor, Ogujiuba and Asogwa 2006).

The effect through the third channel of subsidy reduction seems ambiguous (see figure 3). On one hand, the rise in prices due to the reduction of subsidies causes a slowdown in economic growth that brings about a reduction in tax revenue. On the other, increasing resource availability, because of the reduction in the subsidy burden, encourages the government to increase spending on health, education, unemployment benefits and other social services that are expected to increase the welfare of households. [25] This makes the impact of the change in spending re-allocation of the budget ambiguous since the final outcomes depend on which of these effects will prevail.

4.2 Energy Subsidies reduction: Country Experience

Country experience and models applied provide valuable guidance regarding the impact of energy subsidy removal (reduction). However, models sometimes have shown different directions of results in assessing such impact (Pershing and Mackenzie 2004). Case studies demonstrate that countries have adopted different approaches in reducing energy subsidies. While some countries adopted a gradual approach in reducing subsidies, others applied severe cuts. Nonetheless, gradual energy subsidy removal (reduction) has proceeded along with compensatory measures to support segments of society that are negatively affected (UNEP 2004).

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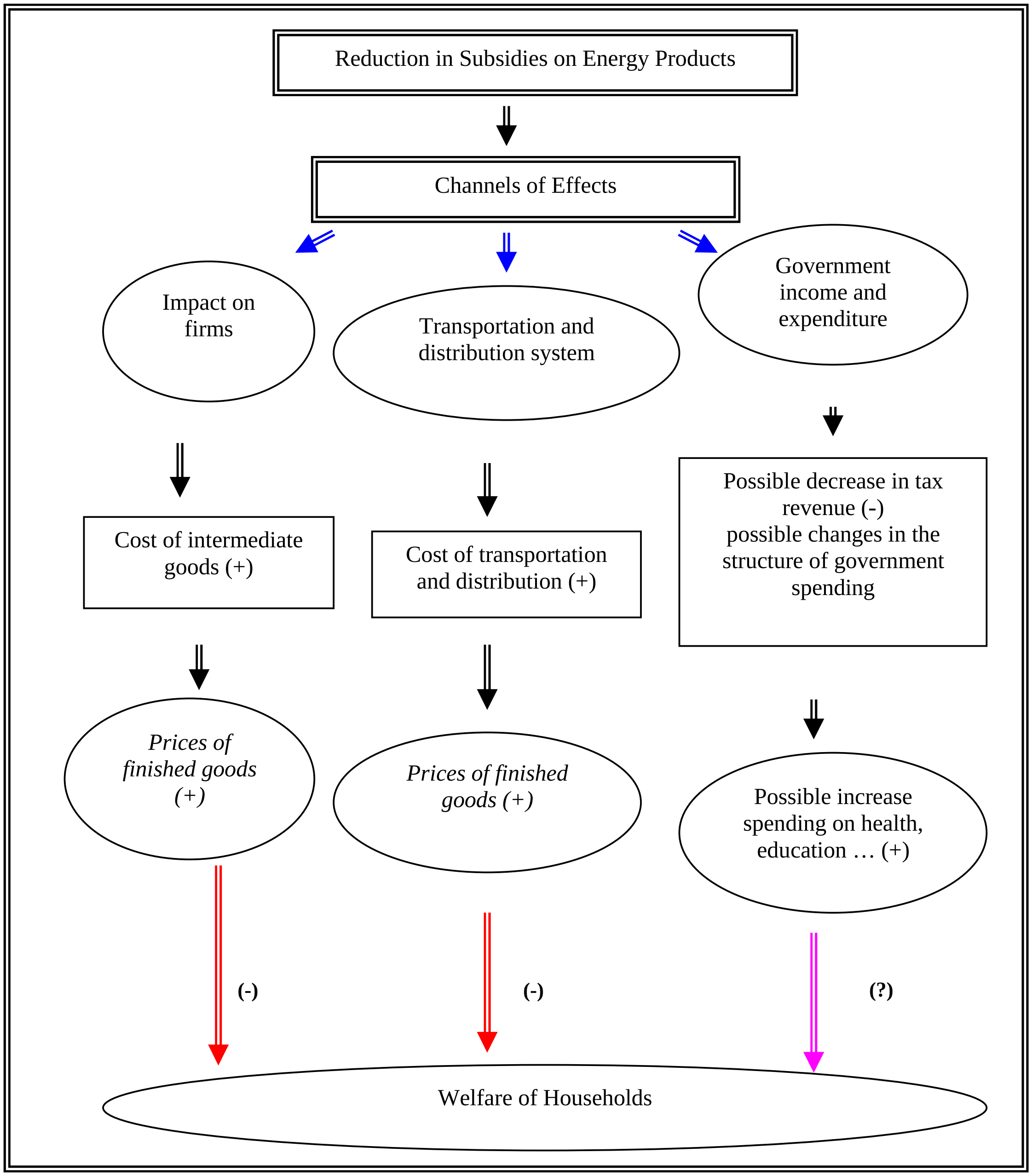
[24] Country experience shows that the increasing energy bill will raise almost all prices (Nwafor, Ogujiuba, and Asogwa (2006).

[25] Such re-allocation of budget spending might also increase the possibility of demand-pull inflation.

Figure 3. Reduction in Energy Subsidies and Households' Welfare



Source: The author based on literature.

Concerning the effects, it has been argued that the economic impact of energy subsidies removal depends mainly on their type, size as well as the structure of the economy (IEA 1999). Examining a number of case studies as shown in table 9 shows that energy pricing reform proved to generate the following positive outcomes: reduction in CO_2 emissions; improving the budget stance; increasing the financial viability of the energy provider and improving the quality of the service provided; encouraging efficient use of energy; and rationalizing domestic energy consumption

Nonetheless, there is also evidence that structural disturbances caused by the removal (reduction) of energy subsidies might involve economic costs, particularly, in the short run as the economy adjusts to higher prices. As argued, output in most energy-intensive industries would normally fall initially unless the government introduces compensatory measures lowering other input costs. Similarly, household spending would also fall unless welfare payments are increased or taxes are cut. Raising energy prices to economic levels also increases the general inflation rate which in turn may require the government to tighten fiscal and monetary policies, dampening GDP growth, production and incomes (UNEP 2004).

Table 9. The Impact of Energy Subsidy Removal (Reduction) in a Sample of Countries

Country	Positive Impact	Negative Impact
Czech and Slovak	▪ Improving energy efficiency ▪ Promoting cleaner energy use	▪ Adverse effects on poor households ▪ Distorting investment decisions
India*	▪ Increasing the financial viability of energy providers ▪ Expanding the capacity of networks ▪ Reducing CO_2 emissions ▪ Improving the quality of services	▪ Raising the cost of living ▪ Raising the producers' cost ▪ Fall in manufacturing sector growth
Indonesia	▪ Improving national budget balance ▪ Providing a hedge against exchange rate fluctuations ▪ Freeing up resources to support the poor in more effective ways	▪ Raising the cost of living ▪ Raising the producers' cost
Chile	▪ Consumption falls slightly ▪ Slightly positive impact on income distribution ▪ Several positive impacts on environmental effects	▪ Sharp fall in investments ▪ Fall in output in most sectors ▪ Dramatic impact on household budgets
Iran	▪ Improving budget stance ▪ Spending on social services	▪ Increasing production cost of goods and services ▪ Increasing cost of living ▪ Increasing inflation
OECD Countries	▪ Boosting trade ▪ Positive impacts on output ▪ Reducing CO2 emissions	▪ Significant negative impact on employment and household spending

Source: UNEP (2004). * FICCI (2005).

In sum, country experience has shown that the effect of energy subsidy removal (reduction) on GDP growth and welfare of households is quite mixed. As argued, subsidy reduction or removal increases economic efficiency as in Iran, Russia and Venezuela (table 1 of the appendix), while in country cases like Chile, the positive impact on output for most sectors is either small or negligible (table 9). Similarly, the effects on households' consumption are also unclear. While energy consumption falls in most subsidizing countries, the size of the consumption decline depends on the magnitude of the price rise and the relevant price elasticity of demand. Because subsidies of different magnitudes are often applied to different fuels in the same economy, there are also shifts in relative fuel prices that lead to inter-fuel substitution within that economy (UNEP 2004).

4.3 Energy Subsidies Elimination in Egypt and its Impact on Energy-Intensive Industries

The manufacturing sector and energy subsidies

In Egypt, the manufacturing sector, particularly, energy-intensive industries benefit from subsidies on energy products, namely, fuel oil, diesel, natural gas and electricity. Moreover, they benefit indirectly from subsidies given to the transportation sector in the form of lower transportation costs (see table 10). Subsidies granted to the manufacturing sector can be roughly estimated based on the sector's total consumption of different energy products. This includes petroleum products, natural gas, as well as electricity. According to table 10, the *manufacturing* sector consumes around 29.82 percent of total petroleum products consumption in Egypt. This implies that the manufacturing sector receives around 5,514 (LE million) as subsidized diesel, fuel oil (mazout) and others. Subsidies are estimated based on the figures of subsidies allocated to such items in the state budget for FY 2005/2006. Similarly, the manufacturing sector's share of total natural gas subsidies exceeds LE 2.3 billion, as the sector consumes 26.2 percent of total natural gas consumption. In addition, the manufacturing sector's share of subsidies to electricity is estimated at 1406 (LE million). In brief, the *manufacturing* sector in Egypt receives around 5.9 (LE billion) in subsidized energy products that constitute between 20 and 25 percent of total energy subsidies (The Ministry of Finance various issues).[26]

Table 10. Sectoral Consumption of Energy Resources in Egypt (2004)

Sector	**Petroleum Products (%)**	**Natural Gas (%)**	**Electricity* (%)**
Agriculture	0.54	-	4
Electricity	8.35	62.4	na
Transportation	41.68	-	na
Manufacturing	*29.82*	*26.2*	*38*
Commercial use	15.46	2	Na
Petroleum	4.15	9.4	Na
Households	-	-	37
Government and public utilities	-	-	16
Total	**100**	**100**	**100**

Source www.undp.org.eg/workshops. * Figures reported do not add up to 100.

[26] Such figures represent only the direct benefits of energy subsidies.

As indicated in table 11, the electricity sector benefits the most from subsidies to natural gas since it is the principal consumer of natural gas (accounting for around 60 percent of natural gas consumption in Egypt). Both the fertilizer and cement sectors are major beneficiaries from natural gas subsidies as their share exceeds that of other industrial sectors. Moreover, fertilizer consumption of natural gas is five times that of households and commercial sectors. In addition, the manufacturing sector also benefits from other subsidies granted to diesel and fuel oil where its share exceeds 45 percent of fuel oil and 15 percent of diesel consumption. Such figures indicate that most energy subsidies are directed to producers.

Table 11. Sectoral Distribution of Petroleum Products and Natural Gas Consumption (December 2005) (thousand ton)

	Natural Gas		**LPG**		**Gasoline**		**Kerosene**		**Gas Oil (Diesel)**		**Fuel Oil (mazout)**		**Others**	
sector	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Electricity	13,698	59.4		-		-		-	100	1.1	4,417	46.7		-
Industry*	2,416	10.5	174	5		-	2	0.4	1,504	15.8	4,334	45.9	110	28.1
Fertilizers	2,024	8.8		-		-		-		-		0		-
Roads and contracts		-		-		-		-	1,023	10.8		0		-
Cement	1,708	7.4		-		-		-		-		0		-
Petroleum	2,480	10.8		-		-		-	425	4.5	161	1.7	24	6.1
HH & Commercial	525	2.3	3,309	95		-	435	92.8		-		0		-
Transport	217	0.9		-	2,847	100		-	2,815	29.6	537	5.7	207	52.8
Agricultural		-		-		-	32	6.8	1,538	16.2		0	51	13
Tourism		-		-		-		-	2,093	22		0		-
Total	**23,068**	**100**	**3,483**	**100**	**2,847**	**100**	**469**	**100**	**9,498**	**100**	**9,449**	**100**	**392**	**100**

Source: Author's calculations based on data from the Ministry of Petroleum (various issues).
* The definition of the sector "industry" given by the Egyptian Ministry of Petroleum excludes both fertilizer and cement industries.

Assessment methodology for energy subsidy reduction

The impact of subsidy reduction on production sectors is assessed through two steps. Firstly, a sample of sectors that heavily consume energy (*fuel*[27] *and electricity*) is selected. Secondly,

[27] The term fuel in this context includes natural gas as a source of energy.

the study considers increasing the cost of energy inputs by 10 percent, 20 percent, 40 percent, 60 percent and 100 percent.[28]

As a first step, the selection of sectors is based on data provided by *the Annual Industrial Production Statistics* in 2006. Table 12 indicates that the cement, fertilizers, steel and aluminum production sectors depend heavily on fuel and electricity. For instance, fuel and electricity constitute about 30 percent of total production requirements and 21 percent of the value of production at factor cost for the manufacture of cement, lime and plaster.[29] In case the government decides to reduce subsidies on fuel and electricity and hence prices of energy inputs increase, holding other factors constant, changes in the cost of production under different scenarios of energy cost increases are shown in table 13. Adjustments for electricity prices (cost) are made to match the reduction of subsidies on petroleum products and natural gas. This is due to the fact that petroleum products (natural gas, diesel and mazout) constitute 25 percent in per unit cost of electricity (kw/h) as shown in table 2 of the appendix. Thus, adjustments are made assuming that the maximum increase in per unit cost of electricity (kw/h) does not exceed 25 percent, under the scenario of total reduction of subsidies on petroleum products (including natural gas). Thus, scenarios of subsidy elimination reported in table 13 assume that the expected increase in price of electricity matches the increase in prices of petroleum products and natural gas.

These hypothetical increases in the prices of fuel and electricity affect the cost of total production as shown in table 13. Under the scenario of increasing prices of fuel by 100 percent and electricity by 25 percent,[30] as noted, the highest increase in cost appears in the manufacturing of cement (10.92 percent), manufacturing of basic iron (4.52 percent), of casting steel (3.48 percent), fertilizers (4.10 percent), glass and glass products (3.3 percent), aluminum (2.91 percent) and manufacture of paper and paper products (2.2 percent). The lowest effect of increasing fuel and electricity cost appears in the manufacture of concrete, cement and plaster (0.89 percent), and in chemicals and chemical products (1.53 percent). Moving a step forward, the study has selected some specific industries in order to reach a

[28] Increasing prices of petroleum products and natural gas by up to 100 percent does not imply total elimination of subsidies, as doubling prices of such products reduces subsidy rates by up to 60 percent. Similarly, a rise in electricity prices matching the increase in prices of natural gas and petroleum products lowers subsidy rates on electricity by up to 80 percent.

[29] Similar results are obtained from the input-output table for the Egyptian economy in the latest Social Accounting Matrix 2005.

[30] This is the potential maximum increase in the cost of electricity.

solid conclusion regarding the effect of subsidy reduction on the cost of production and profitability.

Table 12. Percent of Fuel and Electricity in Production Requirements and the Value of Production at Factor Cost* (2006)

	Percent of Total Production Value at Factor Cost			**Percent of Total Production Requirements**		
	Fuel (%)	***Electricity (%)***	***Fuel & Electricity (%)***	***Fuel (%)***	***Electricity (%)***	***Fuel & Electricity (%)***
Manufacture of paper & paper products	1.92	0.95	2.87	2.48	1.24	3.72
Manufacture of chemicals & chemical products	1.27	1.03	2.30	1.92	1.55	3.47
Manufacture of fertilizers & nitrogen compounds	3.45	2.61	6.06	7.56	5.72	13.29
Manufacture of glass & glass products	2.59	2.89	5.48	4.37	4.89	9.26
Manufacture of cement, lime & plaster	7.80	12.47	20.28	10.89	17.41	28.30
Manufacture of articles of concrete, cement & plaster	0.71	0.72	1.43	0.92	0.93	1.85
Manufacture of basic iron & steel	3.89	2.55	6.44	5.84	3.83	9.67
Casting of iron & steel	0.42	12.24	12.66	0.62	18.04	18.66
Manufacture of basic precious & non-ferrous metals (including aluminum)	1.15	7.06	8.21	1.58	9.72	11.30

Source: Author's calculations based on CAPMAS (2006).

* Production at factor cost includes production requirements plus value added.

Table 13. Percentage of Increase in Total Production Cost of Main Energy-Intensive Industries due to Reducing Fuel Subsidies and the Resulting Electricity Price Increases*

	10%	**20%**	**30%**	**40%**	**60%**	**100%**
Manufacture of paper & paper products	0.22%	0.43%	0.65%	0.85%	1.28%	2.15%
Manufacture of chemicals & chemical products	0.15%	0.31%	0.46%	0.60%	0.90%	1.53%
Manufacture of fertilizers & nitrogen compounds	0.41%	0.82%	1.23%	1.62%	2.42%	4.10%
Manufacture of glass & glass products	0.33%	0.66%	0.99%	1.30%	1.94%	3.31%
Manufacture of cement, lime & plaster	1.09%	2.18%	3.28%	4.24%	6.37%	10.92%
Manufacture of articles of concrete, cement & plaster	0.09%	0.18%	0.27%	0.35%	0.52%	0.89%
Manufacture of basic iron & steel	0.45%	0.90%	1.36%	1.78%	2.68%	4.52%
Casting of iron & steel	0.35%	0.70%	1.04%	1.27%	1.91%	3.48%
Manufacture of basic precious & non-ferrous metals (including aluminum)	0.29%	0.58%	0.87%	1.09%	1.64%	2.91%

Source: Author's calculations based on CAPMAS (2006).

* It should be noted that electricity prices are adjusted under each scenario to match the increase in prices of petroleum products. For instance, the 10 percent-increase scenario reflects an increase by 10 percent in the cost of petroleum products and a resulting 2.5 percent increase in prices of electricity and so on.

Table 14 shows the effects of increasing prices of energy products on cost of production and then the profitability per ton produced for a sample of selected industries. For the *nitrogen fertilizer*s industry two companies that produce about 75 percent of total domestic production were selected for measuring the effects of energy subsidy elimination. As noted in table 14, the profit ratio per ton decreases from 22.65 percent to 7.8 percent as prices of energy inputs increase by up to 60 percent and it turns to be negative (-2.2 percent), if prices of petroleum products (including natural gas) and electricity increase by 100 percent. Nevertheless, the profit ratio per ton is higher when those ratios are calculated based on export prices due to the significant gap between domestic and export prices.[31] Under the 100 percent scenario, the profit ratio per ton exceeds 21 percent. Therefore, for companies that export most of their production, increasing energy cost will not profoundly affect their competitiveness and profitability. However, for domestically oriented companies, increasing the cost of energy products causes a significant decrease in their per ton profitability (see table 14). For the cement and aluminum industries the situation is quite different. For the cement industry,[32] with an average price of LE 250 per ton that is below market price in 2005/2006, the profit ratio falls to 15.4 percent as energy prices increase by 60 percent. However, if an average price of LE 300 per ton is applied, the profit ratio exceeds 33 percent and becomes 29.2 percent when prices increase by 100 percent, holding other factors constant (as shown in table 5 of the appendix). This indicates that the cement industry compared to other energy-driven industries will not face a critical challenge either domestically or in the international markets, if prices of energy products increase. The same conclusion can be reached for the aluminum industry where profit ratios per ton exceed 27 percent and 26 percent when electricity inputs increase by 60 percent and 100 percent, respectively. Thus, the reduction of subsidy on electricity does not seem to present a critical challenge, since the cost of electricity constitutes about 20 percent of total cost per ton and the reduction of subsidies on petroleum products affects partially the cost of electricity as previously mentioned. However, this is not the case for the steel industry since profit ratios per ton are low as they fall to less than 14 and 13 percent when electricity prices increase under the 60 and 100 percent scenarios, respectively.[33]

Subsidy reduction scenarios shown in table 14 assume that electricity prices match the reduction of subsidies on petroleum products and natural gas given the share of such inputs in the cost of electricity unit. However, the potential benefits of adjusting electricity prices differ according to prices of electricity paid by each company; since prices differ according to the

[31] Local prices of fertilizers are determined by the government with a profit margin as part of government policies to subsidize farmers. This makes export prices nearly double domestic prices.

[32] Calculations are based on the cost structure obtained for three companies with a market share exceeding 45 percent. Those companies are the Egyptian Cement Company (ECC), Suez Cement and National Cement.

[33] Scenarios for both aluminum and steel industries assume only an increase in electricity prices. This is due to data availability and to the fact that electricity in both sectors constitutes a major energy component.

type of electricity consumed. Companies that consume very high voltage electricity power get the lowest prices compared to those imposed on medium and low voltage (see table 3 in the appendix). Thus, profit ratios might differ among companies due to the type of electricity consumed.

Table 14. Profit Ratio under Energy Subsidy Reduction Scenarios for Selected Energy-Intensive Industries

	Original	**20% inc**	**30% inc**	**40% inc**	**60% inc**	**100% inc**
Fertilizer (nitrogen fertilizer)*						
Profit ratio based on domestic prices	22.65%	19.9%	17.49%	12.7%	7.8%	-2.24%
Profit ratio based on export price***	40.62%	38.5%	36.6%	33%	29.22%	21.5%
Cement industry*						
Profit per ton (LE/ton)	118	114.58	111.51	106.05	100.08	87.71
Profit ratio per ton	39.33%	38.2%	36.2%	35.4%	33.4%	29.23%
Aluminum**						
Profit per ton (L.E/ton)	3437	3358.271	3318.907	3295.288	3224.432	3043.355
Profit ratio per ton	29.42%	28.74%	28.41%	28.20%	27.60%	26.05%
Steel industry**						
Profit per ton(LE/ton)	380	372.7	369.05	366.86	360.29	343.5
Profit ratio per ton	14.18%	13.91%	13.77%	13.69%	13.44%	12.82%

Sources: Author's calculations based on information available in the appendix.

* Calculations are based on 2004 figures. ** Only electricity components of inputs have been increased.

*** Figures based on export prices are calculated only for fertilizers since there is a significant gap between domestic and export prices.

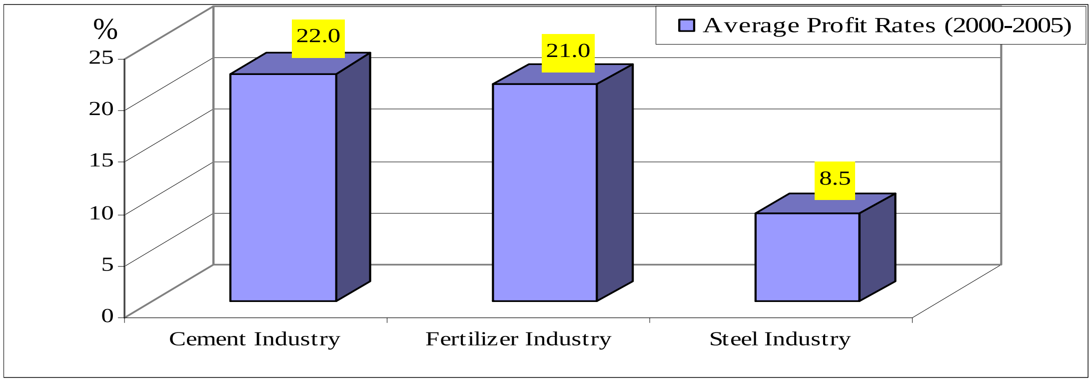
Obviously, figures of profitability ratios under various subsidy reduction scenarios indicate that energy-intensive industries shall not be severely affected. This conclusion is supported by another indicator that is the after-tax profit ratio. This is to avoid the debate on whether the profitability per unit of production is a good indicator for assessing the impact of subsidy reduction. Table 15 shows the after-tax profit ratios for a sample of companies in each industry over the last 5 years, obtained from the published financial statements for these companies in the Egyptian stock market. Although there is diversity in ratios among companies included in the table, on average profitability ratios—excluding that of the steel industry—are relatively high (ratio exceeds 20 percent) as shown in figure 4.

The highest profit ratios appear in the cement industry where for some companies, profit ratios exceed 40 percent, while the lowest ratios appear in the steel industry. Table 15 also reveals the stability in the time path of profitability over the period 2001-2005 for the two leading fertilizer companies (A and B).

This analysis reveals the capacity of cement and fertilizer industries to face a probability of energy subsidy reduction without severely affecting their financial status. The lack of data about profit ratios of other steel companies might lead to a misleading conclusion regarding the ability of the steel industry to adjust to subsidy reduction, particularly because the profit ratios of the two leading companies fluctuate over time (see table 15).

The profit ratios of energy-intensive industries in Egypt are relatively higher than in Europe, North America and Asia and Pacific. Ratios in Egypt are similar to those in Latin America and the GCC countries. For instance, the average profit ratios (before tax) of the cement industry in the GCC countries is estimated at 22 percent over the last 5 years (HSBC 2005). This is consistent with the fact that the operating profit margin of two major cement companies, as shown in table 8 of the appendix, are higher in the Middle East region (including Egypt) compared to other regions. Similarly, in the fertilizer industry, different reports indicate low profit margin ratios in regions such as Europe and North America compared to those in Egypt. The analysis of 46 fertilizer companies in the UK indicates that the average profit margin does not exceed 2 percent.[34]

Figure 4. Average After-Tax Profit Rates in Selected Energy Intensive Industries (2000-2005)



Source: Based on information in table 15.

[34] For more details see www.majorcompanies.co.uk.

Table 15. Net Profit after Tax and Profit Ratios (% of Sales Revenues) in Selected Companies

Industry/Company	2000		2001		2002		2003		2004		2005	
	Net Profit after Tax (mn L.E)	Profit Ratio (%)	Net Profit after Tax (LE mn)	Profit Ratio (%)	Net Profit after Tax (LE mn)	Profit Ratio (%)	Net Profit after Tax (LE mn)	Profit Ratio (%)	Net Profit after Tax (LE mn)	Profit ratio (%)	Net Profit after Tax (mn L.E)	Profit Ratio (%)
Iron and Steel*												
Company A	16.5	1.6	-40.3	-3.3	-124.9	-10.4	NA	NA	200.4	9.2	450.3	14.7
Company B	-35.3	-2.1	-260.2	-11.8	23.2	0.8	NA	NA	1379.5	18.4	2375.9	30.1
Average Iron And Steel	*-9.4*	*-0.25*	*-150.25*	*-7.55*	*-50.85*	*-4.8*	*NA*	*NA*	*789.95*	*13.8*	*1413.1*	*22.4*
Fertilizers*												
Company A	261.3	31.7	317.2	33.8	338.4	36.3	345.4	34.6	360.9	28.8	424.5	29.6
Company B	NA	NA	42	21	47.8	21.5	54	18.8	64.3	16.9	90	23.2
Company C	NA	NA	0.7	0.9	0.3	0.4	0.6	1	3	1.9	NA	NA
Average Fertilizers	261.3	31.7	120.0	18.6	128.8	19.4	133.3	18.1	142.7	15.9	257.3	26.4
Cement												
Company A	NA	NA	NA	NA	56.8	60.2	30.5	12.799	80.1	25.309	148.1	35.254
Company B	352.7	27.4	130.1	11.5	59.4	5.2	214	17.463	394.4	26.325	1045.2	44.47
Company C	NA	NA	NA	NA	NA	NA	22.7	11.3	51.5	17.6	132.8	32.7
Company D	7.1	3.9	105.7	58	-100	-52.1	-43.7	-18.5	-43.2	-13.4	86.9	21.9
Company E	NA	NA	78.7	15.7	NA	NA	-91.4	-23.269	27.5	4.763	NA	NA
Company F	NA	NA	26.7	20.3	19.6	9.1	35.6	14.6	80.7	24.6	181.8	43.2
Company G	NA	NA	273.4	33.3	244.1	25.8	306.1	26.6	676.2	42.1	963.1	47.3
Company H	160.4	34	93.9	23.2	49.8	15.303	20.9	5.626	23.6	6.386	48.8	11.622
Average Cement	*173.4*	*21.8*	*118.1*	*27.0*	*55.0*	*10.6*	*61.8*	*5.8*	*161.4*	*16.7*	*372.4*	*33.8*

Source: The Egyptian stock market, published financial statements, different issues.

*Figures of A and B are for the two leading companies in each industry.

These higher profitability ratios indicate that energy-intensive industries are able to adjust to these changes in prices of energy inputs. Therefore, they have somehow flexible options in the sense that they can choose either not to raise prices or increase them in ways that do not exceed the actual increase in cost. In brief, the results of this analysis are as follows:

- Energy-intensive industries in the Egyptian economy benefit significantly from subsidized energy products either directly or indirectly.
- Higher profit ratios of energy-intensive industries indicate the monopolistic power of such industries. Markets of energy-intensive industries in Egypt are characterized by high market concentration on the supply side. The cement and steel industry present an example of high market concentration. In both industries, few firms are dominating the market. In the cement market, although there are 11 firms in the industry, only three firms account for about 70 percent of total production. The steel industry may be a more striking example since there are about 20 producers in the market, with the market share of two producers amounting to two-thirds of the whole market (Ghoneim and Abdel Latif forthcoming). This phenomenon of supply-side market concentration prevails also in aluminum and fertilizer markets, where Misr Aluminum Company is a clear example of perfect monopoly. Similarly, the market share of three fertilizer companies exceeds 92 percent of the market (IDSC 2004).
- Increasing prices of energy inputs do not constitute a severe challenge for energy-driven industries. Therefore, government intervention through increasing prices of petroleum products and the subsequent rise in electricity prices can be absorbed by energy-intensive companies without raising prices by the same level of increase. The intervention will also be consistent with the enforcement of competition and consumer protection laws, as it might correct for market failure resulting from the monopolistic power of energy intensive industries. Moreover, it enables consumers to stand against exploitation practices of these companies. Protection against exploitation must be extended to include not only the final consumers, as the law states, but also intermediate industries. This is crucial for consumers since the elasticity of demand for such industries is low, which increases the power of such companies and industries to raise

prices in a way that does not exceed the true increase in cost as a result of energy subsidy reduction.

- Since the analysis argues that subsidy reduction will not severely affect the profitability of energy-intensive industries, it strengthens the government's negotiating power with such companies. However, a gradual approach is advisable if the government is to consider a complete elimination of energy subsidies. This will give the energy-intensive sector time to adjust to free market pricing of energy products.

5. MAIN FINDINGS AND CONCLUSION

In Egypt, subsidies continue to be a major item of government expenditures. About 74 percent of such subsidies are allocated to energy products (excluding electricity). Specifically, government spending on energy subsidies is around 15 percent of total government spending and exceeds six percent of GDP in 2006. The study argues that energy subsidies are twice those allocated for defense, three to four times those allocated for health, and exceed those spent on education.

Figures of energy subsidies (excluding electricity) have quadrupled due to the rapid increase in oil prices over the past two years. Such increase in the subsidy bill of energy products has presented a critical challenge for the Egyptian fiscal authority. Starting FY 2005/2006, fiscal authority has recorded such subsidies *explicitly* in order to reveal the true burden of subsidizing petroleum products and natural gas.

The paper has investigated the impact of reducing energy subsidies in Egypt on energy-intensive industries applying a partial equilibrium approach. Assessing subsidy reduction on energy intensive sectors, under different scenarios of increasing prices of energy products, has been conducted by selecting a sample of industries that depend heavily on energy products, and then measuring the impact on profitability per ton of production in these industries, holding other factors constant.

The paper argues that energy-intensive industries in the Egyptian economy benefit the most from subsidized energy products either directly or indirectly. It shows that increasing prices of petroleum products (including natural gas) and hence electricity prices can be absorbed by such companies without raising prices of their products by the same percentage increase. Higher prices of energy inputs do not constitute a severe challenge for energy-driven industries given their highly profitable activities. Profit ratios of energy-intensive industries in Egypt are higher than those in competitive markets such as Europe and North America. Therefore, energy-intensive industries have flexibility to adjust to subsidy reduction. In other words, they can choose either not to raise prices, due to higher profitability ratios, or increase them in ways that reflect at most the actual increase in cost. The significant reduction in tax rates due to the introduction of the new tax law in 2005 is another aspect to be considered. Reduction of taxes by 50 percent benefits such companies and also lowers the cost of subsidy reduction.

As argued, higher profit ratios of energy-intensive industries in Egypt are partially explained by the monopolistic power they possess. This constitutes an example of market failure that requires corrective measures. Thus, protection for both intermediate and final consumers against the exploitation practices of such companies requires effective government intervention in order to effectively enforce the competition and consumer protection laws.

Finally, it is important to stress that the decision to remove subsidies, either partially or totally, requires compensatory measures to reduce its negative impact, particularly on poor households. These measures should be both targeted and temporary until producers and consumers adjust. They should also be coupled with government intervention to correct for market failure in the energy-intensive market, which in turn will lower the cost of compensatory measures.

APPENDIX

Table 1. Impact of Subsidy Removal (selected countries)

	Average Subsidization (% of reference price)	Annual Economic Efficiency Gains (% of GDP)	Reduction in Energy Consumption (%)	Reduction in CO2 Emissions
China	10.89	0.37	9.41	13.44
Russia	32.52	1.54	18.03	17.10
India	14.17	0.34	7.18	14.15
Indonesia	27.51	0.24	7.09	10.97
Iran	80.42	2.22	47.54	49.45
South Africa	6.41	0.10	6.35	8.11
Venezuela	57.57	1.17	24.94	26.07
Kazakhstan	18.23	0.98	19.22	22.76
Total sample	21.12	0.73	12.80	15.96
percentage of				
Non-OECD	Na	Na	7.48	10.21
World	Na	Na	3.50	4.59

Source: IEA (1999).

* The percentage reduction in energy consumption was calculated by adding the gross calorific value of the reductions of the different fuels under consideration and expressing the sum as a percentage of TPES. Because the calculations in this study did not take into account the refinery sector (a 5 percent reduction in gasoline use can amount to a reduction of TPES of more than 5 percent), the number thus derived constitutes again a lower bound to the true reductions in energy consumption.

Table 2. Increasing the Cost of Natural Gas and Mazout on Electricity per Unit Cost (Kw/h)

	Per Unit Cost P.T/Kw/h Base-Scenario	20%	30%	40%	60%	100%
Natural gas	3.6	4.32	4.68	5.04	5.76	7.2
Mazout	0.4	0.48	0.52	0.56	0.64	0.8
Other inputs	6	6	6	6	6	6
Total production cost	10	10.72	11.20	11.6	12.4	14
Transportation cost	2	2	2	2	2	2
Distribution cost	4	4	4	4	4	4
Total production and distribution cost	16	16.8	17.20	17.6	18.4	20
Percentage increase in per unit cost (%)	0	5	7.5	9	13.5	25

Sources: Author's calculations based on IDSC (2005a) and Egyptian Electricity Holding Company (2005)

Table 3. Electricity Prices (KW/h) Paid by the Industry Sector

	2004/2005		
	Quantity	**Value**	**Avg. Price**
Industry			
Very high voltage	11,758	1,044,716	8.9
High voltage	4,604	549,246	11.9
Medium & low voltage	13,922	2,526,378	18.1
Total	30,284	4,120,340	13.6

Source: Egyptian Electricity Holding Company (2005).

Table 4. Effects of Increasing Natural Gas and Electricity on Nitrogen Fertilizer Industry

	Original*	**10 % inc**	**20 % inc**	**40 %inc**	**60%inc**	**100%inc**
The increase in cost of natural gas prices	0.0	16.400	31.800	62.600	93.400	155
The increase in production cost of electricity	0.0	1.968	3.229	3.986	6.256	12.0575
Total increase in cost (per ton)	0.0	18.368	35.029	66.586	99.656	167.0575
Cost under different scenarios	519.0	537.368	554.029	585.586	618.656	686.0575
Domestic sales prices (per ton)	671.0	671.0	671.0	671.0	671.0	671.0
Export sales price (per ton)	874.0	874.000	874.000	874.000	874.000	874
Profit per ton based on domestic prices	152.0	133.6	117.0	85.4	52.3	-15.1
Profit per ton based on export prices	355.0	336.632	319.971	288.414	255.344	187.9425
Profit ratio based on domestic prices	22.7	19.9	17.4	12.7	7.8	-2.2
Profit ratio based on export prices	40.6	38.5	36.6	33.0	29.2	21.5

Sources: Author's calculations based on IDSC (2004).

* Cost structure is an average for both types of nitrogen fertilizers (Yurea + Ammonia), for three leading companies for the year 2004/2005.

Table 5. The Effect of Subsidy Reduction on the Cost (per ton) of Cement Industry

	Original	10 % inc	20 % inc	40 %inc	60%inc	100%inc
Increase in cost of producing one ton of cement due to natural gas price Inc.	0	1.3992	2.7984	5.5968	8.3952	13.992
Increase in cost of producing one ton of cement due to mazout price inc.	0	1.2	2.4	4.8	7.2	12
Increase in cost of producing one ton of cement due to electricity price inc.	0	0.8602	1.2903	1.54836	2.32254	4.301
Total increase in production cost (LE)	0	3.4594	6.4887	11.94516	17.91774	30.293
Cost per ton	182	185.4594	188.4887	193.9451	199.9177	212.293
Average domestic price (LE/ton)	250	250	250	250	250	250
Profit per ton (LE/ton)	68.8	65.3406	62.3113	56.85484	50.88226	38.507
Profit ratio (%)	27.4	26.1	24.8	22.7	20.3	**15.4**
Av. domestic price (LE/ton)	300*	300	300	300	300	**300**
Profit per ton (LE/ton)	118	114.5406	111.5113	106.0548	100.0823	**87.707**
Profit ratio (%)	**39.3**	**38.2**	**37.2**	**35.4**	**33.4**	**29.2**

Source: Author's calculations based on IDSC (2005b).

* The price chosen is the average price at the end of 2005 and January 2006 price, while market prices reach LE 350 per ton.

Table 6. Cost per ton of Aluminum and Increasing Prices of Electricity

	Original	20% inc	30% inc	40% inc	60% inc	100% inc
Quantity of electricity used in producing one ton of aluminum (Kw/h)	14,996	14,996	14,996	14,996	14,996	14,996
Price of electricity (P.T/Kw/h)	10.5	11.025	11.2875	11.445	11.9175	13.125
Cost of electricity used in producing one ton of aluminum (LE)	1574.58	1,653.309	1,692.674	1,716.292	1,787.148	1,968.225
Cost of other inputs	6,672.42	6,672.42	6,672.42	6,672.42	6,672.42	6,672.42
Total cost of producing 1ton of aluminum	8,247	8,325.729	8,365.094	8,388.712	8,459.568	8,640.645
Price of aluminum (LE/ton)	11,684	11,684	11684	11,684	11,684	11,684
Profit (LE/ton)	3,437	3,358.271	3,318.907	3,295.288	3,224.432	3,043.355
Profit ratio per ton	29.42%	28.74%	28.41%	28.20%	27.60%	26.05%

Source: Author's calculations based on Ministry of Investment (2005).

Table 7. Cost per ton of Steel and Increasing Prices of Electricity

	Original	20% inc	30% inc	40% inc	60% inc	100% inc
Price of electricity (m/Kw/h)	0.105	0.11025	0.112875	0.11445	0.119175	0.13125
Cost of electricity used in producing one ton of steel (LE)	146	153.3	156.95	159.14	165.71	1,82.5
Cost of other inputs (LE)	2154	2,154	2154	2,154	2,154	2,154
Total cost of producing one ton of steel (LE)	2,300	2,307.3	2,310.95	2,313.14	2,319.71	2,336.5
Price of steel (LE/ton)	2,680	2,680	2,680	2,680	2,680	2,680
Profit (LE/ton)	380	372.7	369.05	366.86	360.29	343.5
Profit ratio per ton (%)	14.18%	13.91%	13.77%	13.69%	13.44%	12.82%

Source: Author calculations based on Egyptian Electricity Holding Company (2005).

* The cost reported is an average figure since the cost of production ranges between LE 2200 and LE 2500 per ton. **Prices are also averages and do not include transportation cost.

Table 8. Operating Profit Margin of two Leading Companies across World Regions in 2004/05 (%)

Region	CEMEX	Holcim
North America	24.1	8.7
Europe	11.1	14.9
Latin America	18.6	26.2
Africa and Middle East	20.3	22.5
Asia and Pacific	2.6	12.7

Source: Cemex (2005) and Holcim (2005).

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