

1. INTRODUCTION

1. This note addresses the issue of higher energy prices impact on Ukrainian economy. It concentrates on oil and natural gas prices, but notes how those prices relate to the price of other energy sources in Ukraine, as well as to measures of inflation. High oil prices are already a reality, while the import gas price, which is far below the market price in Central Europe, is increasingly under pressure to increase by Russian and Turkmen suppliers. The analysis is limited to impact on GDP and some discussion of the direct inflation response.³ Information is also provided about energy inputs and consumption shares across the economy, which helps shed light on microeconomic pressures that many sectors would experience in the face of price increases. The main quantitative result is that, depending on the scenario, the impact on the economy would be in range of 0.4-8.6% GDP “loss” for the first year after the shock relative to the baseline (no energy price change) and 0.2-6% GDP “loss” for the second year, with the high end of these ranges being the result of separate, drastic, price shocks in both oil and natural gas simultaneously. A discussion of additional non-linearities in the economy’s response is also provided.

2. The note is organized as follows. First, we describe the structure of the Ukraine’s market of oil and gas, and explore oil and gas price trends in the country. Then, we estimate oil and gas vulnerability indicators for Ukraine and compare them with other countries. Next, using assumptions on price elasticities drawn from cross country studies, we calculate the direct impact of higher oil and gas prices on Ukraine’s GDP. We then discuss the potential impact of increases in oil and gas prices on inflation. Finally, we provide some policy recommendations for reducing Ukraine’s vulnerability to energy price increases.

2. STRUCTURE OF THE MARKET

3. Oil and gas play an important role in Ukraine’s economy. Table 1 shows the energy balances of Ukraine in percentages of total final energy consumption (TEC).⁴ Natural gas and oil products constituted 60% of final energy consumption in 2002. Natural gas is the most important source of energy, accounting for 43.3% of energy consumption by end users. Industry is by far the major final consumer of energy at 41%, followed by the residential sector with 31% and transportation with 10%. The largest final consumers of natural gas are residential sector (41%) and industry (36%). Oil products are most heavily used by transportation (55%) and agriculture (18%).

4. Total primary energy supply (PES) exceeds the final consumption by 71%;⁵ this figure is 20 to 30 percent higher than figures for OECD countries, due to aging capital, outdated energy transformation technologies and distribution losses (both technical and non-technical). 20% of PES (equivalent to 34% of TEC) is used by electric plants as an

³ We recognize the related important variables influenced, such as exchange rate, current account and fiscal balance, but leave those beyond the scope of this note.

⁴ Annex 1 presents energy balances in thousand tons of oil equivalent (ktoe) on a net calorific value basis.

⁵ This is much higher than in many other countries: for example, in the OECD countries this indicator is equal to 45%, in the EU – 41%, in Russia – 50%.

input for energy production. Coal transformation takes 7% of PES (12% of TEC), and 7% of PES (11% of TEC) is lost during energy distribution. While the relative level of intermediate energy consumption by energy plants is comparable to the level in many OECD countries, Ukraine has much higher relative coal transformation costs and distribution losses. Additionally, within final consumption, there is significant additional waste due to outdated technologies, lack of metering devices, and other related shortcomings.

5. According to the International Energy Association (IEA) data, 90% of domestic supply of oil and 77% of domestic supply of gas are imported in Ukraine. Ukraine exports 9% of locally produced gas and 16% of locally produced oil. Nearly all primary supply of crude oil is being transformed into oil products in Ukraine. The primary natural gas supply is about evenly distributed for final consumption (discussed above) and for transformation into electrical and heat energy.

Table 1: Energy Balances for Ukraine, 2002

% , Total Final Consumption =100

SUPPLY and CONSUMPTION	Coal	Crude Oil	Petroleum Products	Gas	Nuclear	Electricity	Heat	Total
Production	40.1	4.9		20.5	26.6			93.5
Imports	4.4	25.4	1.7	61.7		0.6		93.8
Exports	-1.9	-0.6	-11.1	-1.7		-1.0		-16.3
Total Primary Energy Supply	42.6	29.7	-9.4	80.4	26.6	-0.4		171.0
Statistical Difference	-0.5							-0.5
Electricity Plants	-3.6		-0.9	-19.1	-26.6	17.3		-33.9
CHP Plants	-12.9					2.2	6.8	-3.9
Heat Plants	-2.6		-0.7	-14.6			15.9	-2.0
Petroleum Refineries		-29.7	28.1					-1.6
Coal Transformation	-12.3							-12.3
Own Use	-0.1		-0.5	-1.7		-3.2	-0.1	-5.7
Distribution Losses				-1.6		-3.8	-5.7	-11.1
Total Final Consumption	10.6		16.6	43.3		12.2	16.9	100.0
Industry sector	8.4		1.2	15.7		6.4	9.1	40.8
Transportation sector			9.2			1.0		10.2
Other sectors	2.2		3.6	27.6		4.8	7.8	46.5
<i>Agriculture</i>			2.9	0.5		0.4		3.8
<i>Commercial and Public Services</i>				9.4		1.9		11.4
<i>Residential</i>	2.2		0.7	17.7		2.4	7.8	30.9
<i>Non-Specified</i>								0.4
Non-Energy Use			2.5					2.5

Source: IEA Energy Statistics

6. Thus, Ukraine's economy appears to be largely dependent on oil and gas, of which domestic production is far from sufficient to satisfy demand. Therefore, an increase in natural gas and oil prices are likely to have a significant impact on the economy. The structure of energy consumption reveals that a natural gas price increase

would directly and most heavily affect industrial production and households, while the direct effect of oil price increases will be the most noticeable in transport and agriculture.

7. Table 2 provides the data on energy imports to Ukraine for 2001 and 2004. Energy imports represented 16% of GDP in 2004, and they increased by 62% in US\$ terms in three years since 2001. Oil imports increased by nearly 130% during 2001-2004. While natural gas decreased as a share of energy imports, its value increased by 9% since 2001.

Table 2: Imports of Energy to Ukraine

	2001	2004
Energy imports, US\$ million	6253.5	10160.9
Energy imports / GDP, %	16.5	15.7
<i>Structure of imports, %</i>		
Imports	100.0	100.0
Mineral products	42.6	37.4
Energy	39.6	35.0
coal	1.8	3.1
Oil	13.3	16.7
natural gas	20.8	12.4
oil products*	3.6	2.9
<i>Index of value in US\$, 2001=100</i>		
Imports	100.0	183.8
Mineral products	100.0	161.3
Energy	100.0	162.5
coal	100.0	312.6
Oil	100.0	229.8
natural gas	100.0	109.2
oil products*	100.0	145.3

* Oil products import is calculated as a residual in the energy sub-group.

Source: State Statistics Committee of Ukraine.

3. PRICE TRENDS

8. Relative prices of energy sources are not stable in Ukraine. In theory, in a perfectly functioning market economy, the cross elasticity of substitution between energy sources approaches unity (that is, if the price of oil goes up by 10%, so does the price of coal, gas, and derivatives of these supplies – such as power). However, as Figure 1 reveals, there are large variations in energy supply prices even in OECD countries (i.e., the cross elasticities are not 1, and they appear to vary over time). Factors determining prices in Ukraine are especially complex, and while market forces are at play, they work in ways that are not obvious. The impact of oil price increases on coal, hydro and/or nuclear power prices will be closer to a market relationship than with gas. Gas price setting between Ukraine and its suppliers is affected by political factors, leverage and market factors combined (and they appear to have been dominated by political factors and leverage to date). Coal prices also appear to be heavily influenced by political