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**Article**

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## EFFECTS OF ENERGY PRICE CHANGES ON RUSSIAN ECONOMY

PAAVO SUNI\*

The Russian economy has greatly benefited from the rapid rise in energy and other commodity prices since 2001. The average price of Russian oil<sup>1</sup> was 69.1 dollars per barrel in 2007, 85.3 dollars in the last quarter of 2007 and close to 120 dollars per barrel in mid-May 2008. The average price in 2007 was three times higher than that in 2001. The prices of gas, coal and many other Russian export commodities have also climbed to new heights. However, so far it is oil which has dominated the generation of Russian export revenues with an export share of over one third. Oil and gas together accounted for 47 percent of Russian exports in 2007. In 2002 this share had been 32 percent (BEA 2008). Oil product exports have risen as well, although less rapidly, with shares of 10.4 in 2002 and 14.7 percent in 2007.

The estimates of the volume of oil and other energy production in Russia's total GDP vary. According to the World Bank (2004 and 2005), its share in GDP amounted to 25 percent in 2002. According to the Russian government, as quoted by Juurikkala and Ollus (2006), the energy sector accounted for 30 percent of Russian GDP in 2005 (see also Kaitila 2007).

The rise in the price of oil spurred Russian oil production as well as the volume of exports

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<sup>1</sup> Mediterranean Russian Urals Spot Price. Russian oil is cheaper than e.g. WTI or Brent qualities as the rise in demand has concentrated on these "light and sweet" qualities. The price difference has fluctuated strongly and increased from 1–2 dollars to 2–10 dollars per barrel compared to the European Brent spot price in recent years.

in the period 2001 to 2004. In the years between 2005 and 2008 the price increase has mainly dominated the substantial rise in export values (Figure 1). Oil is mostly transported by pipelines inside the country. This capacity has been supplemented by rail transports. Exports of gas have grown substantially as well, although the capacity of the export pipe lines has restricted the rise in volume as there is currently no liquefied natural gas (LNG) production in Russia. Export capacity is planned to be expanded by e.g. Nord stream lines in the Baltic Sea and Blue stream lines in the Black Sea.

Russia is a major player in global energy markets. The country was the world's largest producer of oil in 2007 with an output of 10 million barrels per day, which was 1.5 million barrels more than that of Saudi Arabia (IEA 2008). Russia has already been the world's largest producer and exporter of gas for a long time. It is currently also the fifth largest producer and the fourth largest exporter of coal. In the long run, the Russian dominance in the oil markets will diminish because the country's share in known global oil reserves is relatively small. Russia's role as a key energy producer will continue, however, as its reserves of coal and gas are very huge in international comparison.

According to British Petroleum (2007), Russia's oil inventories will only last 22 years if the scale of exploitation remains at the 2006 level. On the other



Figure 1

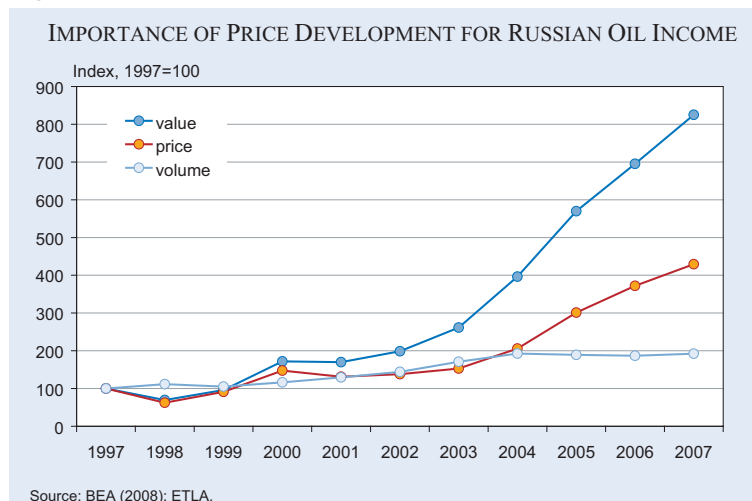
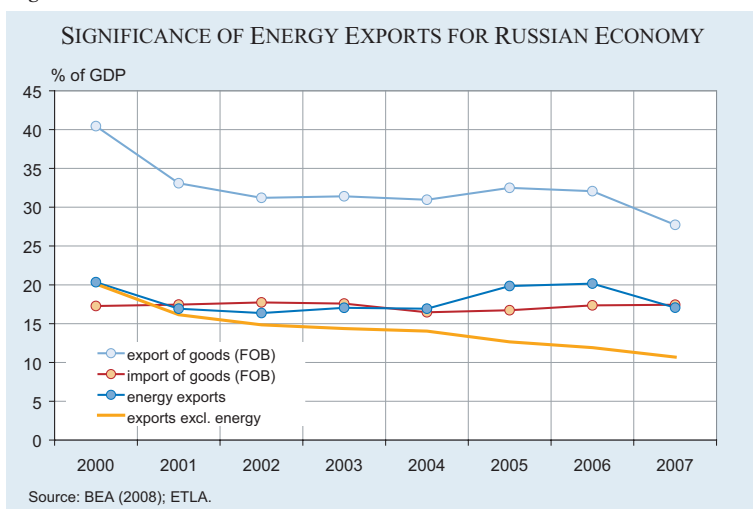


Figure 2



hand, the country's reserves will last over 500 years for coal and 78 years for natural gas. This estimate overestimates the role of reserves, however, as both consumption and production tend to rise over time. Moreover, new discoveries, technological advances and especially higher prices will probably raise the reserve estimates as the (proven) reserves are a function of the price. The higher the price, the higher may be the costs of exploitation of the potential reserves. Since the late 1980s global oil reserves relative to production have been quite stable instead of declining. In fact, British Petroleum (2007) calculated this global adequacy ratio at 40.5 years in 2006, compared to only 29 years in 1980 (see also Suni 2007).

Figure 2 shows the value of energy and other exports in relation to GDP. The total exports-to-GDP ratio has remained relatively stable in nominal terms in 2001–06. World energy prices and thus Russia's export prices have risen considerably, but so has Russia's GDP in nominal terms. In 2007 the energy share declined, as the appreciation of the rouble decreased the energy export growth in rouble terms. The imports-to-GDP ratio has been rather stable. These developments disguise the slow growth in volume terms since 2004.

The value of energy exports is almost the same as the value of total imports, which means that the former can be used to

finance the latter. However, it is worth noting that the value of non-energy exports is also rather close to the value of total non-energy imports. The volume of Russia's oil exports has been stable in the period 2004–07. This is due to increasing domestic demand and too little investment in fuel extraction. Crude oil accounts for 60 percent of the total value of Russia's crude oil, oil product and natural gas exports.

There is a marked price differential between the Russian Urals

grade and other oil grades. The differential arises from the properties of Russian oil that do not meet well the market's demand which favours the so-called sweet and light oils at the expense of sour and heavy oils like that of the Urals. This is due e.g. to the tightening environmental regulation and the structure of global refineries, which makes the supply of light grades tight compared to heavy grades.

Russia has been taxing energy exports/production heavily, which has resulted in almost wiping out the large foreign debt inherited from the former Soviet era, eliminated the uncomfortable arrears in pensions and public salaries, and pushed the government and current account balances into surplus (Figure 3). Looking forward, Russia's oil production in volume terms is likely to peak during the next few years as has already happened in the United States, for exam-

Figure 3

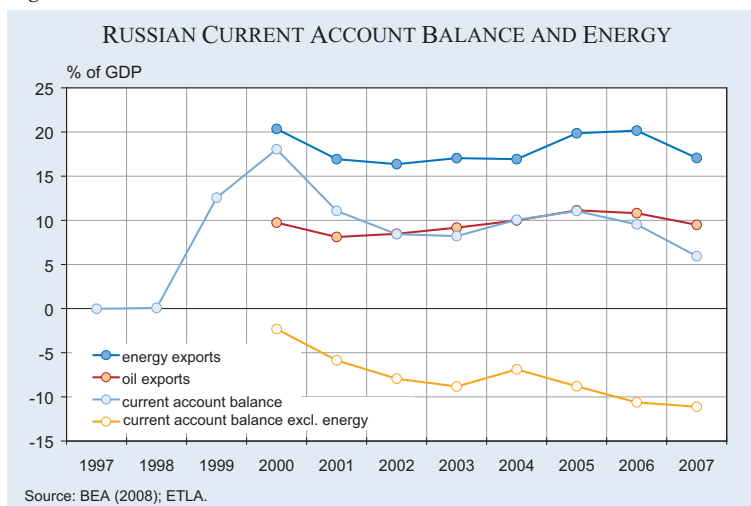
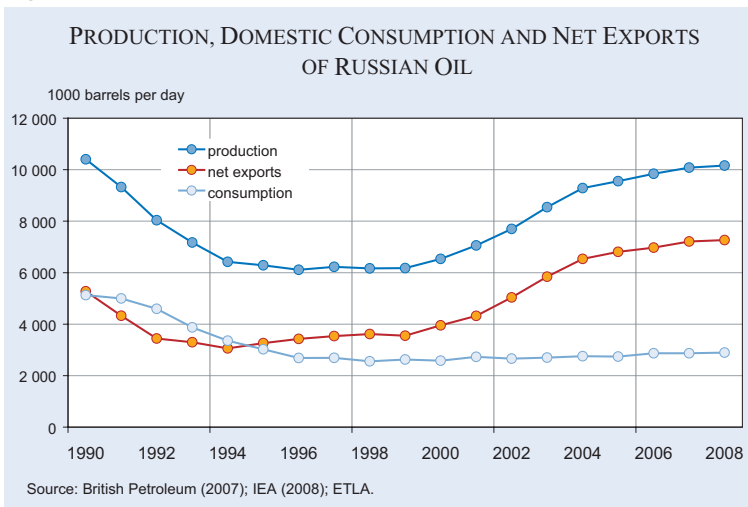


Figure 4



ple. Production growth has already slowed down considerably (British Petroleum 2007; IEA 2008). The rise in exports is also constrained by expanding domestic oil consumption, although growth has so far been very modest (see also Figure 4). Consequently, any future effect from energy commodities, positive or negative, will be mostly based on world market price changes, which are notoriously difficult to forecast.

To sum up, oil price changes have undoubtedly had a strong effect on the Russian economic “miracle” in the 2000s. This development has in fact been initiated and reinforced by the lagged effects of the 1998 collapse of the Russian rouble, which drastically improved the international price competitiveness of Russian products. The increase in oil prices, production and exports have markedly extended this step-wise effect.

#### Oil prices and the Russian economy in the light of simulations with NiGEM

There exist some interesting studies dealing with this issue. For example, Bebee and Hunt (2007) examine the effects of oil price rises according to the source of the shock. The oil price shock we have faced in the 2000s can be interpreted as a demand shock and thus, according to Bebee and Hunt (2007), it may be positive for the world economy, as the source is the strong rise in Asian demand in contrast to a reduction of oil supply. This interpretation fits well with the recent period of historically robust global growth.

Rautava (2002) has studied the effects of oil prices and exchange rates on the Russian economy using

VAR methodology and co-integration techniques. He finds that in the long run a 10 percent permanent increase (decrease) in international oil prices is associated with a 2.2 percent growth (fall) in the level of Russian GDP. Respectively, a 10 percent real appreciation (depreciation) of the rouble is associated with a 2.4 percent decline (increase) in the level of output with significant short-run effects due to an error-correction mechanism. This implies large short-run GDP effects on the Russian economy similar to our perma-

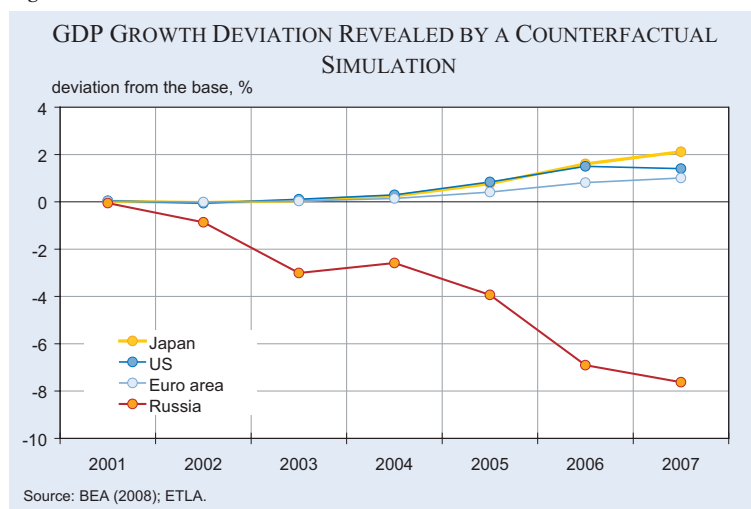
nent oil price rise simulations. Barrel and Magnusson (1996) have made interesting counterfactual simulations for the effects of oil prices on the Norwegian economy based on the National Institute Global Econometric Model (NiGEM).

NiGEM is a tool used in economic forecasting and simulations of real economic developments up to the medium term. The Neo-Keynesian model contains a rich description of the world economy with 35 countries including Russia and 13 regions and their economic structure. Nominal shocks have a short-term impact while the effects are neutral in the long term. The world is closed in the sense that exports and imports as well as foreign liabilities and assets add up to world totals. The behaviour is described using error-correction models, where short-term dynamics are taking place around theoretically justified equilibria. The model is used extensively in both forecasting and simulations in the short and medium term. The forecast and simulations period can be extended to the end of the 2030s to facilitate the use of forward expectations (NIESR; Suni 2007).

The Russian model is less sophisticated than the models of other industrial economies, but it provides a systematic framework for analysing e.g. oil price effects. The Russian model has been revised recently and currently it is less responsive to oil price changes than e.g. shown by Suni (2007). The reason for the modification was to a large degree a surprisingly well-functioning oil fund that has dampened the effect of the rise in oil prices as intended. The government established the fund in 2004 to protect the economy against the windfall profits. The size of the fund was about 157 billion USD at the end of 2007 (BOFIT 2008). This corresponds to 12.3 percent of GDP.

We shall try to get a grip on the effect of the rise in oil prices on the Russian economy in two ways. First, we make a counterfactual analysis of Russian economic development in the 2000s with lower oil prices. Second, we try to assess the effects of the sensitivity of the current state of the economy on the changes in oil prices. These simulation attempts do not provide a final truth of this interesting issue, but give one additional reference point to assess the situation.

Figure 5



### Counterfactual simulations

With counterfactual simulations we try to answer the question: What would have been Russian economic growth without the drastic hike in oil prices? The use of NiGEM allows us to consider this question in a global context, which we deem very useful as oil prices affect the global economy and developments would have been accordingly different if the oil price had been different. With the help of the model we can construct the new counterfactual global economic framework for Russian development.

We made the counterfactual simulation by fixing the oil price and the rouble/USD exchange rate in the period 2002–07. Basic options for monetary and fiscal policies were assumed. Exchange rates were set according to the interest rate differentials except for Russia, where the rouble/USD rate was fixed. Backward-looking expectations were adopted. This is a quite natural assumption as oil price rises in 2002–07 can be regarded as a surprise for most forecasters.

The counterfactual case was constructed as follows:

- The baseline scenario is the real development in 2001–07 as described in NiGEM.
- The price of oil (average price of Brent and Dubai grades) was fixed at 23.6 \$/b, which was the average price in 2001 according to the NiGEM data base. For the period between the first quarter of 2001 and the last quarter of 2007, the dollar price of oil was set at an average 42.5 \$/b, i.e. 43.9 percent lower than in reality.
- The dollar value of the rouble was fixed at 29.2 roubles per dollar, the average of the year

2001 for the same period, while the other currencies followed interest rate differentials.

- The central bank of Russia is assumed to have used a combined nominal GDP and inflation target like the Euro Area countries and Japan. The US central bank was assumed to use a Taylor rule.

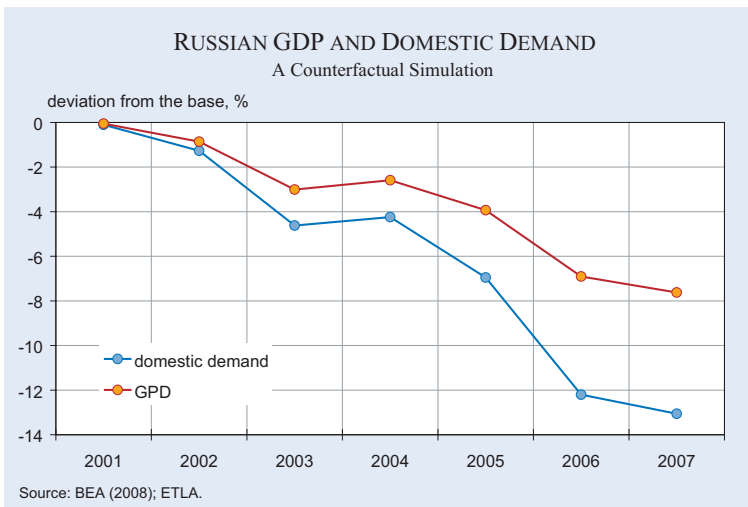
The oil price assumption is relatively close to the OPEC target set in March 2000, when OPEC agreed on a price band mechanism aimed at keeping the price of the OPEC basket between 22 and 28 \$/b. On 30 January 2005, OPEC decided to suspend (temporarily) the price band mechanism as the price had risen much higher (EIA 2006).

The first simulation was done by fixing the oil price and the exchange rate of the rouble *vis-à-vis* the USD as described above and otherwise utilising the standard assumptions of the model.

Lower oil prices in the counterfactual case have a positive effect on real GDP growth in oil-consuming countries as can be seen in the case of the Euro Area, the United States and Japan. The cumulative impact of lower oil prices for GDP growth in these countries vary around 1.5 percent in 2001–07. In the case of Russia the dominant role of oil in the economy makes the effects much larger and naturally negative. According to the results, the level of Russia's real GDP in 2007 would have been 7.6 percent lower if the oil prices had remained unchanged since 2001. This would have produced an average GDP growth rate of 5.3 percent in 2001–07 instead of the actual 6.6 percent (see Figure 5).

Domestic demand in Russia would have been hit harder than this, however, as seen in Figure 6. The

Figure 6



simulated real domestic demand is about 13 percent lower than in the actual baseline scenario. The average growth rate of domestic demand would have been 7.3 percent a year instead of 9.4 percent in reality. Government has succeeded to dampen part of the effect of the oil price rise by the use of the oil fund. Consequently the effects are lower also in the counterfactual case than in a previous simulation made in the end of 2006 (Suni 2007).

Both real GDP and domestic demand were marked by similar annual developments, although the changes were larger in the latter. During the first few years, the effect was minimal due to small changes in the oil price. As the oil price accelerated, the negative effects of the oil price would also have been increasingly larger. The rapidly diminishing levels are driven by weakening terms of trade and decreasing net foreign assets caused by lower oil prices.

The very strong positive external balance in the beginning of the decade deteriorated in both real world statistics and the counterfactual simulation. With the lower oil price, the current account would still show a large surplus in the counterfactual case albeit clearly lower than in the actual case. In 2007, it would be 6.4 percent of GDP instead of the actual 10.3 percent. Lower oil prices mean that nominal export revenues would be smaller, but, on the other hand, lower domestic demand would also translate into lower imports both in real and nominal terms. The latter partly compensates for the effect of lower oil prices on the current account. In terms of imports, the assumption of a fixed exchange rate is of course important, especially in the case of oil producers like Russia. Lower oil prices could justify a weaker rou-

ble, but this would only translate into increasingly lower imports. Anyway the still existing current-account surplus suggests that the rouble would not need to be weaker than assumed.

Lower export revenues and weaker domestic demand lead to lower average consumer price inflation in our counterfactual scenario than in the actual case. This also means that the rouble would have appreciated less in real terms than in the actual case, which would have supported the trade and current account

surpluses. Both lower inflation and GDP growth, on the other hand, lead to lower interest rates supporting economic growth.

To a large extent, GDP growth has been fuelled by the rise in export prices in Russia. We have only taken into account the price of oil here. As many other commodity prices have also risen, our results show a higher bound for the development without the price hikes. Taking into account the higher prices also in other commodities, a lower value of exports would have resulted in even larger negative effects for the Russian economy.

Naturally, the depreciation of the exchange rate could smooth drastically the results in case of a large shock. In the basic simulation, the rouble value of the USD was fixed. When the interest rate arbitrage was allowed to determine the exchange rate, the domestic demand reacted strongly leading to a rather large decrease in imports. As a result, the effect on GDP was milder than in the base case, as exports got some boost at the same time. The improbable case of fixed real exchange rates would have caused even more severe effects.

### Looking forward

The counterfactual simulations show a strong dependence of the economy on the oil price, although the use of the oil fund has clearly decreased the dependency. The future of Russian economic development looks good in this respect if international energy and oil markets remain tight as generally expected. We simulated the effects of a rise of oil prices by 20 \$/b.



The initial effects are large regardless of whether forward looking or backward-looking expectations on exchange rates, inflation, long-term interest rates and other variables are utilised (see NIESR). Using both type of expectations, most of the GDP effect will be felt for two years, followed by a rather stable development afterwards. GDP will rise permanently by about four percent. The effect of the oil price rise found in this study is, however, about half of Rautava's (2002) estimate, which does not take into account the effect of the oil fund.

Output in a commodity producing country is permanently affected by a permanent change in commodity prices, much as is the case for Russia in the simulations. The equilibrium level of unemployment will be reduced by higher commodity prices in such a country, and hence overall output will be higher. Real producer wages (nominal wages deflated by output prices) fall relative to real consumer wages (nominal wages deflated by consumer prices) because output is more heavily weighted by commodities than is consumption. The "wedge" between these two wage rates is an important determinant of the equilibrium level of unemployment as shown by Layard, Nickell and Jackman (1991). This decline in the wedge will raise equilibrium employment and hence the supply capacity of the economy. Although the impact of oil prices might be less than such an analysis indicates, other commodity production will become more labour intensive, and the overall direction of the effect on output is clear.

The effect of oil price changes on the Russian economy will be mostly driven by terms of trade changes, as the Russian supply of oil has stabilised and will obviously start declining soon, while its own demand is growing rapidly and international economic growth remains strong. In the future, the volume effect is, however, reinforced by rising gas and coal exports.

#### Russia will remain a key global energy producer

According to the counterfactual simulations, the role of oil has been a key driver of Russian economic

Figure 7



development in the early years of this century. Given the short and insufficient Russian time series and, partly due to this reason, also rather underdeveloped models, the results contain a large amount of uncertainty. However, they provide one useful benchmark on the size of the effects of the energy price rise on the Russian economy.

So far, Russia has benefited from the higher price of oil by both exporting a larger volume in 2000–04 and the continuous rise in the oil price. Consequently, its domestic demand was boosted strongly. This development has initially been reinforced by the lagged but large effects of the 1998 Russian crisis, when the pronounced depreciation of the rouble drastically improved the international price competitiveness of Russian products. Depreciation strongly favoured domestic demand and exports at the expense of foreign products. These potentially visible lagged effects during the first simulation years have not been taken into account in the computations. According to the counterfactual simulations, the stabilisation of the oil price at the 2001 level would have had a significantly negative effect on Russian economic growth. Average GDP growth in 2001–07 would have been slightly below 5.5 percent, more than one percentage point lower than in the actual case. The strong effect is due to a large and rising price difference between the actual and counterfactual oil prices especially in the years 2003 to 2007, which would have meant pronouncedly smaller oil income than was actually achieved.

While the counterfactual simulations try to get a better grip on the past development from a very bad starting situation, the simulations of the future will reveal the model-based effects from the currently

very good economic situation. The effects of the permanent 20 USD price rise from the current level show an initial strong reaction to the rise with e.g. a solid boost to GDP growth and the current account. The effect would, however, quickly vanish after the rise (see Figure 7). In addition, the effects would not differ from one case to the other regardless of whether backward or forward-looking expectations are applied.

The temporary end of the current commodity boom would obviously cause serious difficulties for Russian economic development. The effects could be softened by the use of the oil fund as planned. The more robust growth would, however, necessitate drastic changes in the economic structure away from a resource-based economy.

There is a risk that, while energy effects dominate Russian economic development, the need to create fruitful circumstances for the growth of the non-oil sector is seriously underestimated, as the short-term gains from rapidly rising energy prices have been large. Here, more openness in the economy and the accumulation of the oil fund would serve as an important impetus to raise the productivity and the competitiveness of production outside the energy sector in the long run. The openness of the economy would provide the necessary competition to check the price structures and give correct price signals to the non-resource economy for its development.

WTO membership would be a good step in this direction. However, recent Russian policies to support the monopolistic nature of the energy sector as well as export duties raise the vulnerability of the economy to a decline in the prices of raw materials and energy in particular and may undermine the ability of the economy to move to a more balanced structure.

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