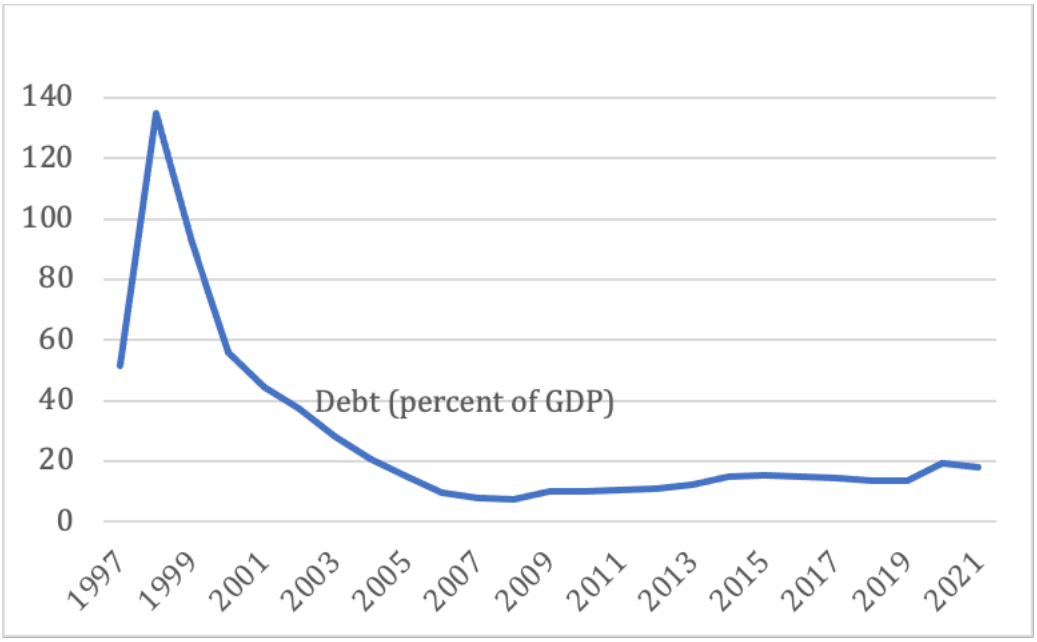
Figure 4: General Public Debt (Gross) in Percent of GDP



Note: Data is from the IMF, World Economic Outlook Database.

To check for possible irregularities, consider some basic public debt accounting. In the absence of stock-flow-adjustments, the change in debt is governed by the simple accounting identity,

$$B_t = B_{t-1} + D_t \qquad (1)$$

where B_t is the total stock of nominal debt at the end of year t and D_t is the nominal deficit in year t. Using z_t as the nominal growth rate and Y_t as nominal GDP, we can rewrite this equation using lower case letters that indicate variables scaled by GDP ($b_t = \frac{B_t}{Y_t};\ d_t = \frac{D}{Y_t}$):

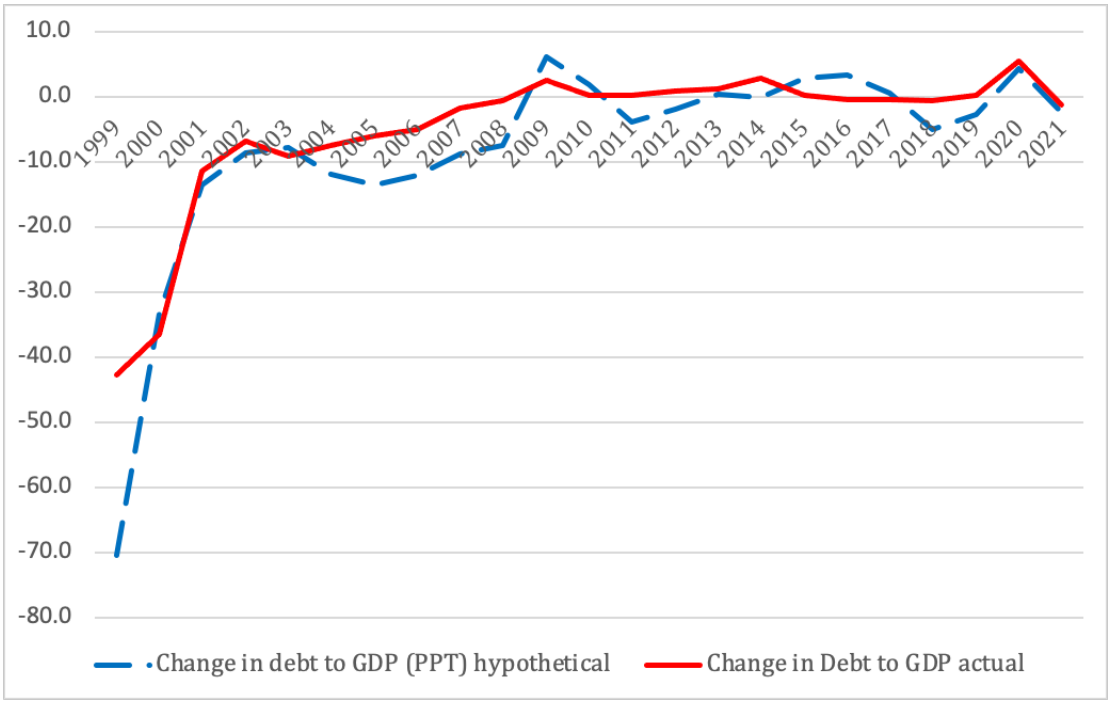
$$\Delta b_t = (1 + z_t)d_t - z_t b_t \qquad (2)$$

In words, equation (2) says that the hypothetical percentage point change of the debt-to-GDP ratio, b_t, should equal the growth factor of GDP, $(1 + z_t)$, times the deficit ratio, d_t, minus the product of the nominal growth rate and the debt-to-GDP ratio. Δb_t is a hypothetical change in the absence of stock-flow adjustments.

Because of stock-flow adjustments, the actual change of debt-to-GDP can be lower or higher. Stock-flow-adjustments may be owed to debt denominated in foreign currencies. For example, if some debt is denominated in dollar and the dollar appreciates against the ruble, then this tends to increase the debt-to-GDP ratio even in the absence of a budget deficit. Stock-flow-adjustments may also occur if some expenditures are hidden in special entities, the debt of which is taken over by the central

government (possibly sporadically). For this reason, those adjustments could also reflect military expenses outside the official budget.

Figure 5: Stock-Flow Discrepancies



Note: Note: Data on actual deficits is from the IMF, World Economic Outlook Database. The blue line of hypothetical discrepancies in the absence of stock-flow adjustments is based on equation (2) and IMF data.

Figure 5 illustrates the difference between the actual deficit (in red) and the deficit, that is expected in the absence of stock-flow-adjustments, i.e., using equation (2) and the actual history of debt and GDP. For most years, the actual increase in debt is bigger than the hypothetical one and the red curve is above the blue. This said, larger discrepancies appear before the financial crises, smaller differences after 2011. For the last ten years, this does not suggest that military expenditures were hidden in stock-flow adjustments. The next section will in more detail look at reported military expenditures.

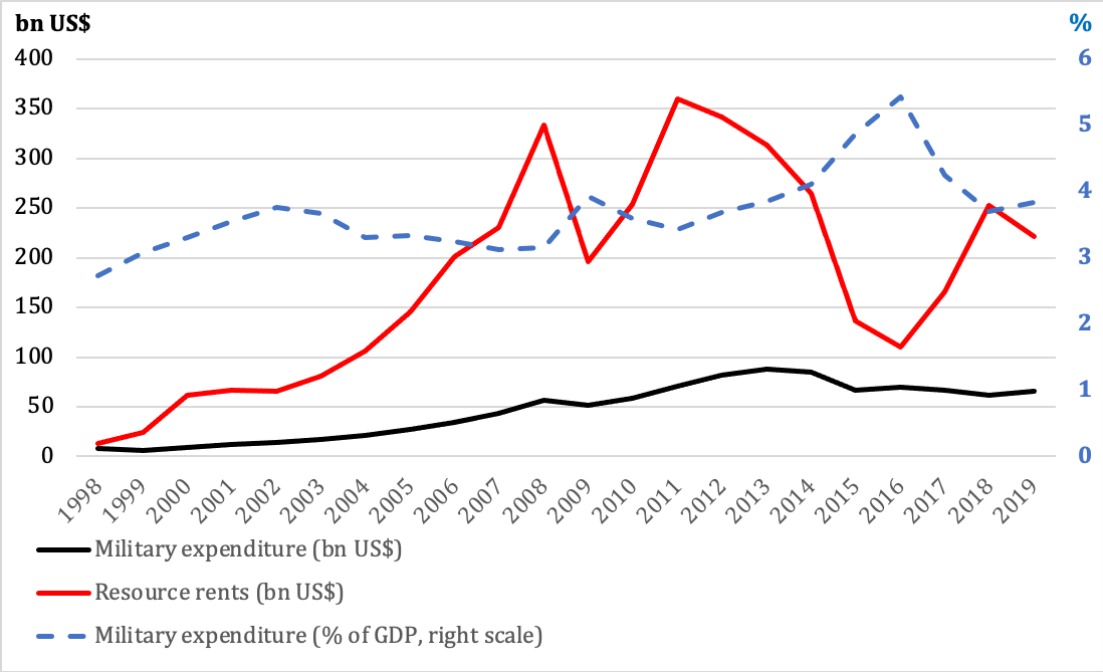
IV. Military Expenditures

In the current situation, a public expenditure of particular interest is military expenditure. Figure 6 illustrates the development of these expenditure in billions of US$ (black line) and in percent of GDP (blue line). The blue line puts military expenditure into perspective by comparing it with Russian yearly resource rent (red line).

When looking at military expenditure as a fraction of GDP, a peak is visible around 2015. Yet, this should not be interpreted as a deliberate reaction to the Maidan revolution. Rather, the relative

increase is probably due to a mechanical effect as real GDP in 2015 shrank by some 2% in connection to the Russian financial crisis 2015-16 that was partly triggered by low oil prices and led to a huge depreciation of the ruble. Note that GDP, denominated in US$, even contracted from 2.29 trillion in 2013 to 1.28 trillion in 2016, which amounts to a 44% reduction when measured in international currency. If measured in US$, military expenditures peaked in 2013 and somewhat levelled off after the Maidan revolution.

Figure 6: Military Expenditure and Resource Rents in Comparison



Note: Data on military expenditure is from SIPRI, Stockholm. Resource rents are taken from the World Bank.

V. Possible Effects of Reduced Fossil Fuel Exports

An imminent question is to which extent a stop of fossil fuel purchases by the West can reduce Russia's economic means to continue the war against the Ukraine.

From previous experience, as captured in Figure 6, we see a mixed picture when looking at the relationship between Russian military expenditure and the resource rents cashed in. During the years before the financial crises, we see a US$ increase in military expenditure that, while almost constant in percent of GDP, may have been fueled by the explosion of natural resource income. After 2008, the large fluctuations in resource rents are not quite mirrored in military expenditures. As we saw in Section 3, lower resource rents, at least in the past, could largely be cushioned by taking out additional public debt.

When it comes to the budgetary implications of lower resource rents, we may also take a look at the past. Here, a one percentage point (ppt) reduction of the resource rent (relative to GDP) has led to an increase of the deficit ratio by 0.75 ppt. The last World Bank figure for Russian resource rents is somewhat outdated, but if we start from some 15% of GDP, sanctions could well wipe out that part that is owed to gas exports. Conversely, oil exports may be more easily redirected, although Russian oil is at the time of writing is traded at a US$30 discount compared to non-Russian oil, even without a European embargo against Russian oil.[8] In any case, based on previous experience, one may expect that any ppt reduction of resource rent in GDP may lead to a 0.75 ppt increase in the budget that requires financing through debt.

In the case of oil, in 2020 Germany bought 8.7% of Russian exports, Europe as a whole roughly half of these (Siedenbiedel, 2022). With 32.8% of exports going to China, the effects of an EU embargo can only be partial.

A different picture applies to natural gas exports. Here, in 2020, 24% went to Germany, and 54% to the rest of Europe, including Turkey.[9]

Reuters (2022) reports that, in 2021, Russian crude oil exports accounted for US$110.2 billion, oil products for US$68.7 billion, pipeline natural gas for US$54.2 billion and liquefied natural gas was sold for US$7.6 billion.

With lower capital exports and some arm twisting of domestic savers into Russian government bonds it seems realistic that Russia could fend off even a large drop in resource rents, say be 10 ppt, in particular since remaining sales may be possible at higher prices than in recent years.

A somewhat neglected aspect that highlights possible difficulties of sanctioning Russia by stopping energy imports is that sanctioning natural resource producers is different from sanctioning ordinary producers of goods and services. If the latter are sanctioned, lower production in the period of sanctioning cannot be easily made up for in later periods. For example, a service not exported means that some production factors are idle. Avoiding idleness of production factors in manufacturing required storing the output during the sanction period, which may collide with financial and spatial restrictions.

[8] Based on a communication by Gabriel Felbermayer, Wifo, Vienna.

[9] https://www.iwkoeln.de/presse/iw-nachrichten/verkraftet-europa-einen-importstopp.html (accessed 24 March 2022).

In the case of natural resources, storage is automatic. Any unit not extracted today is kept in the ground and is available for extraction in the future. This means that some part of oil and gas revenues may not be lost, but only pushed back in time.[10]

The importance of this effect is related to extraction costs. If extraction costs make up for the lion's share of the resource revenue, then during a sanctioning period a large quantity of production factors may lay idle and the economic losses are large. Conversely, if a huge share of revenues represents an economic rent, then the loss, seen from an intertemporal perspective, should be small.

For Russian oil, estimates of the extraction costs differ substantially. Saudi Aramco recently estimated Russian extraction cost to exceed US$40 per barrel (Moscow Times, 2019), but this figure is highly contested. Marszalkowski (2020) puts the extraction and transport costs of Rosneft at somewhat over US$15, which implies that a major part of sales is representing a resource rent.

VI. Conclusions

When it comes to the question of whether Putin's Russia has prepared the aggression well ahead, the evidence presented above is weak. Some authors have interpreted the high gold reserves as a preparation to withstand western sanctions. While impressive gold reserves indeed have been built up, the start of this policy seems more related to the financial crises than a reaction to the Ukrainian Maidan revolution in 2013/2014, although, thereafter, some acceleration did occur. There are little signs for Russian war preparation in other indicators presented, which may suggest that the decision to wage the war is relatively recent or, alternatively, that the intensity of the war may have been underestimated. An alternative hypothesis that cannot be completely dismissed is that the build-up of financial independence and military capacity may have been a longer plan, the start of which predates the changed situation in the Ukraine.

The evidence put together in this note also illustrates the limits of energy related sanctions. Russia has withstood huge swings in energy revenues in the past. From 2011 to 2016, the Russian natural resource rent as reported by the World Bank collapsed from US$360 to US$110 bn. This created a severe financial crisis which crushed the ruble exchange rate. At the same time, Russia could largely accommodate the reduced rent by higher budget deficits. The low debt-to-GDP ratio helped.

[10] It could be argued that greening economies that react to climate change may reduce their demand for carbon fuels in the future. For that reason, Russian oil left in the ground could depreciate more quickly than without greening economies. This argument would overlook, however, that other oil exporters may react to slower Russian extraction by extracting faster, increasing future oil prices and making future Russian extractions more valuable.

A similar situation may evolve in the case of a severe embargo against Russian gas and oil. While there is a strong relationship between a possible cut in energy rents and public deficits, reduced capital exports and pressure on domestic savers may well create enough demand for public debt to fill the gap. Confidence in Russian bonds may not only benefit from growing nationalism and Russian propaganda. It may also rest on the fact that a reduction in energy exports today potentially allows for more energy exports in the future. Hence, to a considerably extent, sanctions in this area do not wipe out Russian wealth, but, to some extent, merely change the portfolio composition of that wealth. More of it stays in the ground, although perhaps only temporary.

Even if their leverage on Russia is limited, sanctions on oil and gas exports may be a more general signal, both as a commitment in future conflicts, as well as a signal of unity towards China, as recently suggested.[11] At the end, it is a political decision to expand sanctions.

[11] See Hufbauer and Hogan (2022).

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