

Energy sanctions against Russia:
What options does the EU have and how costly are they?

Benjamin Moll

20th Anniversary of the Germán Bernácer Prize
From Covid-19 to the war in Ukraine:
EU's macroeconomic policies in times of disruption

May 25, 2022

What if ...? The Economic Effects for Germany of a Stop of Energy Imports from Russia

Bachmann, Baqaee, Bayer, Kuhn, Löschel, Moll, Peichl, Pittel, Schularick
(heavily building on work by the late Emmanuel Farhi with David Baqaee)

March 7, 2022

Energy Sanctions Roadmap: Recommendations for Sanctions against the Russian Federation

The International Working Group on Russian Sanctions
<https://fsi.stanford.edu/working-group-sanctions>

May 9, 2022

The need for energy sanctions against Russia

- ▶ Russia's economy and budget are underpinned by revenues from the sale of oil and gas, primarily to Europe.
- ▶ Since the start of the war, EU has paid the Kremlin around \$800 million daily to import Russian oil and gas
- ▶ These payments finance Putin's war against Ukraine (either directly or indirectly)
 - ▶ see e.g. work by Sergei Guriev and Oleg Itskhoki
- ▶ Needed: immediate European action to
 1. reduce Russia's oil and gas revenues rapidly
 2. combined with longer-term actions to eliminate Russian oil and gas sales to Europe and the Russian threat to European energy security

Oil embargo and other policy options

European Commission, May 4: complete import ban on all Russian oil in 3-6 months

Problems:

- ▶ severe political resistance from Hungary etc
- ▶ 3-6 months is too slow
- ▶ announced embargo may have counterproductive effect: increase short-run demand for Russian oil and hence its price

⇒ complement or substitute with other policies

Some excerpts from “Energy Sanctions Roadmap” paper

See <https://drive.google.com/file/d/1FP3R-jMv05zw5Jin8L8LTWqRLAQIhbgJ/view>

1. Tax on the sellers of Russian energy into Europe, separate rates for oil and gas
2. Escrow regime to capture the balance of Russian export earnings
3. European gas negotiator to counter Putin's divide-and-conquer strategy (rubles)
4. another promising policy idea: if keep announced embargo, complement with price cap (Johnson and Rachel)

<https://www.latimes.com/opinion/story/2022-05-09/european-union-embargo-imports-russian-oil-price-cap>

My personal opinion: really doing pretty much anything is better than doing nothing!

Cost of sanctions: “What if...?” paper

Assess economic consequences for Germany of cut-off from Russian energy imports

- ▶ either embargo by Germany/EU
- ▶ or stop of deliveries by Russia

Worst-case scenario of cold turkey complete import stop

- ▶ arguably bounds other scenarios, say tariff
- ▶ less extreme policies may trigger full stop by Russia

Get sense of rough magnitudes of economic losses relative to “do nothing” baseline

1. Small GDP decline, say 0.5-1%, perhaps not even a recession?
2. Like Covid = 4.5% decline in German GDP?
3. Like Spain or Portugal during Euro crisis (5.1% & 7%)?
4. “Mass unemployment and poverty” (Habeck), “millions of lost jobs” (Scholz)
So perhaps like Great Depression?

Takeaways

Economic losses relative to “do nothing” baseline?

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Headline numbers: **GDP decline between 0.5% and 3%**

Takeaway: Import stop likely somewhat less severe than Covid recession

Really a paper about gas not oil

- ▶ Elephant in room in Germany
- ▶ Will talk about oil at end
- ▶ Related historical episode: Chile cut off from Argentinean gas in 2007
<https://www.project-syndicate.org/commentary/russian-gas-chiles-lessons-for-germany-europe-by-andres-velasco-and-marcelo-tokman-2022-04?>
- ▶ Also not a paper about inflation, though will also talk about it at the end

German primary energy usage

	Oil	Gas	Coal	Nuclear	Renew.	Rest	Total
TWh	1077	905	606	209	545	45	3387
%	31.8	26.7	17.9	6.2	16.1	1.3	100
of which Russia	34%	55%	26%	0%	0%	0%	30%

Oil and coal have **global market** (+ a strategic reserve)

Gas much trickier due to pipeline network, small LNG supplies ⇒ **focus on gas**

Size of the gas shock

Lose 55% of gas but some substitution possible (Bruegel, 2022, and others)

- ▶ Relevant time horizon: roughly until next winter (seasonality of gas demand)
- ▶ Increase gas imports from NOR, NL,...
- ▶ Substitute some gas in electricity generation (lignite, hard coal, nuclear)
- ▶ Lose 55% of gas, import or substitute 25% \Rightarrow gas \downarrow 30%
- ▶ \Rightarrow energy shock: gas \downarrow 30% or equivalently energy (gas+oil+coal) \downarrow 8%

German government report on May 1: in mid April dependence on Russian

- ▶ gas down to 35% (from 55%), oil down to 12% (from 35%), coal down to 8%

https://www.bmwk.de/Redaktion/DE/Downloads/Energie/0501_fortschrittsbericht_energiesicherheit.html

Right in line with our assumptions, arguably faster:

- ▶ still lots of time until next winter (= our time horizon for substitution)
- ▶ still room for substituting gas in electricity generation (12% of total)

Some Facts about German Economy

1. Consumption of gas, oil and coal: 4% of GDP
2. Imports of gas, oil and coal: 2.5% of GDP
3. Consumption of gas (also = imports): 1% of GDP
4. Gas usage and economic importance of broad economic sectors

	Households	Industry	Services, T&C	Electricity Gen.	Other
Gas usage (%)	30.8	36.9	12.8	12.6	6.9
Employment (%)		22.6	72.8	0.6	2.9
Gross Value Added (%)		25.9	69.7	2.2	2.3

Sources: BDEW (2021) and Eurostat (2020)

https://ec.europa.eu/eurostat/databrowser/view/NAMA_10_A64_E__custom_2410757/default/table?lang=en

https://ec.europa.eu/eurostat/databrowser/view/NAMA_10_A64__custom_2410837/default/table?lang=en

Numbers in 1.-3. small. But energy = critical input \Rightarrow amplification important.

Macro models

- ▶ Starting from facts, map energy shock into GDP losses using macro models
- ▶ e.g. recall gas $\approx 1\%$ of GDP, gas shock = -30%
- ▶ Two extreme **non-sensical calculations** that are inconsistent with data
 - ▶ GDP loss = $1\% \times -30\% = -0.3\%$
 - ▶ no substitutability whatsoever: GDP falls one for one with gas, i.e. -30%
- ▶ Our results: **large amplification rel. to naive 0.3% calc but by factor of 10 not 100**

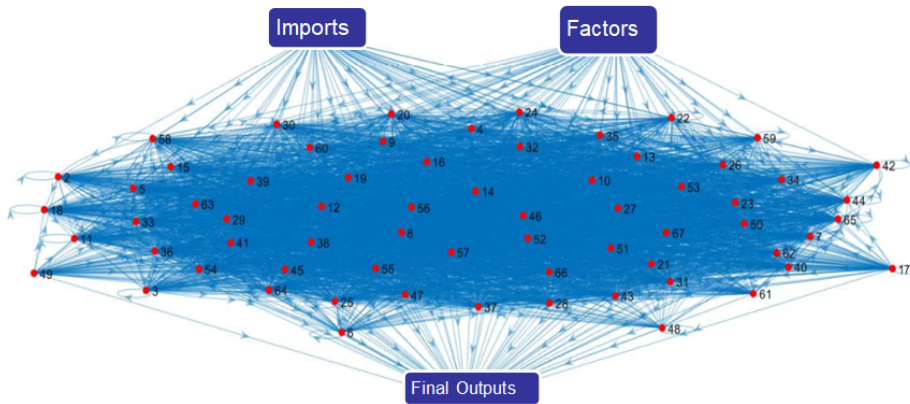
Simplest model: CES production function

$$Y = \left[(1 - \alpha)^{\frac{1}{\sigma}} F(K, L)^{\frac{\sigma-1}{\sigma}} + \alpha^{\frac{1}{\sigma}} Gas^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

- ▶ Key parameters: elasticity of substitution σ , gas share α
- ▶ Two extreme cases above are Cobb-Douglas, $\sigma = 1$, and Leontief, $\sigma = 0$

Richer models with supply chains and trade (Baqae-Farhi)

- ▶ Complex production network, i.e. supply chains/production cascades
⇒ allows for spill-overs and increased damages
- ▶ Multi-country ⇒ substitution via imports possible, e.g. import energy-intense products instead of energy (e.g. basic chemicals, raw metals)



The Numbers

	Baqae- Farhi suff. statistic	Baqae- Farhi simulation	Simplest model 10% energy ↓	Simplest model 30% gas ↓
GNE Loss, in %	< 1	< 0.3	1.5	2.3
As % of GDP	< 1	< 0.3	1.3	2.2
Per capita	€400	€100	€600	€900

- ▶ All Models use conservative elasticity estimates
- ▶ Simplest model (= production fn) abstracts from trade/substitution downstream
- ▶ Some mechanisms left out \Rightarrow round up headline number to 3% (“safety margin”)

Other Studies

TABLE 3

Selected scenarios on the consequences of an intensification of the conflict for the economic outlook

Institution	Scenario	Assumptions	GDP- deduc- tion ¹	Additi- onal infla- tion ¹	Region
Effects relative to a baseline scenario incorporating the state of the conflict and sanctions at time of publication					
Deutsche Bank Research ²	Negative scenario with a temporary import stop of natural gas and oil from Russia	Sharply higher energy prices (Oil 140 US-\$/barrel; natural gas 150 €/MWh)	1.5	1-1.5	Germany
ECB ²	Adverse scenario	Sharp temporary increase of natural gas prices and increase of oil prices	1.2	0.8	Euro area
ECB ²	Severe scenario	Sharper and longer increase of natural gas and oil prices; strong second round effects	1.4	2.0	Euro area
Oxford Economics ²	Stop of Russian natural gas imports for 6 months	Oil price between 100 and 115 US-\$/barrel, natural gas price at 190 €/MWh	1.5	2.6	Euro area
Goldman Sachs ²	Stop of russian natural gas imports		2.2	-	Euro area
Effects relative to a baseline scenario not incorporating the state of the conflict and sanctions at time of publication					
EcoAustria ² (Köppel-Turyna et al.)	Increase of natural gas prices and stop of exports to Russia	Natural gas price of 172 €/MWh and no exports to Russia and to Ukraine	1.3	-	Austria
NIESR ² (Liadze et al.)		Oil price at 140 US-\$/barrel higher public spending	0.8	2.5	Euro area
Estimates of Bachmann et al. (2022)					
Bachmann et al. ³	Cessation of trade between Russia and the EU	Introduction of trade barriers in the model of Baqaee and Farhi (2021), which lead to a stop of all imports from Russia to the EU	0.2-0.3	-	Germany
Bachmann et al. ⁴	Stop of Russian natural gas imports	30 % decline of natural gas imports; elasticity of substitution between natural gas and other inputs of 0.1	2.2	-	Germany
Bachmann et al. ⁵	Stop of Russian energy imports	30 % decline of energy imports; change of the cost share of energy imports in the GNE by 5 percentage points to 7.5 %	1.4	-	Germany

Table from excellent review by German Council of Economic Experts

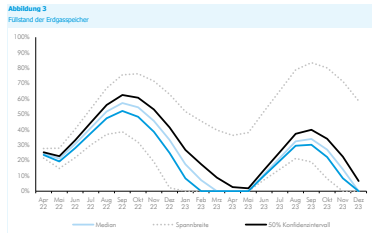
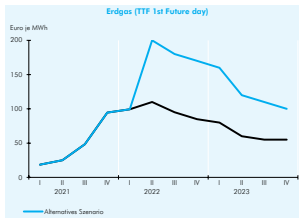
Our review with additional studies:
https://benjaminmoll.com/RussianGas_Literature/

Summary: no single study has found

- ▶ GDP deviation > 5.3%
- ▶ recession with GDP drop > 2.5%

Gemeinschaftsdiagnose (main econ institutes joint analysis)

Full-blown macro analysis, including detailed modeling of energy sector, gas storage etc



Erdgasanteil an Endenergieverbrauch nach Wirtschaftsbereichen

Wirtschaftszweig	WZ 2008	Erdgasanteil
Herstellung von Glas und Glaswaren, Keramik, Verarbeitung von Steinen und Erden	23	70%
Herstellung von Nahrungsmitteln und Futtermitteln, Getränkeherstellung, Tabakverarbeitung	10, 11, 12	54%
Herstellung von chemischen Erzeugnissen	20	39%
Metallerzeugung und -bearbeitung	24	34%
Maschinenbau	28	32%
Kohlenbergbau, Gewinnung von Erdöl und Erdgas	05, 06	31%
Herstellung von Kraftwagen und Kraftwagenantrieben	29	30%
Herstellung von Gummi- und Kunststoffwaren	0,38	27%

Quellen: AG Energiebilanzen e.V.; Berechnungen der Institute.

Für die Berechnung der Effekte einer Gasverknappung auf die erdgasintensiven Bereiche des produzierenden Gewerbes in Deutschland werden die reduzierten Erdgasverbrauchsmengen ($EG_{i,t}^r$) aus dem monatlichen Erdgasmodell verwendet. Für die Wirtschaftszweige ($i, j \in 1, \dots, S$) werden Produktionsfunktionen vom Leontief-Typ unterstellt. Daraus folgt, dass sich die Produktion (Q) eines Sektors durch das Minimum der verfügbaren Vorleistungsgüter (Q^j) in Relation zu den benötigten Mengen pro Produktionseinheit ($a_{i,j}$) ergibt:

$$Q_i = \min \left(\frac{Q^j}{a_{i,j}}, v_j \right).$$

Interestingly, Gemeinschaftsdiagnose model has Leontief production all over the place

Main text https://gemeinschaftsdiagnose.de/wp-content/uploads/2022/04/GDF2022_Gesamtdokument_unkorrigiert_12.4.13h.pdf

Appendix https://gemeinschaftsdiagnose.de/wp-content/uploads/2022/04/GD22F_Hintergrund-Alternativszenario_final.pdf

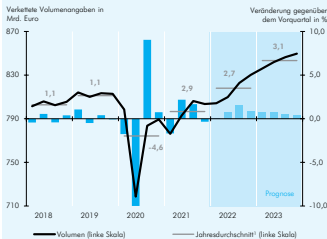
Gemeinschaftsdiagnose (main econ institutes joint analysis)

- ▶ GDP deviations rel. to “do nothing”: -0.8% in 2022, -5.3% in 2023 (-3.05% ave)
- ▶ Year-to-year GDP change with import stop: +1.9% in 2022, -2.2% in 2023

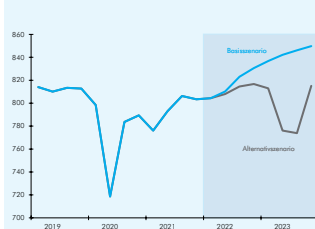
Bruttoinlandsprodukt und Bruttowertschöpfung nach Wirtschaftsbereichen – Alternativszenario

	2022				2023				2022	2023
	I	II	III	IV	I	II	III	IV		
	Veränderung gegenüber dem Vorquartal ¹ in %								Veränderung gg. dem Vorjahr ² in %	
Bruttoinlandsprodukt	0,1	0,4	0,8	0,3	-0,5	-4,5	-0,3	5,3	1,9	-2,2
	Abweichung vom Basisszenario in Prozentpunkten									
Bruttoinlandsprodukt	0,0	-0,3	-0,8	-0,7	-1,2	-5,2	-0,8	4,9	-0,8	-5,3

Reales Bruttoinlandsprodukt in Deutschland
Saison- und kalenderbereinigter Verlauf



Szenarienvergleich - Reales Bruttoinlandsprodukt
Verkettete Volumenangaben in Mrd. Euro; saison- und kalenderbereinigter Verlauf



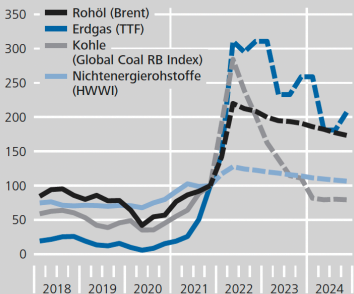
Oil Embargo: Bundesbank

In contrast to gas, no shortages. But higher prices. Bundesbank separates price effects:

- ▶ -1.85% GDP rel. to baseline, $+1.15\%$ growth in 2022, more in 2023 and 2024
- ▶ $+1.5\%$ extra inflation in 2022, more in 2023 and 2024

Rohstoffpreisannahmen¹⁾

4. Vj. 2021 = 100

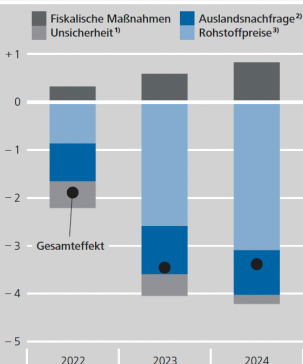


Quelle: EZB und eigene Berechnungen. * Unterstellt dauerhaften Boykott russischer Öl-, Gas- und Kohlieieferungen.

Deutsche Bundesbank

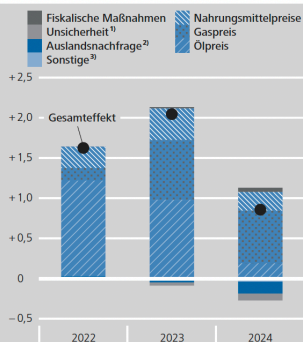
Potenzielle BIP-Verluste in Deutschland infolge des Krieges in der Ukraine

Abweichungen von der Basislinie in %



Potenzielle Effekte auf die HVPI-Rate in Deutschland infolge des Krieges in der Ukraine

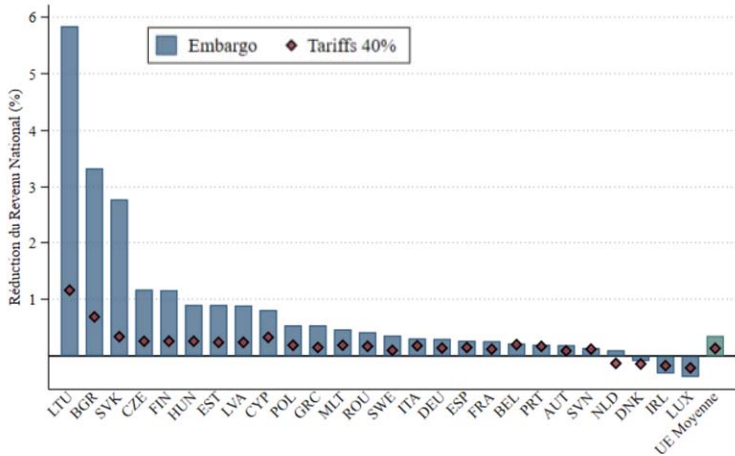
Abweichungen von der Basislinie in %-Punkten



France and other EU countries, embargo vs tariff

Report for French CEA w Landais & Martin <https://www.cae-eco.fr/staticfiles/pdf/cae-focus84.p>

b. Impact of a complete ban vs a 40% tariff on Russian energy imports the most pessimistic calibration in terms of substitution



Conclusion

Energy sanction options

- ▶ oil embargo plans not enough, too slow
- ▶ many other policy options available, see “Energy Sanctions Roadmap” paper

Bounding the economic costs

- ▶ Estimated costs of complete import stop are substantial, but not catastrophic.
- ▶ Ballpark: somewhat smaller than COVID, worst-case 3% GDP on impact
- ▶ That was recession in which we were able to provide insurance, compensate losers
- ▶ tariffs allow to “calibrate” these costs

Policy

- ▶ Make sure the price mechanism works, want people and firms to substitute
- ▶ Bad fiscal policies: tax subsidies on energy, ...
- ▶ Monetary policy: raise interest rates to control inflation

Facts II: Hardest Hit Industries

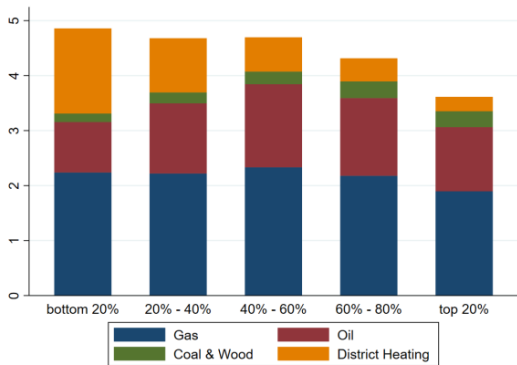
	2022 Crisis (Import Stop)			2020 Crisis (Covid-19)		
	Chemicals	Food+	Metal	Air Trans.	Hosp.	Entert.
Employees (in 1,000)	352	941	271	66	1894	693
Employees (% of total)	0.78	2.08	0.60	0.15	4.18	1.53
GVA (in €bln)	46	47	21	7	51	43
Gross Output (in €bln)	137	195	104	25	104	69
Share males (in %)	74	52	88	46	47	49
Share gas (%)	37	12	10			

Source: Volkswirtschaftliche Gesamtrechnungen (2019)

3 hardest hit sectors:

- ▶ Make up 59% of industrial gas usage
- ▶ In terms of GVA, wages, and employees comparable to hardest hit sectors in 2020
- ▶ Big difference in gender to sectors shut down in 2020

Facts III: Direct exposure across the income distribution



- ▶ Expenditure shares for heating between 3-5%
- ▶ Relatively flat in income (=declining income share)
- ▶ Larger households have smaller heating shares (not shown)
- ▶ Gradient in income the same across household sizes
- ▶ Share of car fuels (not shown): inverse U-shape in income