How Europe Withstood Putin's Weaponization of Gas

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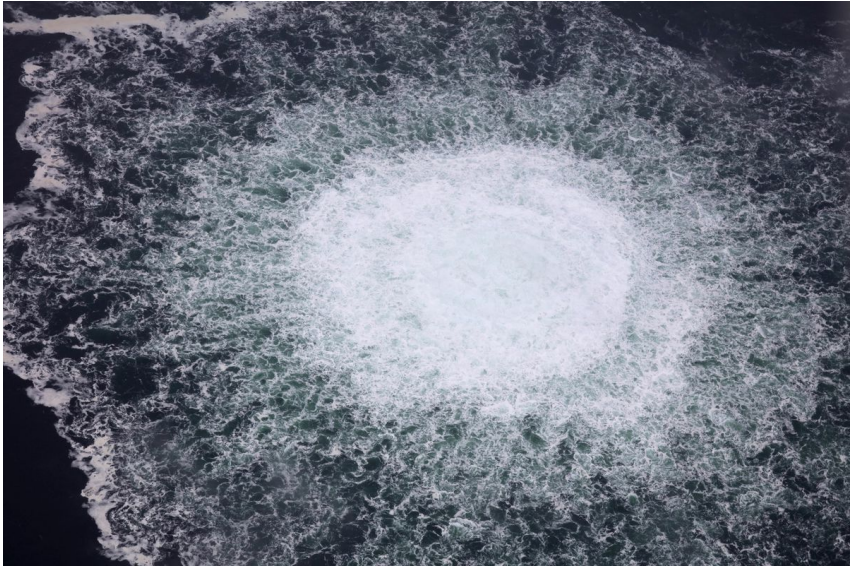
What my talk is about



Background: huge debate after Russian invasion of Ukraine

manager magazin

Money for Russian gas imports

660 million euros a day – this is how we finance Putin's war

Gas from Russia: For President Putin, gas exports are currently the most important source of foreign exchange Photo: Dmitry Lovetsky / dpa

Bild HOME PAGE NEWS POLITICS REGIONAL ENTERTAINMENT SPORTS FIFA WORLD CUP 2022 STYLE COUNSELOR AUTOMOBILE DIGITAL GAMES DEAL

Putin is swimming in our money

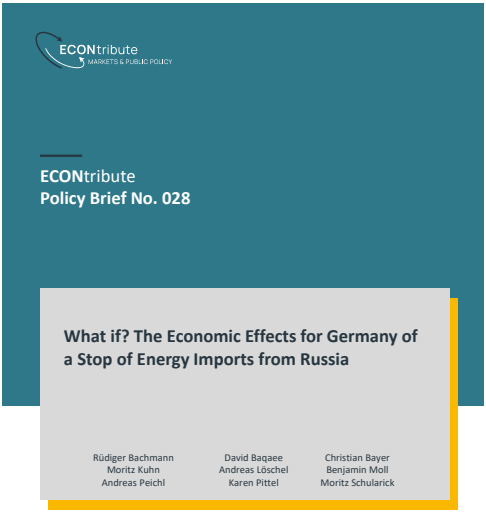
embargo debate

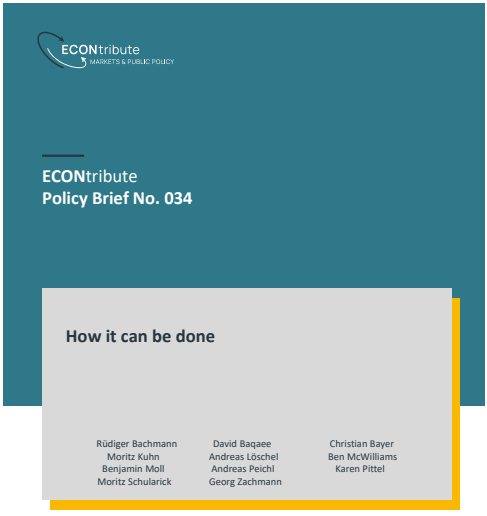
BASF boss warns of destruction of the "entire economy"

Oil and gas are central to the chemical industry. Should their imports from Russia be stopped, BASF boss Martin Brudermüller predicts the "worst crisis since the end of the Second World War".

Implications for current debates? China and “de-risking”

Talk is based on two papers about Germany





Plan

1. What things looked like back in March 2022
2. Our paper back then and what happened next
3. How Germany withstood Putin's weaponization of gas
    - Industry
    - Households
4. Could Germany have withstood an April 2022 gas cut-off?
5. Did Germany simply get lucky due to a mild winter etc?

What things looked like for Germany in March 2022

	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**

Gas trickier due to pipeline network, limited LNG supplies ⇒ focus on gas

- our estimate back then: gas demand needs to drop by 30%
  (August update: 25%)

Consumption of gas (also = imports): ≈ 1% of GNE

- small number but energy = critical input ⇒ amplification important

Objectives and results of March 2022 paper

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

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

Get sense of rough magnitudes of 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” so perhaps like Great Depression?

Our assessment back in March: **GDP decline between 0.5% and 3%**

- Import stop likely somewhat less severe than Covid recession
- Key mechanism: substitution of gas and gas-intensive inputs

Reception by German government

Chancellor Scholz on TV, responding to "economists don't predict doom"

- "But they get it wrong! And it's honestly irresponsible to calculate around with some mathematical models that then don't really work."
- "I don't know absolutely anyone in business who doesn't know for sure that these would be the consequences."

Head of chancellery Wolfgang Schmidt during televised panel

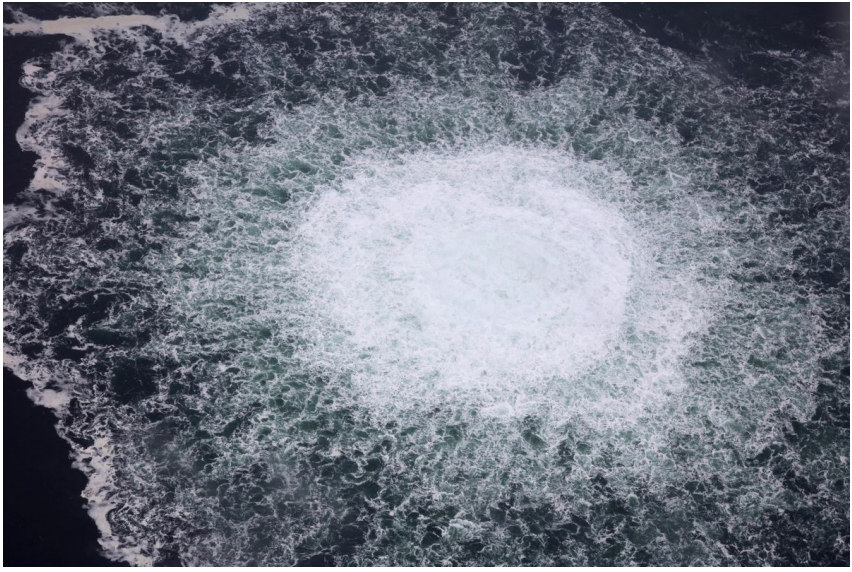
- "The second thing is, what they call elasticity, the question whether you can substitute or whether you cannot substitute gas, oil, and coal."
- "And they always said in that model: 'Yeah there is elasticity, it is not zero.' But that is not true."

Transcripts: https://benjaminmoll.com/Scholz/ and https://benjaminmoll.com/Schmidt/

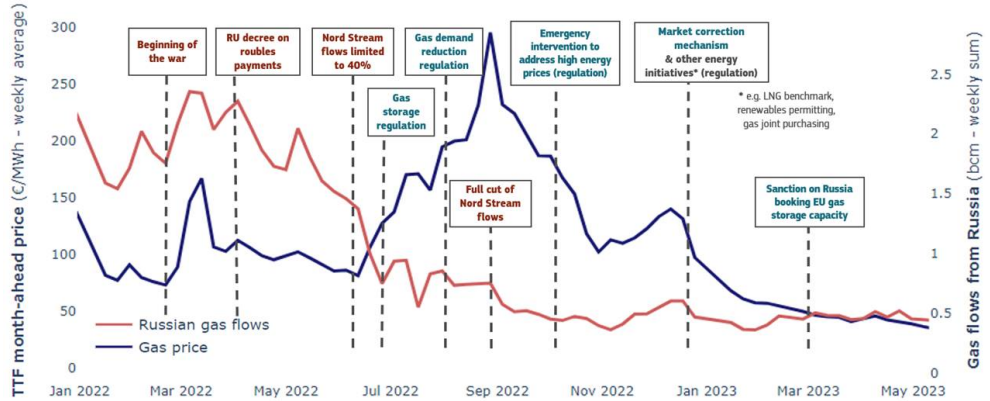
June 2022: Russia cuts gas deliveries to 20%

September 2022: Russia shuts down Nordstream pipeline

September 2022: Nordstream pipelines blow up

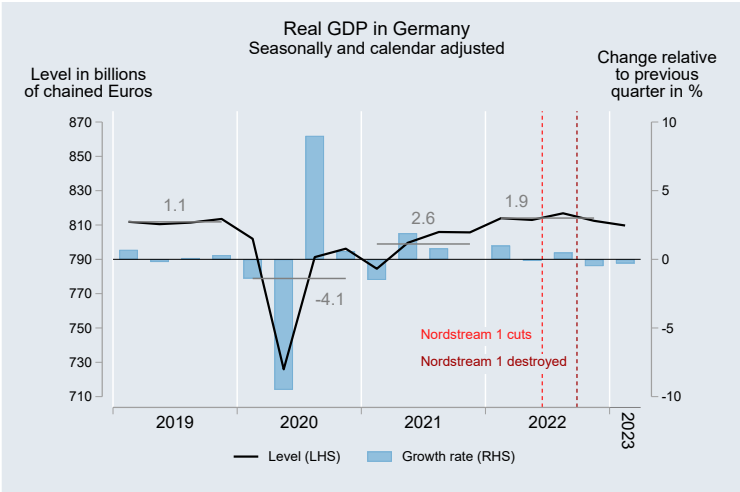


More detailed timeline and prices



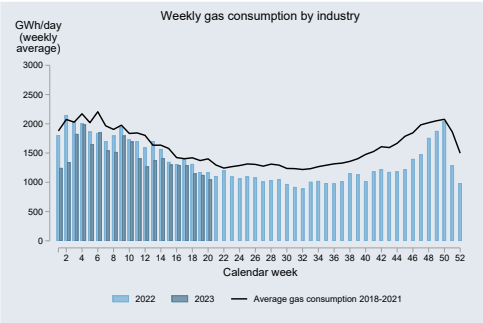
Source: Miguel Gil Tertre (2023)

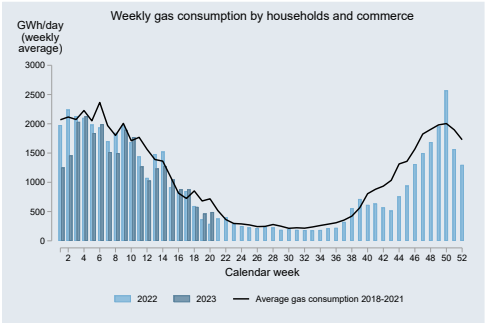
Destruction of economy? Worst crisis since end of WWII?



Instead: a **mini recession**. Two last quarters: GDP ↓ by 0.5% and 0.3%.

Large declines in gas consumption by both industry and households

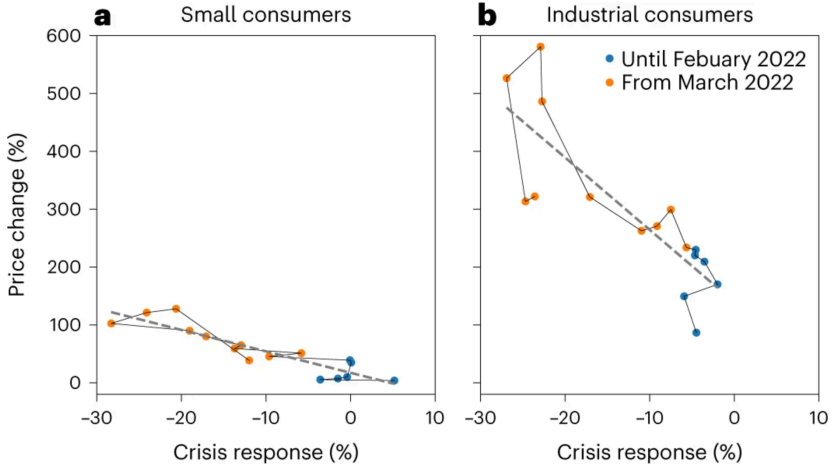




Roughly: industry 20-30%, households 10-20%, overall 20-25%

Source: https://www.bundesnetzagentur.de/DE/Fachthemen/ElektrizitaetundGas/Versorgungssicherheit/aktuelle_gasversorgung/start.html

... at least in part driven by skyrocketing prices

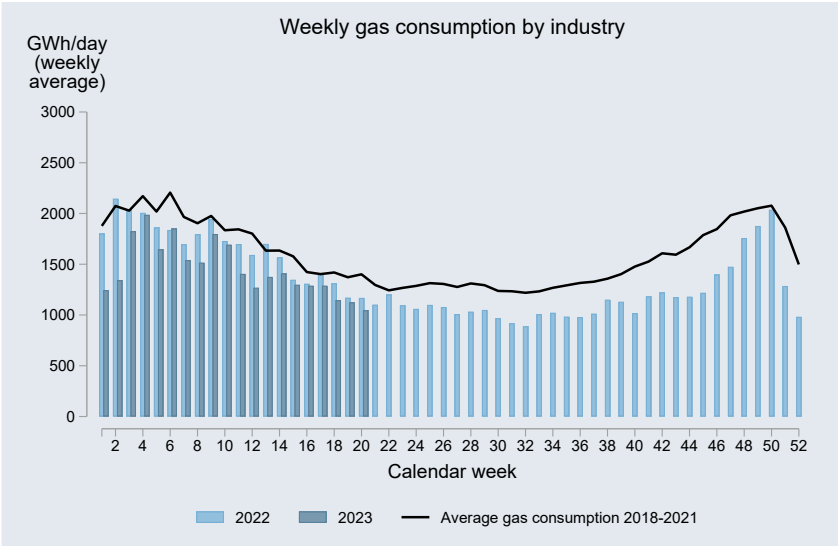


Source: Ruhnau-Stiewe-Muessel-Hirth “Natural gas savings in Germany during the 2022 energy crisis”, Nature Energy (2023) https://www.nature.com/articles/s41560-023-01260-5

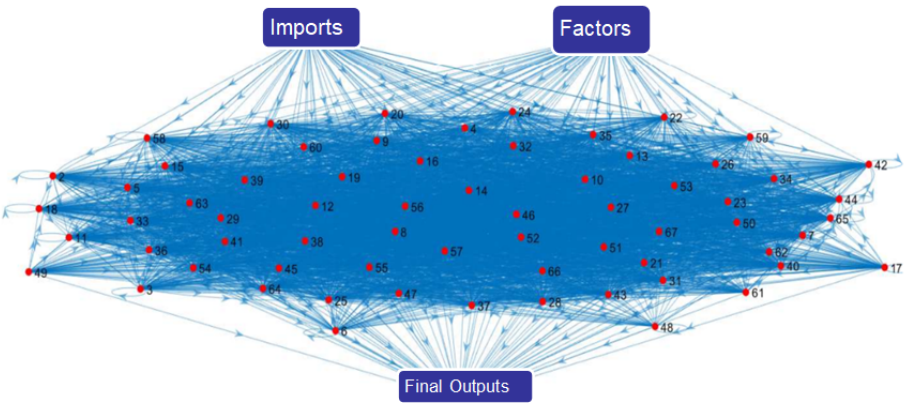
How Germany withstood Putin's weaponization of gas

Industry

Gas consumption by industry



The worry: “cascading effects” along supply chain



Key prediction: Leontief ⇒ total production drops one-for-one with gas usage

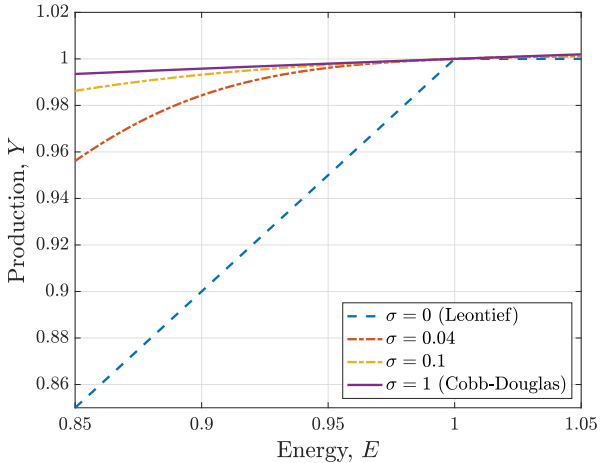
- if true, should have seen a 20-30% drop in industrial production

Simplest Model

$$Y = \left[\alpha^{\frac{1}{\sigma}} \text{Gas}^{\frac{\sigma-1}{\sigma}} + (1-\alpha)^{\frac{1}{\sigma}} (\text{Other Inputs})^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}$$

- Gas has small expenditure share, but substitution elasticity might be small

Output losses for different elasticities of substitution



- Leontief $\Rightarrow$ total production drops one-for-one with gas usage
- Even with very low σ output losses potentially far from Leontief

Modeling “cascading effects”: Baqaee-Farhi model

- Input-Output linkages allow for spill-overs $\Rightarrow$ larger economic costs
- But: multi country $\Rightarrow$ import energy-intense products instead of energy
  - ammonia
  - basic chemicals
  - raw metals

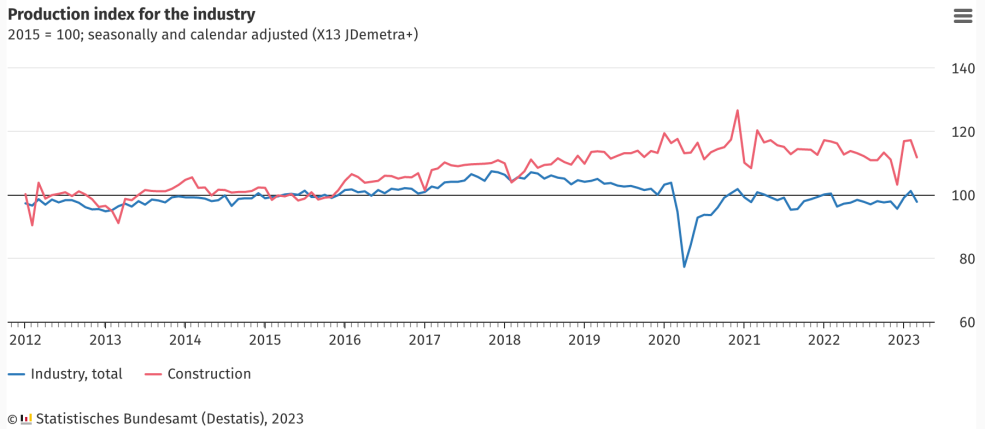
What did we predict back in March?

	Baqaee-Farhi suff. statistic	Baqaee-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
- The cost statements are in terms of GNE
- Some mechanisms left out ⇒ round up headline to 3% (“safety margin”)

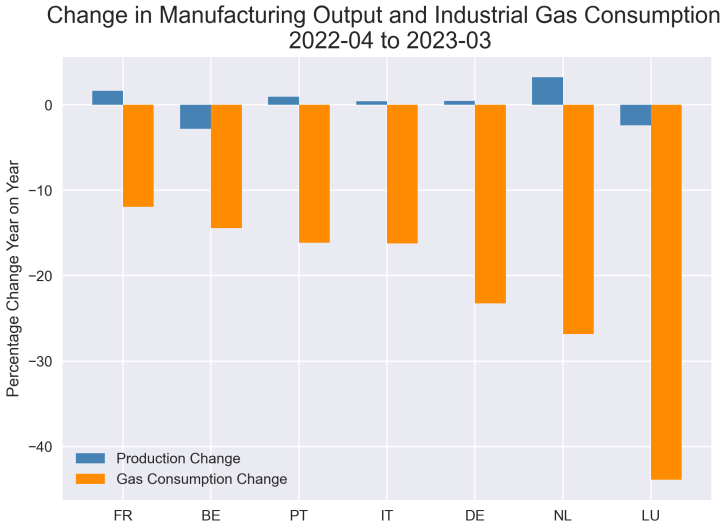
Industrial production looks nothing like Leontief

Recall: Leontief ⇒ should have seen 20-30% drop in industrial production

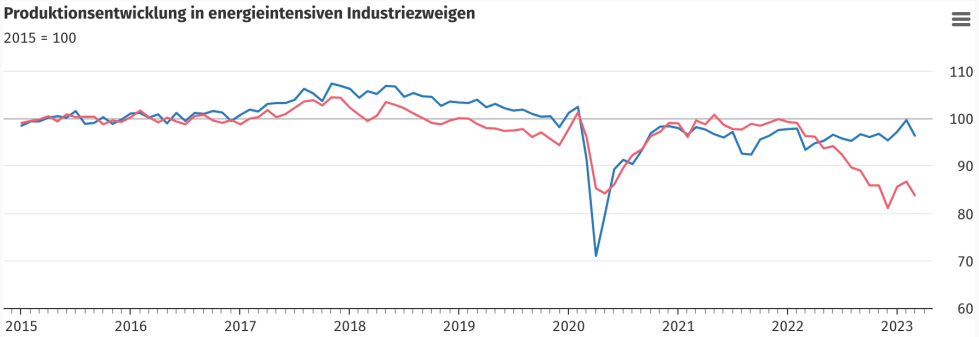


Source: https://www.destatis.de/EN/Press/2023/05/PE23_177_421.html

Also other European countries look nothing like Leontief



Cuts in energy-intensive sectors but decoupling from rest



Source: https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Industrie-Verarbeitendes-Gewerbe/produktionsindex-energieintensive-branchen.html

How so? Substitution along supply chain

- See examples in this twitter thread
  https://twitter.com/ben_moll/status/1548004135294754817?s=20&t=78Fe5LKpYYWtxmfMD-To-w
- ... and Section 2 of "How it can be done" paper

  - **BASF**[20] "in Ludwigshafen can replace [with] heating oil about 15 percent of the natural gas needed for electricity and steam generation." Gas for electricity and steam generation accounted for about half of the gas consumed in Ludwigshafen in 2021.[21] **BASF** is also substituting in ammonia production. The company has reduced the production of ammonia at its Ludwigshafen site because of high gas prices and supplemented it with purchases: "this substitution via the world market [is] relatively easy."[22] The company can substitute some by producing ammonia in the U.S. instead of at the Ludwigshafen site.[23] This is a good example of substitution through imports, which we emphasized in our earlier study, in this case even within the same company. A study by Stiewe et al. (2022) examines German fertilizer production, for which **ammonia** is an important precursor, which in turn is produced with gas. The study concludes "that increased ammonia imports have caused domestic fertilizer production to remain remarkably stable." Consistent with these examples, data from Oxford Economics show that chemical imports have surged in recent months.[24]
  - Glass manufacturer **Wiegand Glas** will be able to "heat its furnaces with light fuel oil in the future instead of only natural gas as before."[25]
  - Car manufacturer **Mercedes-Benz** sees a reduction potential for natural gas of 50% in Germany "if regional pooling is made possible." "For example, at the Sindelfingen site [...] the paint shop can be operated in emergency mode without gas supply."[26]
  - Car manufacturer **Audi** says it can get by with 20 percent less gas. Only about 10 percent of normal gas demand, the company says, is "the minimum amount of gas

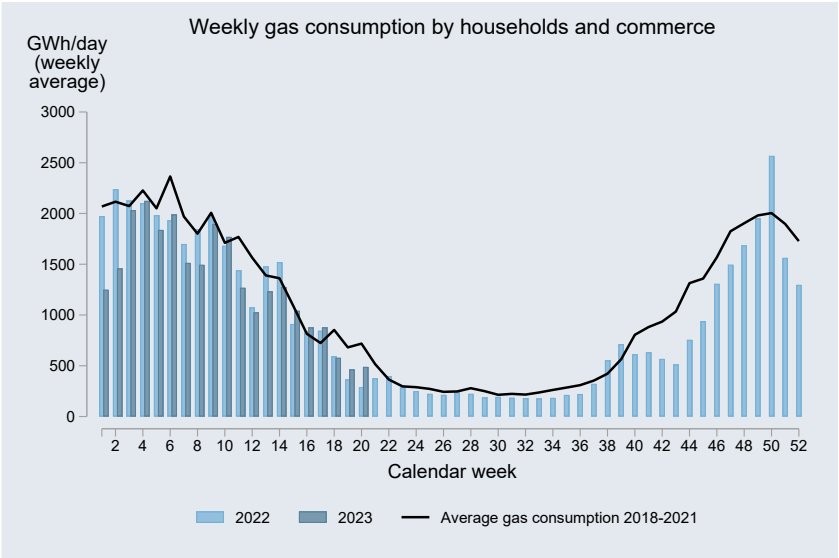
... true despite German industry lobby claiming opposite

Source: https://bdi.eu/artikel/news/substanz-der-industrie-bedroht/

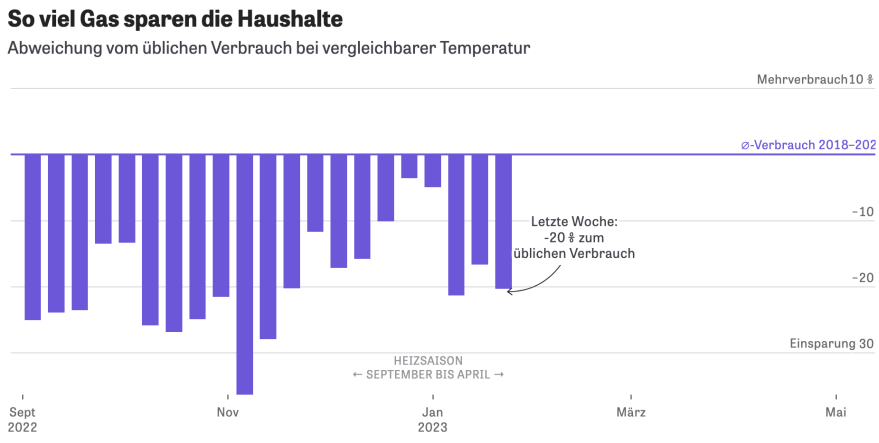
How Germany withstood Putin's weaponization of gas

Households

Gas consumption by households: large demand reduction



... true even when controlling for temperature



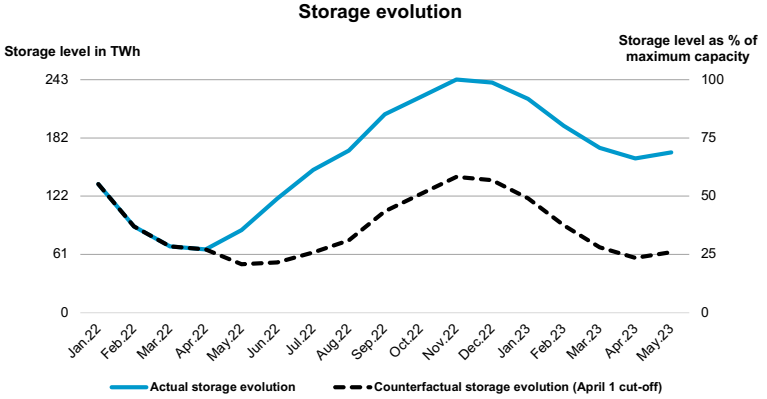
Policies to support households in face of skyrocketing energy prices

- Crucial to support households, especially economically weaker ones
- Good policy: do this by means of transfers that are not directly tied to gas consumption and that preserve incentives for reducing gas demand
- German “gas cost break” (commission incl Bayer & Pittel)
  - importantly, not price subsidy / cap but lump-sum transfers
  - compensation based on historical consumption = Bayer’s idea featured in “what if” and “how it can be done” papers
- Rising gas prices have income and substitution effects
  - income effect is the enemy but substitution effect is our friend
  - German model targets income effect but leaves subst. effect intact

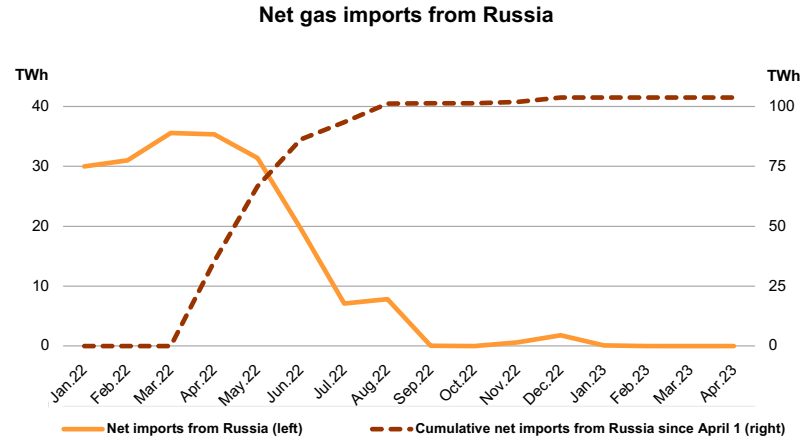
Could Germany have withstood an April 2022 gas cut-off?

Yes, Germany could have withstood a 1 April 2022 cut-off

- Gas in storages at end of heating period = 160 TWh (65% of capacity)
- Gas imported from Russia Apr-Aug 2022 = 100 TWh (10% of yearly cons.)
- Assuming identical consumption, would still have had 60 TWh (25%) left



Large majority of additional Russian imports in April and May 2022, very little imports in June to August



Did Germany simply get lucky?

Did Germany simply get lucky?

- Frequent argument: Germany got lucky due to particularly mild winter
- Data on winter temperatures and "heating degree days": this is not true
  - average winter temp. 2022/23 = 2.9°C vs 3°C four previous winters
  - "heating degree days" slightly less than previous years but this happens every year due to climate change, 2022/23 right on trend
- On other hand substantial "bad luck" = negative energy supply shocks
  - maintenance issues at French nuclear reactors
  - fire at Freeport LNG plant in U.S.
- "Bad luck" elements arguably exceeded "good luck" ones over last year

Conclusion

- Western economies have adapted remarkably well to Putin's energy war
  - Germany: a mini recession
- Key = demand reduction and substitution along the supply chain
- Production cuts in energy-intensive sectors but decoupling from rest
- Household demand reduction in winter has been critical
  - key: alleviate hardship but without destroying incentives
  - example of good policy: Germany "gas cost break"
  - example of bad policy: price cap
- In retrospect, even immediate gas import stop (embargo) was feasible