Sanctions, Energy Prices, and the World Economy

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• International trade benefits both parties.
• It will take away Russia’s ability to fund the military invasion if they can’t sell oil to us.
• It will hurt us if we can’t buy oil from them.
• Oil prices increased dramatically before the invasion for reasons unrelated to war or sanctions
• Explanation: demand for oil recovered more quickly than ability to produce
US. demand is back to pre-COVID levels …

<table>
<thead>
<tr>
<th></th>
<th>Dec 2019</th>
<th>Dec 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. vehicle miles traveled</td>
<td>261.8 M</td>
<td>268.4 M</td>
</tr>
<tr>
<td>U.S. gasoline product supplied</td>
<td>8971 mb/d</td>
<td>8941 mb/d</td>
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Production in Nov 2021 down 3.3 mb/d (world) and 1 mb/d (U.S.) from Jan 2020
Drilling rigs are steadily returning and production could be back to pre-COVID levels soon

Number of drilling rigs active in the United States
• Russia produces 10 mb/d of crude oil (13% of global field production) and 17% of world production of natural gas.

• Oil is readily transported and essentially sells on a world market
  – View 13% decrease in oil production as world event

• Natural gas is much more localized
• The dollar value of refined petroleum products consumed in the U.S. represents about 4% of total U.S. GDP
• A quick calculation of the economic cost of losing all of Russia oil production would be 
  \((0.04) \times (0.13) = 0.5\%\) of GDP
• Average peak-to-trough decline in U.S. real GDP relative to trend is 5% of GDP
Formal justification for quick calculation

If output $Y$ depends on inputs of capital, labor, energy:

$$Y = F(K, N, E)$$

$$\frac{\partial F}{\partial E} = \frac{P_E}{P_Y}$$

$$\frac{\partial F}{\partial E} \cdot \frac{E}{Y} = \frac{P_EE}{P_YY}$$

elasticity = expenditure share
Energy’s share of GDP has been declining over time …
... but the share increases when the price goes up
• If price of energy doubles and people buy the same quantity of energy as before, the expenditure share approximately doubles.

• Baqae and Farhi (Econometrica 2019) develop calculations more appropriate for non-epsilon change.

• Bachmann et al. (2022) use their approach to conclude that a cut-off of energy imports from Russia would reduce German GDP by 0.5-3.0% depending on substitutability.\textsuperscript{12}
Percent change in crude oil production from members of OAPEC (in black) and world total (in blue) after Sept. 1973 Arab-Israeli War.
Iranian revolution: production after Oct 1978
Major historical oil supply disruptions were followed by recessions

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Supply cut (local)</th>
<th>Supply cut (global)</th>
<th>Price Change</th>
<th>Recession Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 73</td>
<td>OAPEC embargo</td>
<td>7%</td>
<td>7%</td>
<td>51%</td>
<td>Dec 73</td>
</tr>
<tr>
<td>Nov 78</td>
<td>Iran revolution</td>
<td>7%</td>
<td>4%</td>
<td>57%</td>
<td>Feb 80</td>
</tr>
<tr>
<td>Oct 80</td>
<td>Iran-Iraq War</td>
<td>6%</td>
<td>4%</td>
<td>45%</td>
<td>Aug 81</td>
</tr>
<tr>
<td>Aug 90</td>
<td>Gulf War I</td>
<td>9%</td>
<td>6%</td>
<td>93%</td>
<td>Aug 90</td>
</tr>
</tbody>
</table>
• Economic recessions are characterized by underutilized resources.
• Unemployment rate spikes up and capacity utilization decline.
• $N$ and utilization of $K$ change along with $E$.
• Is there reason to believe that previous oil shocks contributed to this?
Decline in auto production made significant contribution to downturns

<table>
<thead>
<tr>
<th>Period</th>
<th>Contribution of autos</th>
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<tbody>
<tr>
<td>1974:Q1-1975:Q1</td>
<td>-0.5%</td>
</tr>
<tr>
<td>1979:Q2-1980:Q2</td>
<td>-0.8%</td>
</tr>
<tr>
<td>1981:Q2-1982:Q2</td>
<td>-0.2%</td>
</tr>
<tr>
<td>1990:Q3-1991:Q3</td>
<td>-0.3%</td>
</tr>
<tr>
<td>2007:Q4-2008:Q4</td>
<td>-0.7%</td>
</tr>
</tbody>
</table>

Source: Hamilton, “Major Historical Oil Shocks,” 2013
• Decline in auto sales coincides with gasoline price increases and often precedes the recession.
• Often see sales of more fuel-efficient vehicles rise at same time that sales of less fuel-efficient vehicles decline.
• Kuhn, Kehrig, and Ziebarth (2021) document considerable heterogeneity across U.S. consumers.
• 10% of U.S. households never buy gasoline.
• For a different 10% of households, gasoline accounts for more than 10% of total spending.
• If median household does not reduce number of gallons purchased, it must cut back on purchases of other goods and services by 4% when gasoline price doubles.
Consumers become more pessimistic when oil prices rise.

![Graph showing real price of oil and consumer sentiment over time](chart.png)
Conclusion: An energy price spike has potential to significantly disrupt spending on other goods

• In the presence of nominal rigidities, this could contribute to drop in real GDP.
  – If this is the mechanism, expansionary monetary and fiscal policy could help.

• Alternatively, may cause drop in real GDP if it is technologically costly to reallocate productive resources -- Hamilton (JPE 1988), “Supply, Demand and Specialized Production” (2022).
  – If this is the mechanism, potential for monetary or fiscal stimulus may be limited.
Current situation: auto production limited by supply, not demand
Effects on inflation

• An increase in relative price of energy need not cause increase in overall price level if other prices decline.
• However, if other prices are rigid downwards, relative price increase will be inflationary.
• Mechanical consequences of this are similar to earlier calculations
• If crude oil represents half the retail after-tax cost of refined product and these other costs are fixed, when price of oil goes up 10% the price of refined product goes up 5%.

• If no other prices change, we get the direct mechanical contribution to inflation by multiplying percentage change in nominal crude oil price by 0.02.
• Consistent with Fed Chair Powell rule of thumb: if oil price goes up $10 (about 10% at current prices), headline inflation goes up 0.2 percentage points
Price of oil boosted U.S. inflation by 2% in 1974, 1979, 2021
This can translate into sustained inflation from inflationary expectations and monetary policy.
OPEC production is also 1 mb/d below its level at start of 2020
Other possibilities for increased production
Response of real GDP and inflation to oil price shock for China, India, and Brazil from Nasir et al. (En Econ 2018)
• Biofuels are another alternative to conventional gasoline from crude oil.
• Roberts and Schlenker (AER, 2013) estimated that U.S. ethanol mandate increased world cost of meeting minimum daily calorie requirement by 20%.
• Increased cost of running agricultural equipment and creating fertilizer also increase food costs.
Consequences of non-energy sanctions for Russia

• Visa, Mastercard, American Express, Discover suspended operations in Russia and blocked Russian banks

• Many Russian banks blocked from using SWIFT (system for making international payments)

• Can’t use Federal Reserve or ECB clearing either

• Default and nationalization will block access to credit and rest of world for years
Additional slides
Stocks (million barrels)

U.S. crude oil stocks
million barrels

580
540
500
460
420
380
340
300

Jun-20 Dec-20 Jun-21 Dec-21 Jun-22

Source: U.S. Energy Information Administration

- Motor fuel, fuel oil, and propane
  - CPI-U 3.020   CPI-W 3.796

- Electricity and natural gas
  - CPI-U 3.155   CPI-W 3.568

- Energy
  - CPI-U 6.155   CPI-W 7.364
A regression of year-over-year log change in gasoline CPI on y-o-y log change in WTI has coefficient 0.45 and $R^2 = 77\%$