

Sanctions, Energy Prices, and the World Economy

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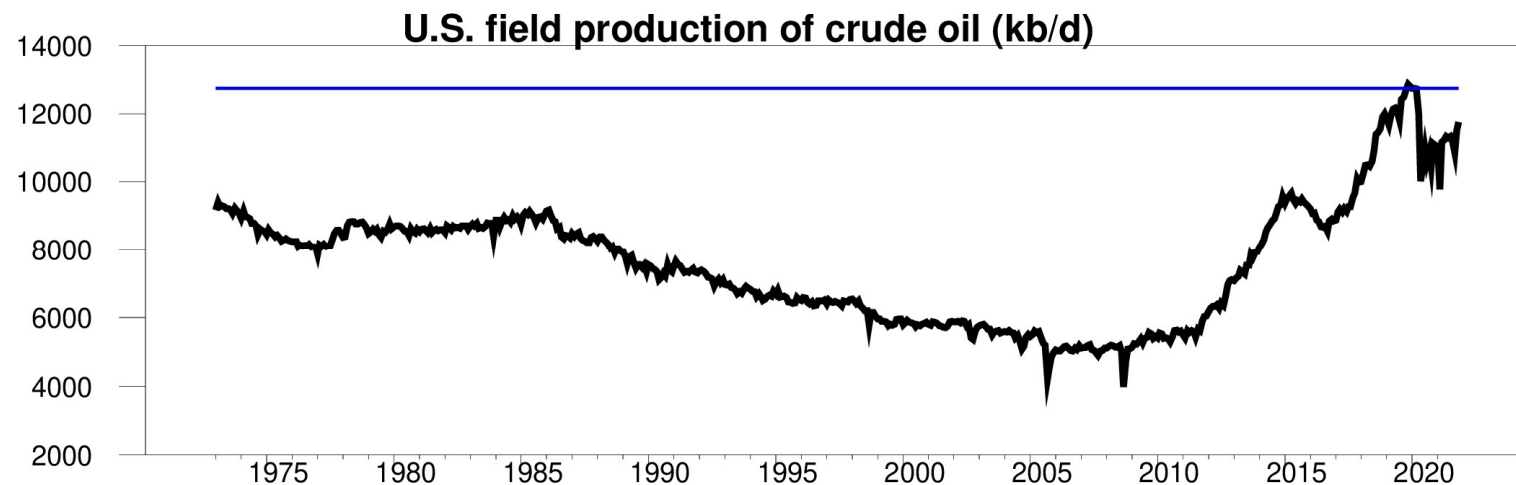
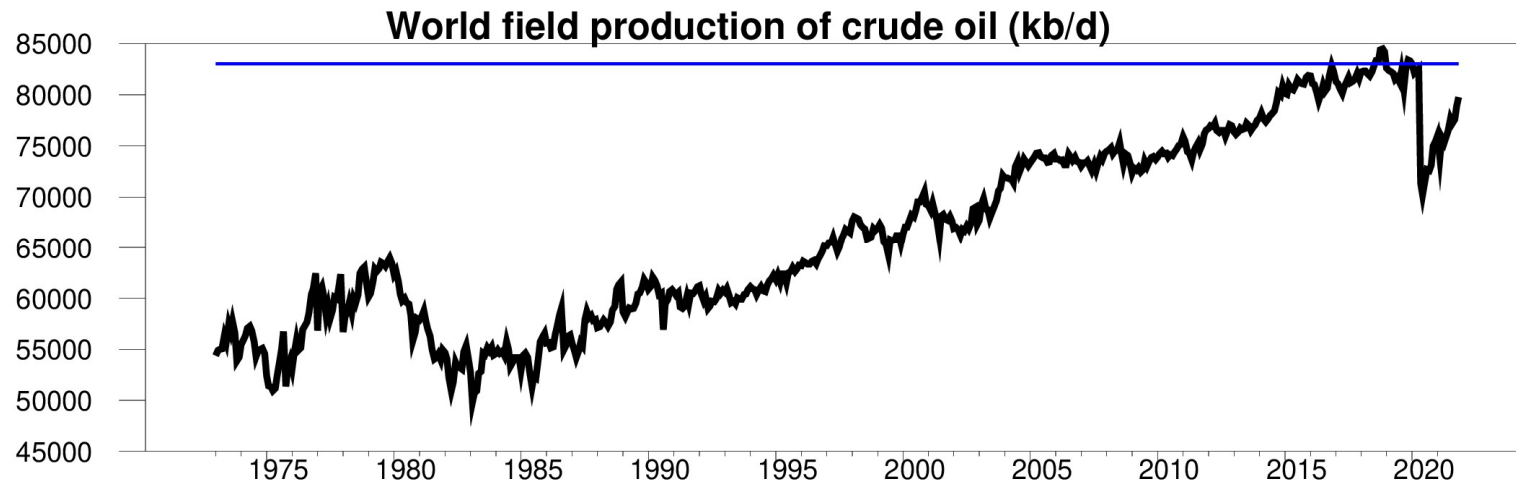
- International trade benefits both parties.
- It will take away Russia's ability to fund the military invasion if they can't sell oil to us.
- It will hurt us if we can't buy oil from them.

- 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 ...

	Dec 2019	Dec 2021
U.S. vehicle miles traveled	261.8 M	268.4 M
U.S. gasoline product supplied	8971 mb/d	8941 mb/d

... but production of crude oil is not



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:

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

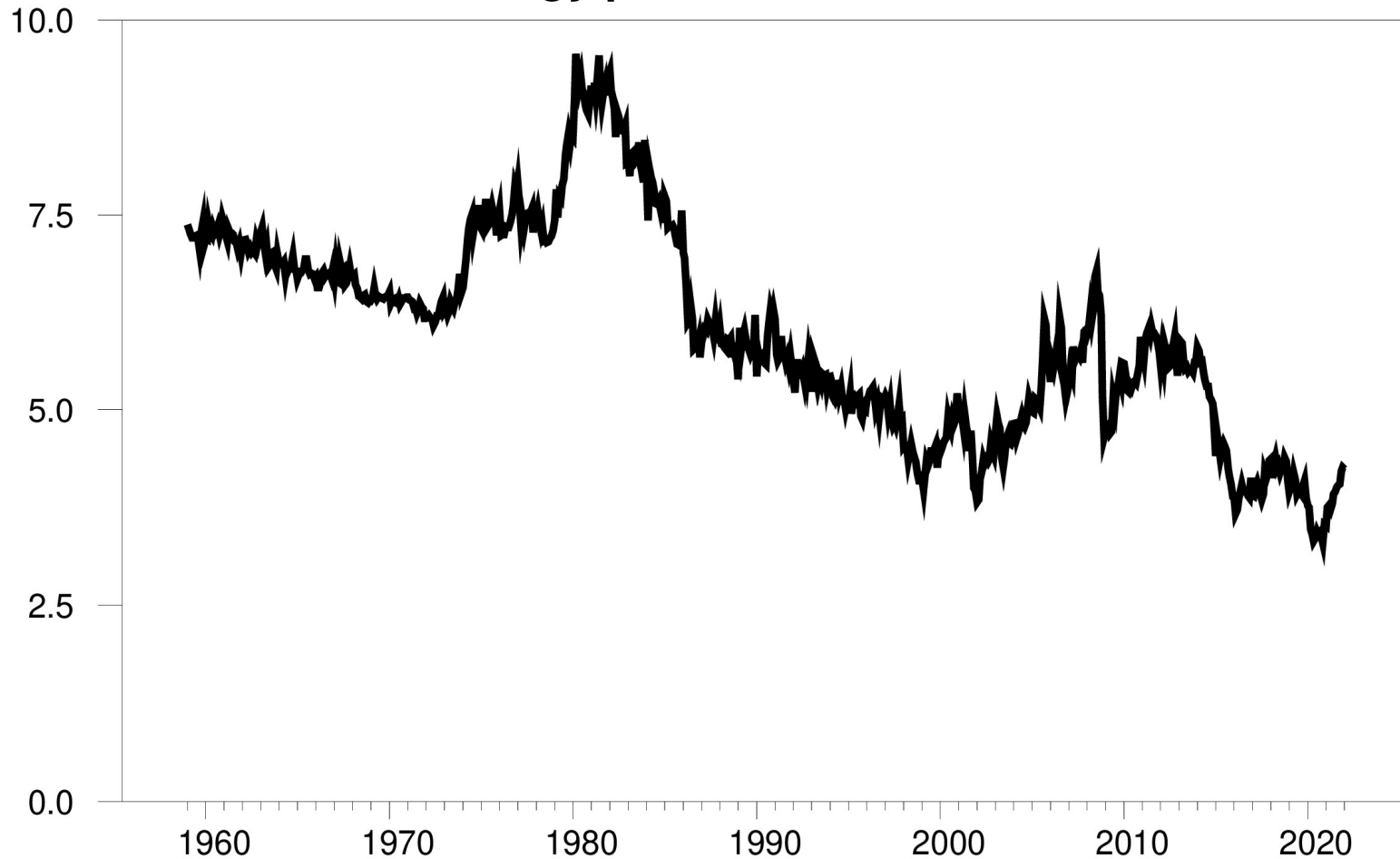
$$\frac{\partial F}{\partial E} = \frac{P_E}{P_Y}$$

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

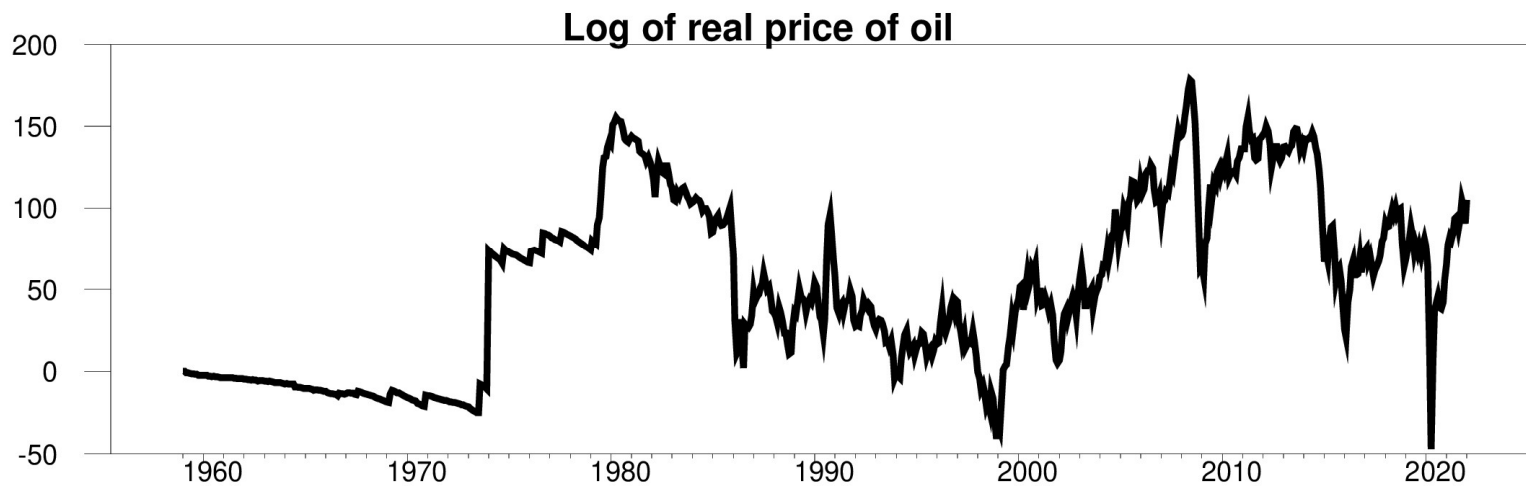
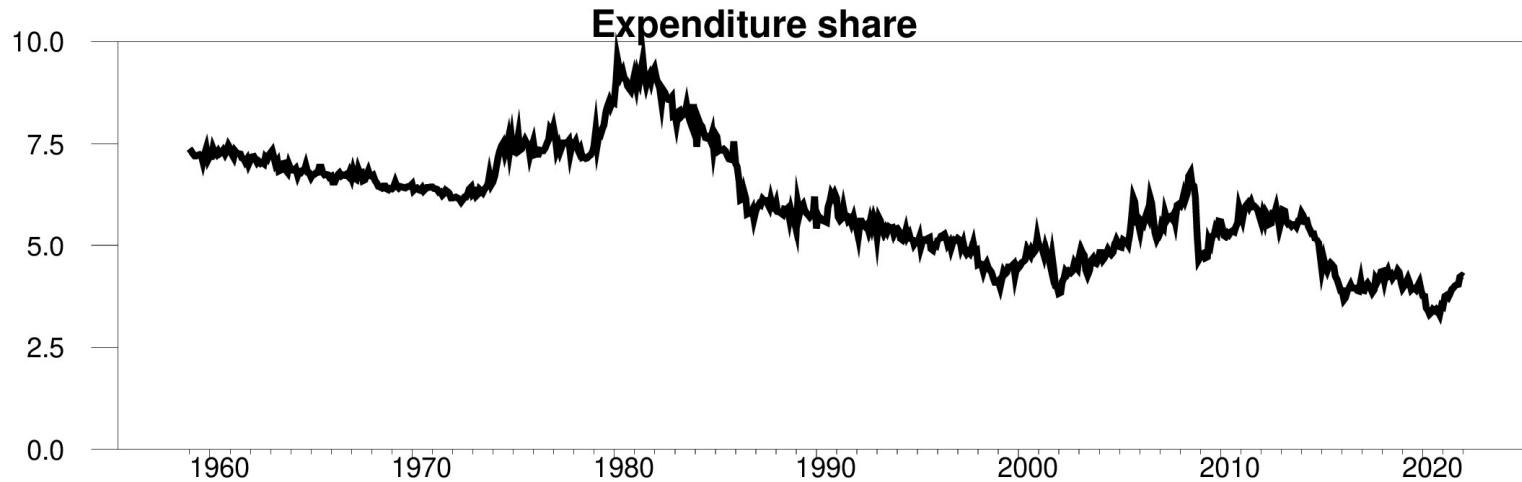
elasticity = expenditure share

Energy's share of GDP has been declining over time ...

Consumer energy purchases as share of total

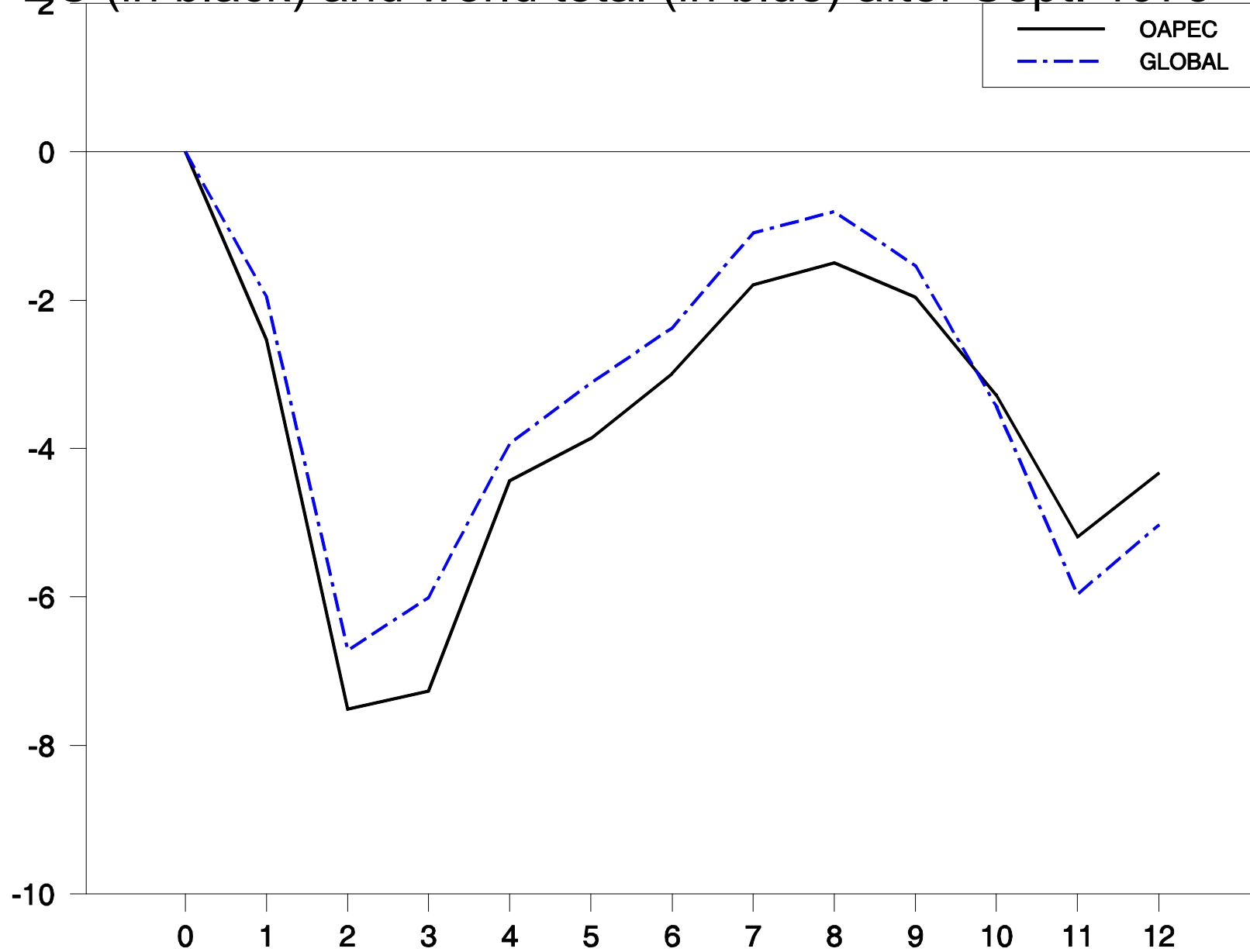


... but the share increases when the price goes up

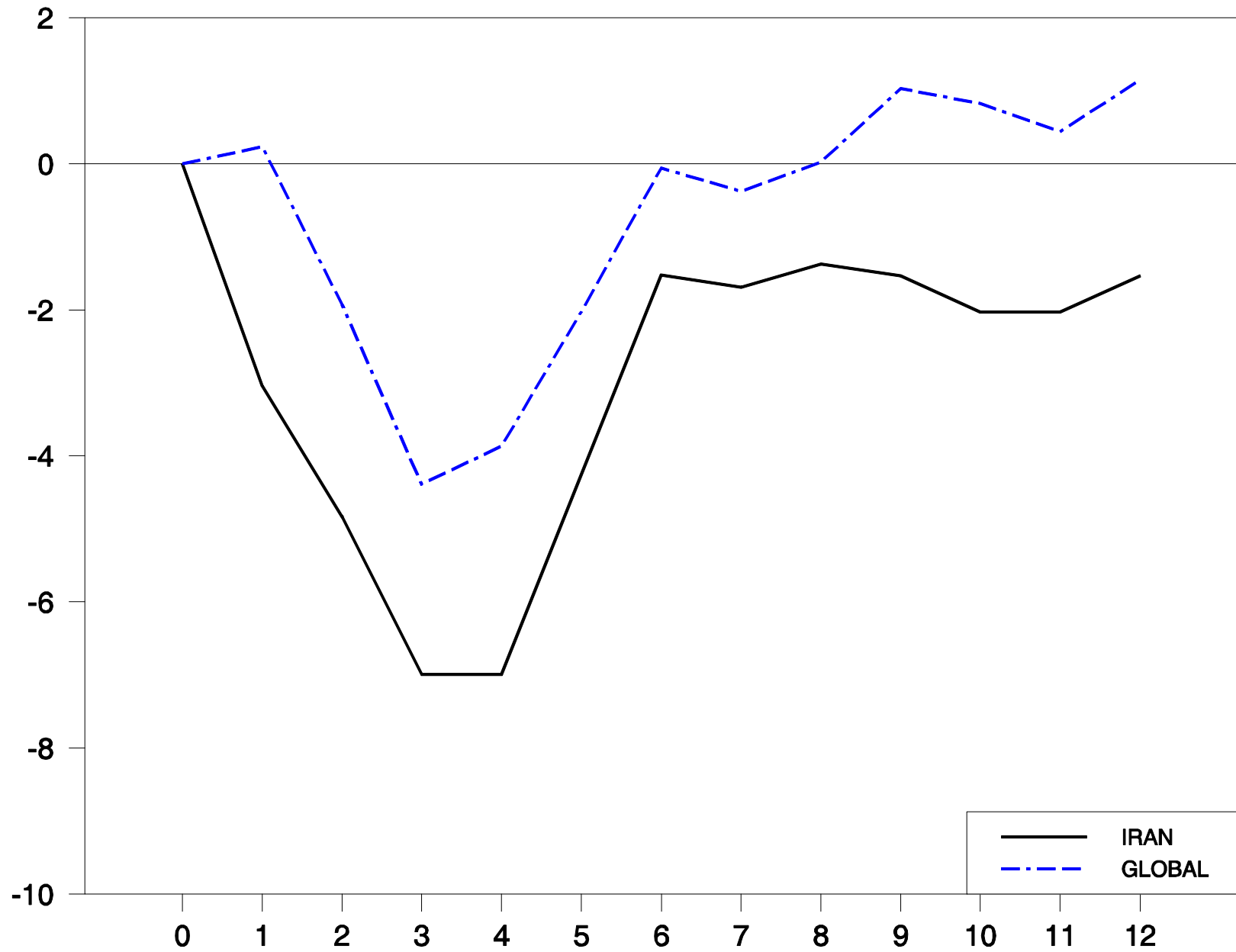


- If price of energy doubles and people buy the same quantity of energy as before, the expenditure share approximately doubles.
- Baqaee and Farhi (Econometrica 2019) develop calculations more appropriate for non-epsilon change.
- Bachmann et al. (2022) use their approach to conclude that a cut-off of energy imports from Russia would reduce German GDP by 0.5-3.0% depending on substitutability.^{.12}

Percent change in crude oil production from members of OAPETC (in black) and world total (in blue) after Sept. 1973



OAPETC embargo: Oil production after Sept 1973 Arab-Israeli War.



Iranian revolution: production after Oct 1978

Major historical oil supply disruptions were followed by recessions

Date	Event	Supply cut (local)	Supply cut (global)	Price Change	Recession Start
Nov 73	OAPEC embargo	7%	7%	51%	Dec 73
Nov 78	Iran revolution	7%	4%	57%	Feb 80
Oct 80	Iran-Iraq War	6%	4%	45%	Aug 81
Aug 90	Gulf War I	9%	6%	93%	Aug 90

- 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

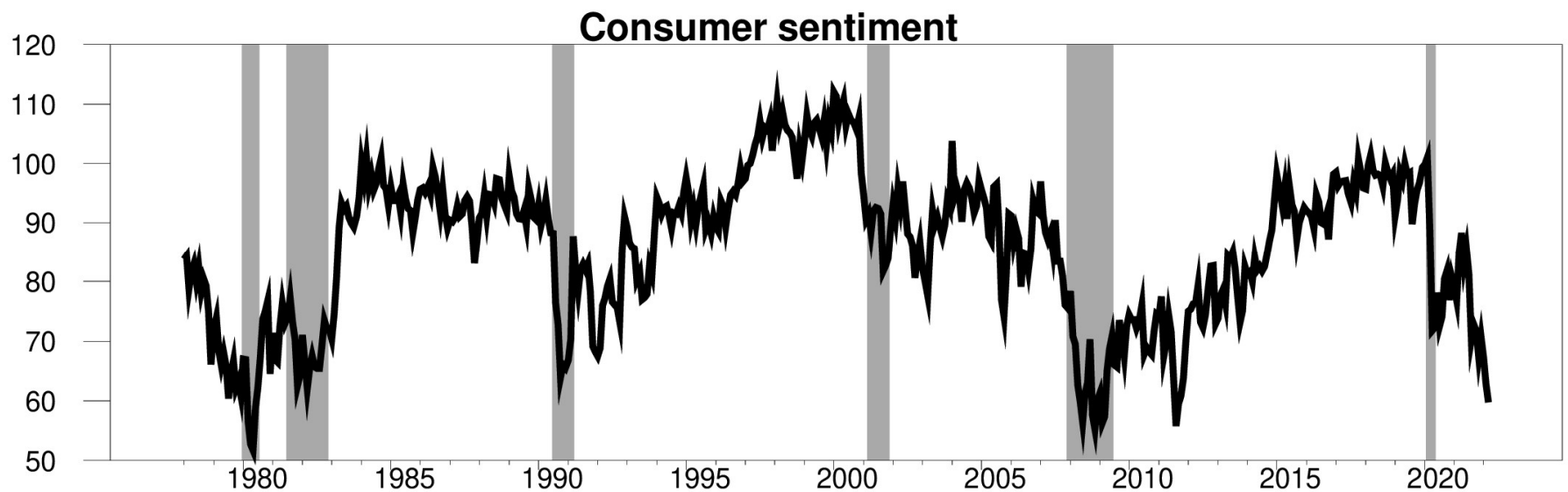
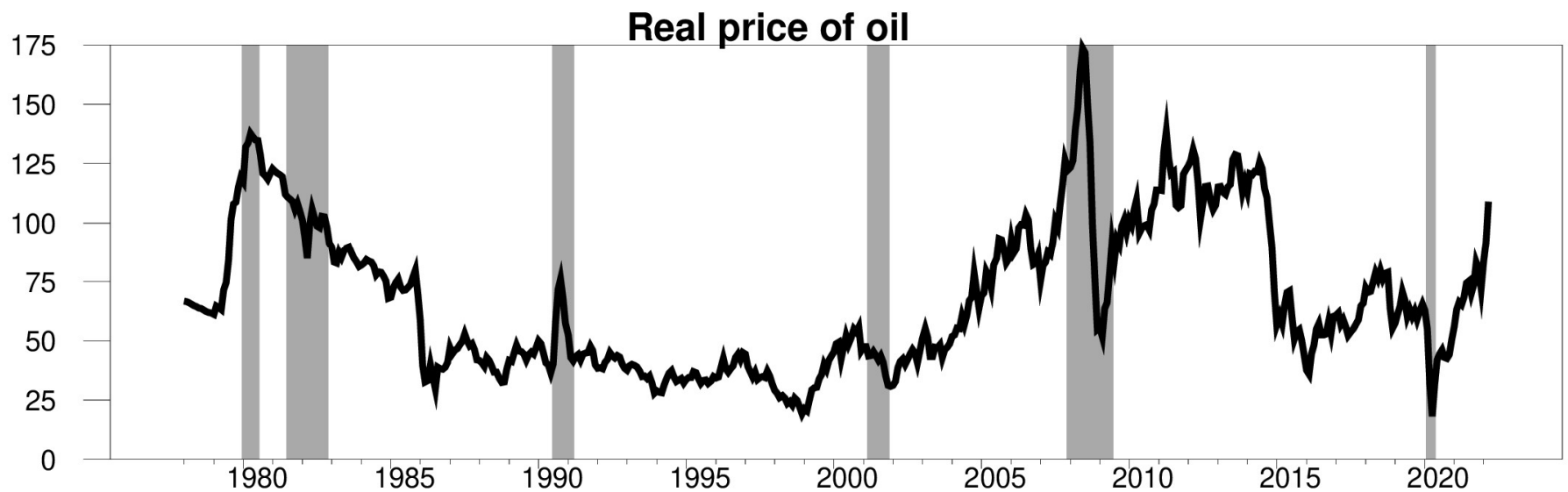
Period	Contribution of autos
1974:Q1-1975:Q1	-0.5%
1979:Q2-1980:Q2	-0.8%
1981:Q2-1982:Q2	-0.2%
1990:Q3-1991:Q3	-0.3%
2007:Q4-2008:Q4	-0.7%

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

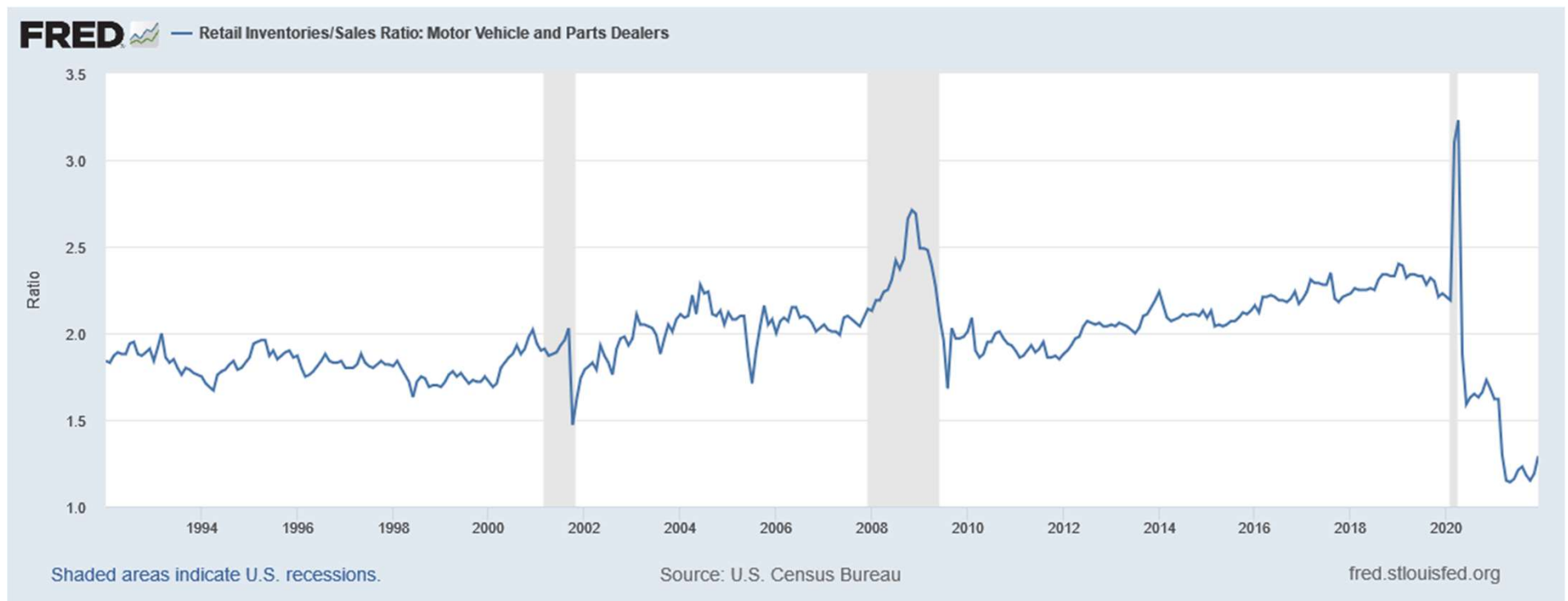
Consumers become more pessimistic when oil prices rise



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



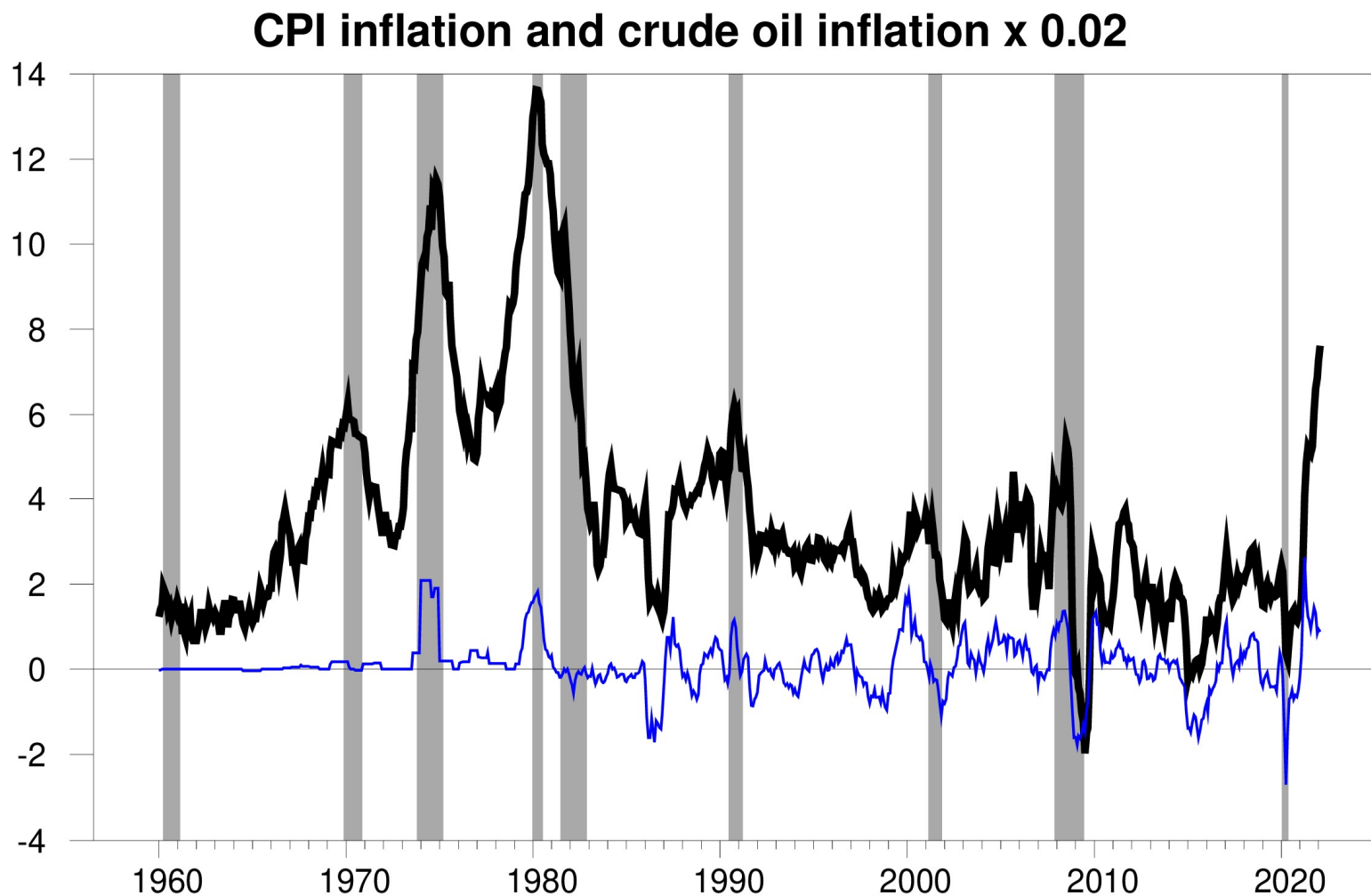
Effects on inflation

- 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

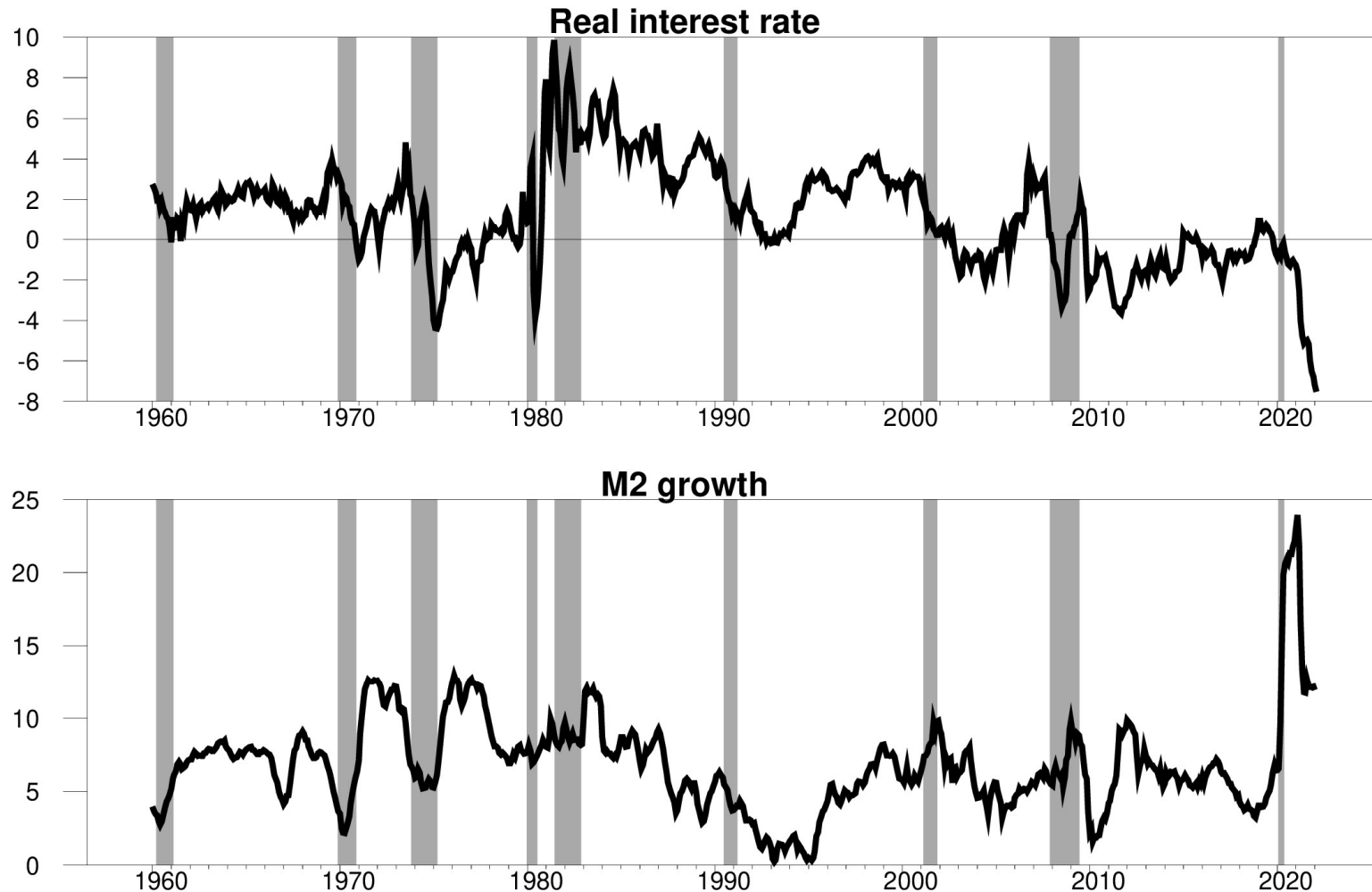
- If crude oil represents half the retail after-tax cost of refined product and these other costs are fixed, when price of oil goes up 10% the price of refined product goes up 5%.
- If no other prices change, we get the direct mechanical contribution to inflation by multiplying percentage change in nominal 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

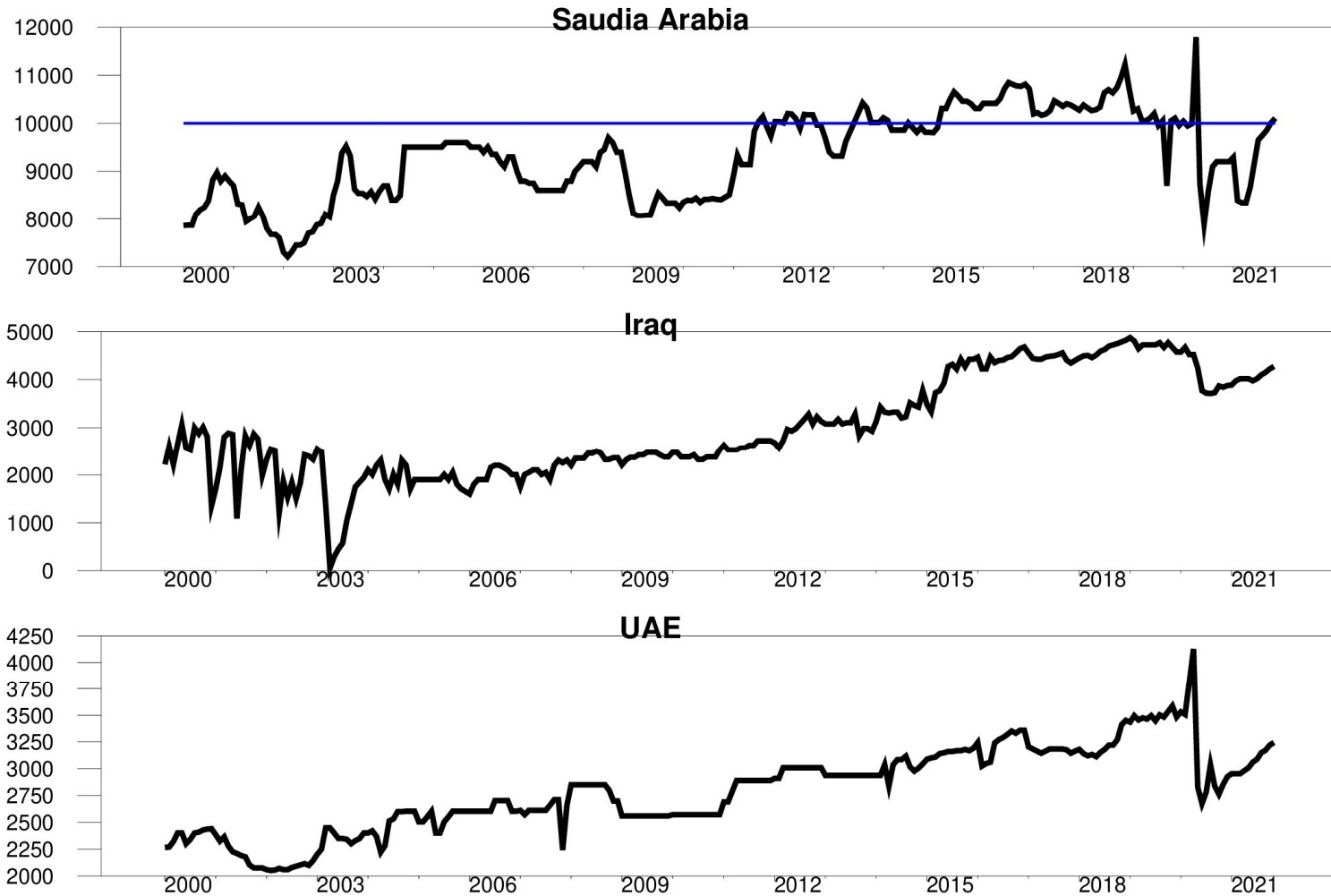
Price of oil boosted U.S. inflation by 2% in 1974, 1979, 2021



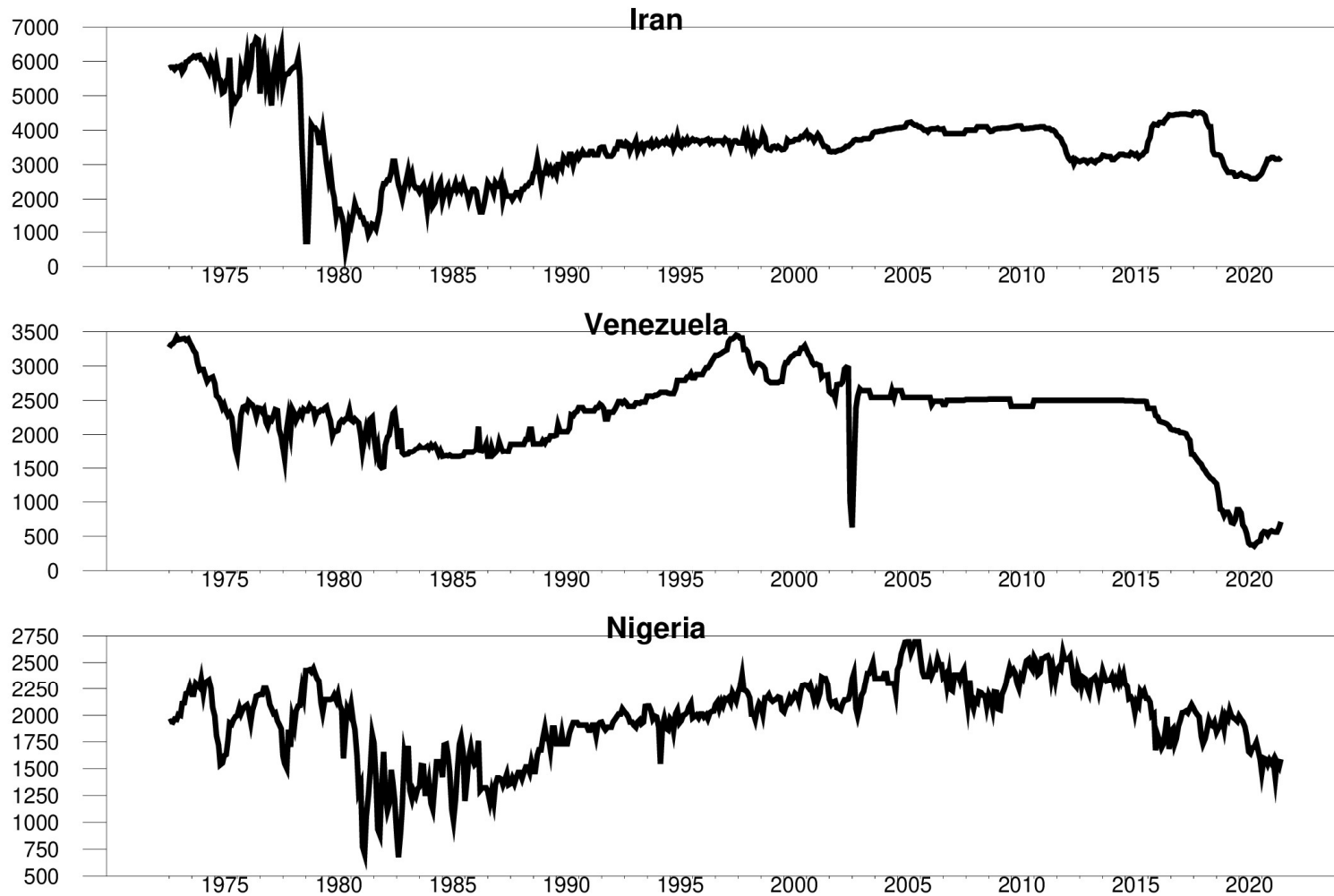
This can translate into sustained inflation from inflationary expectations and monetary policy



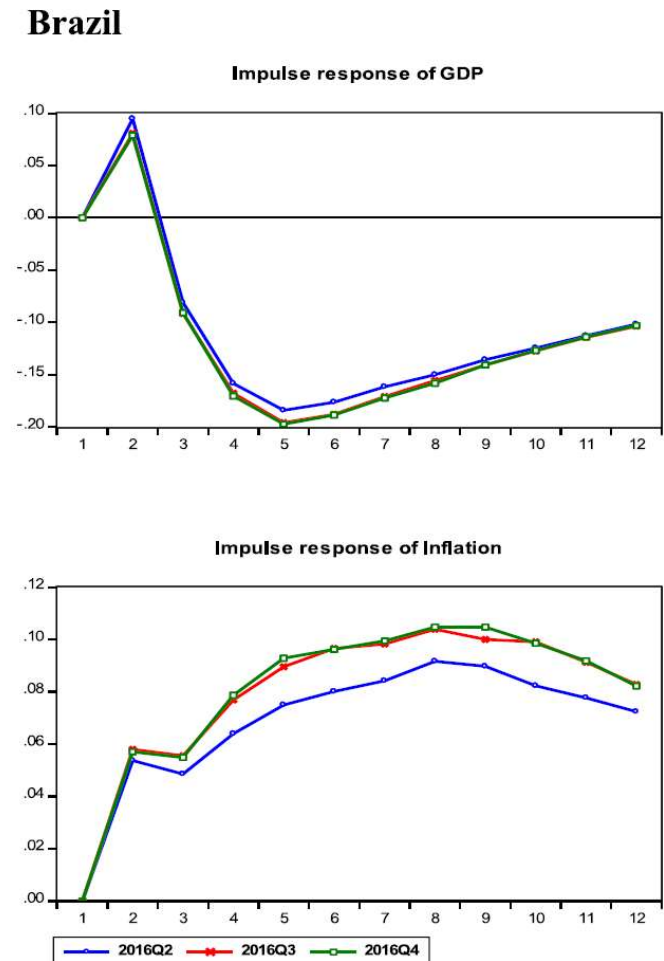
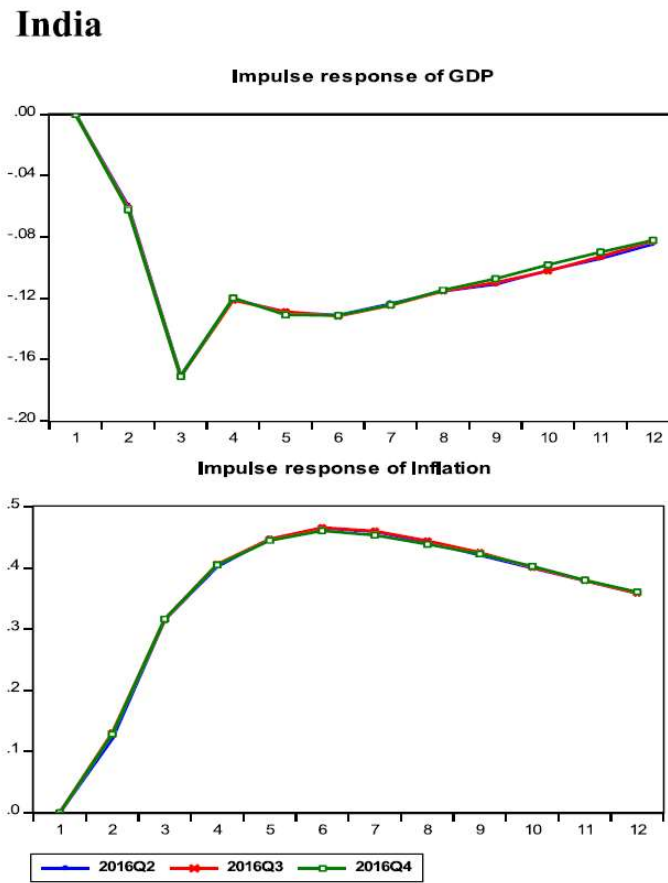
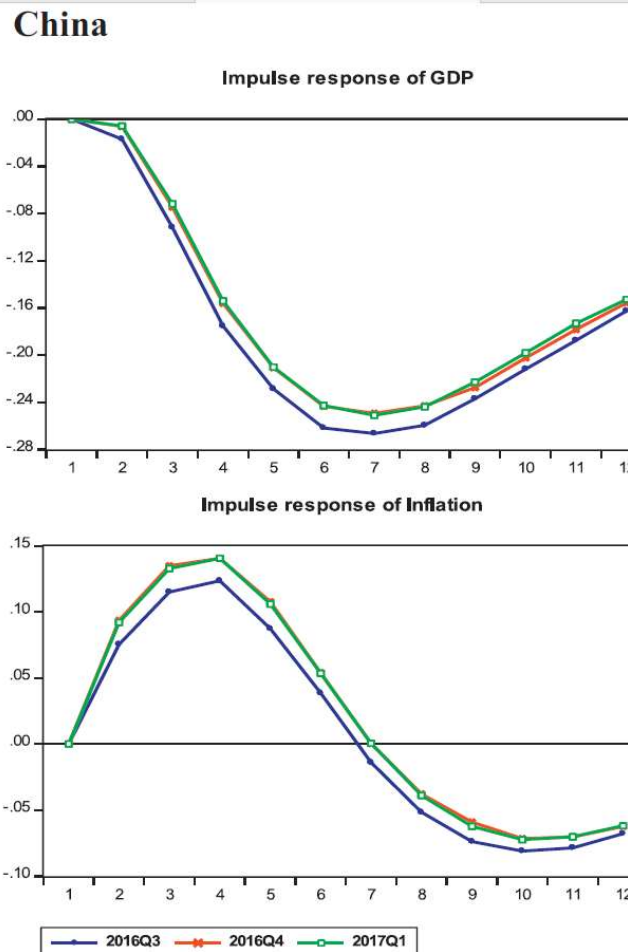
OPEC production is also 1 mb/d below its level at start of 2020



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.

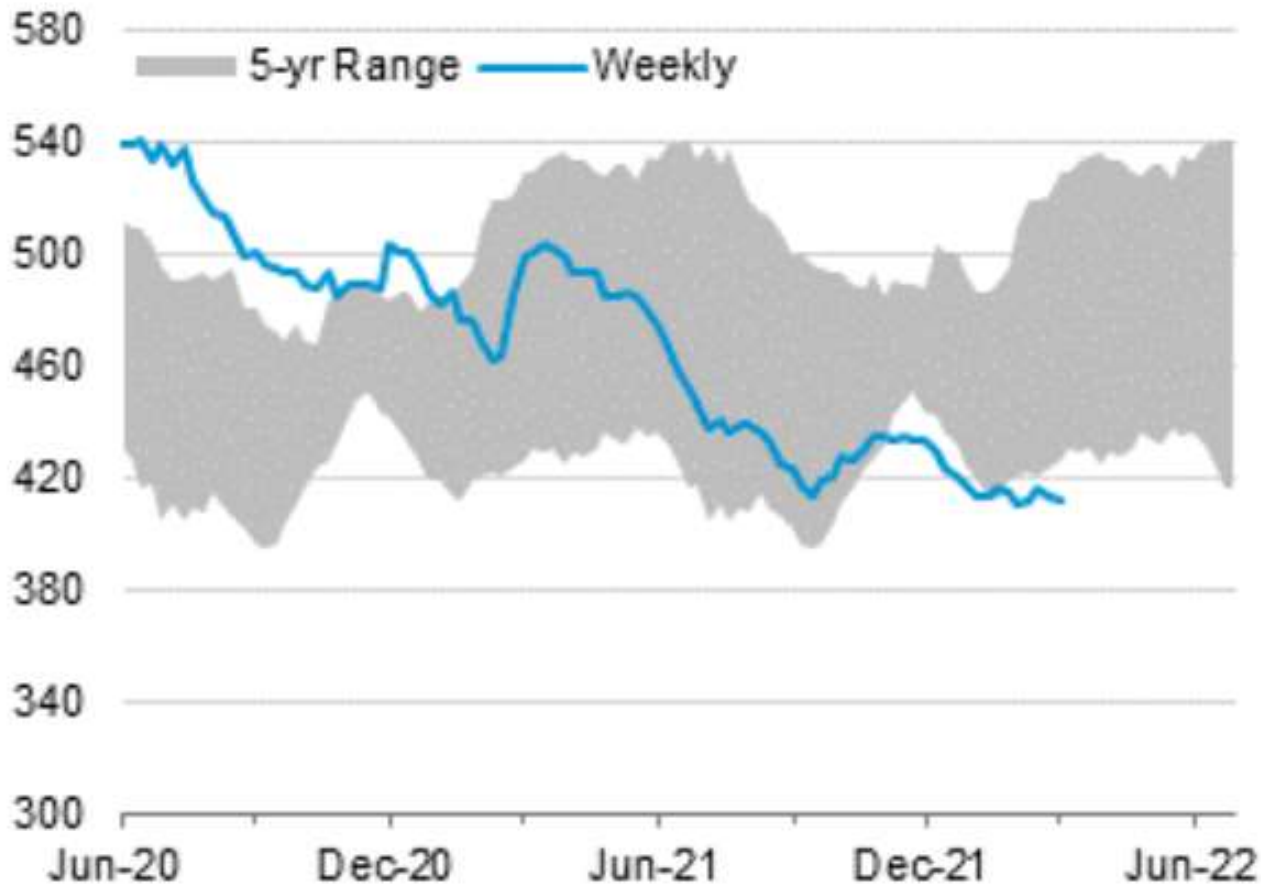
Consequences of non-energy sanctions for Russia

- 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



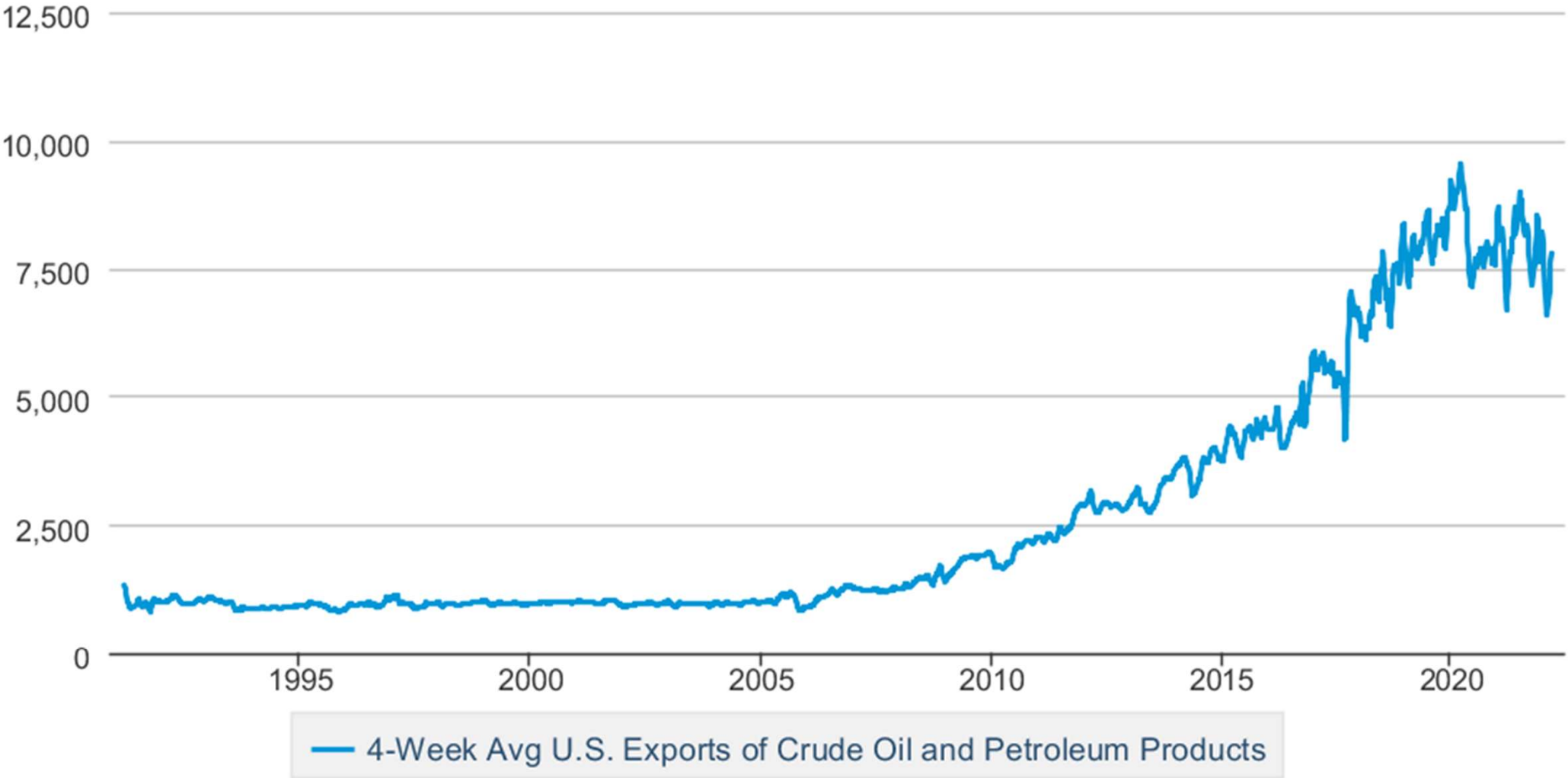
Source: U.S. Energy Information Administration

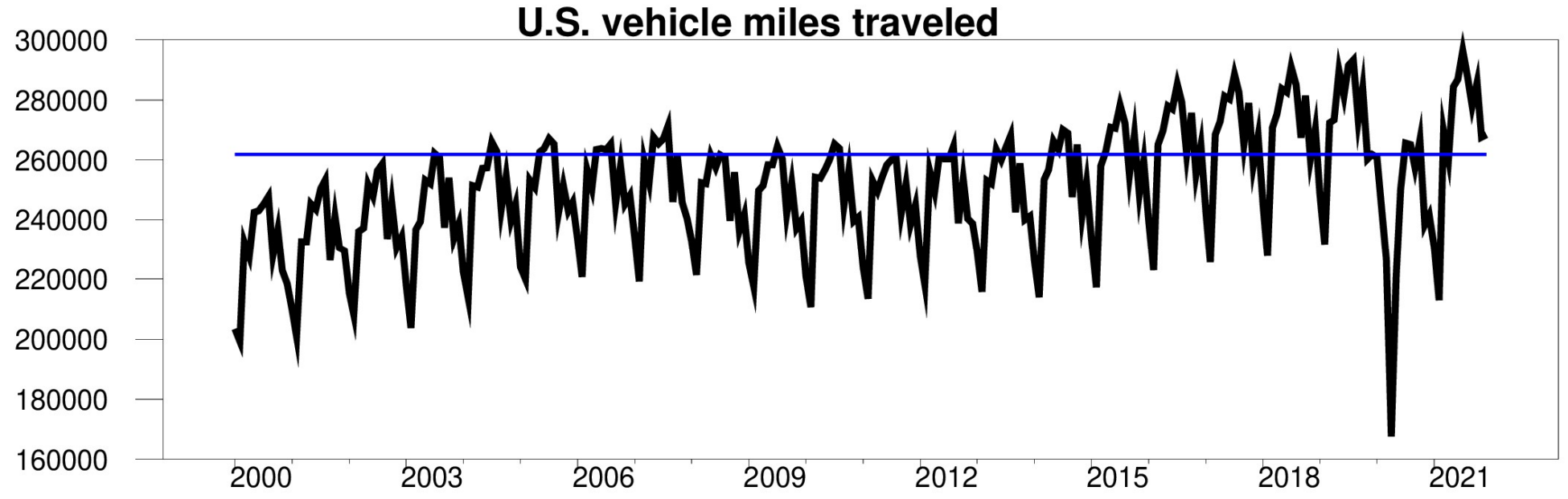
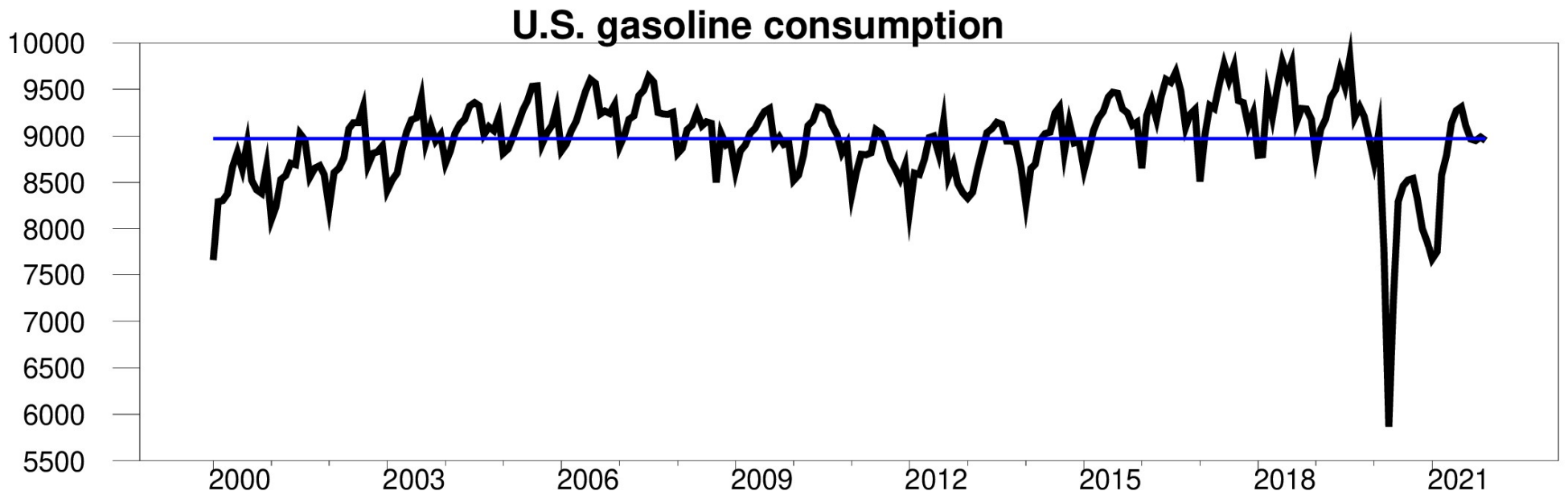
Stocks

Change from last

4-Week Avg U.S. Exports of Crude Oil and Petroleum Products

Thousand Barrels per Day

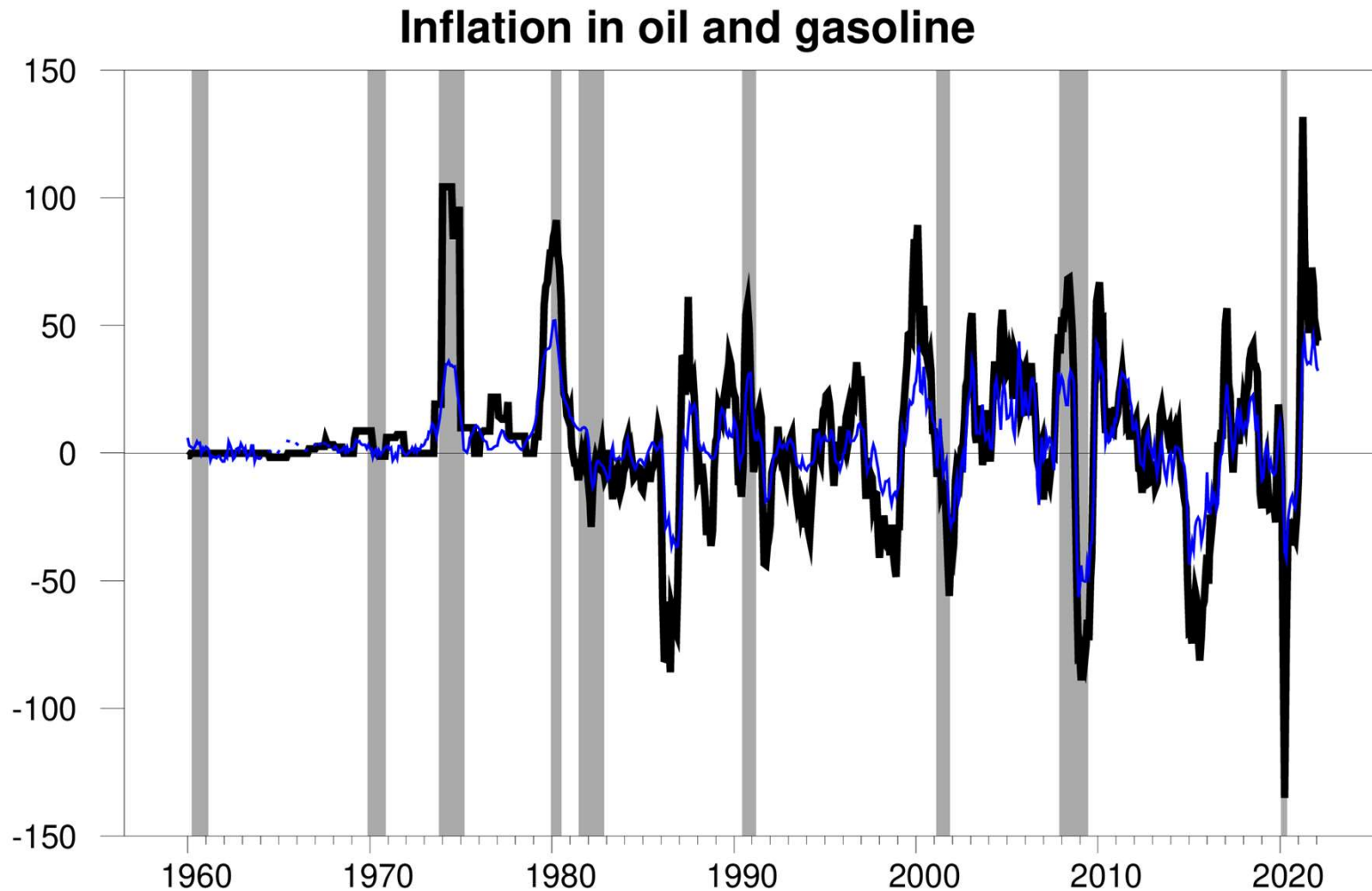


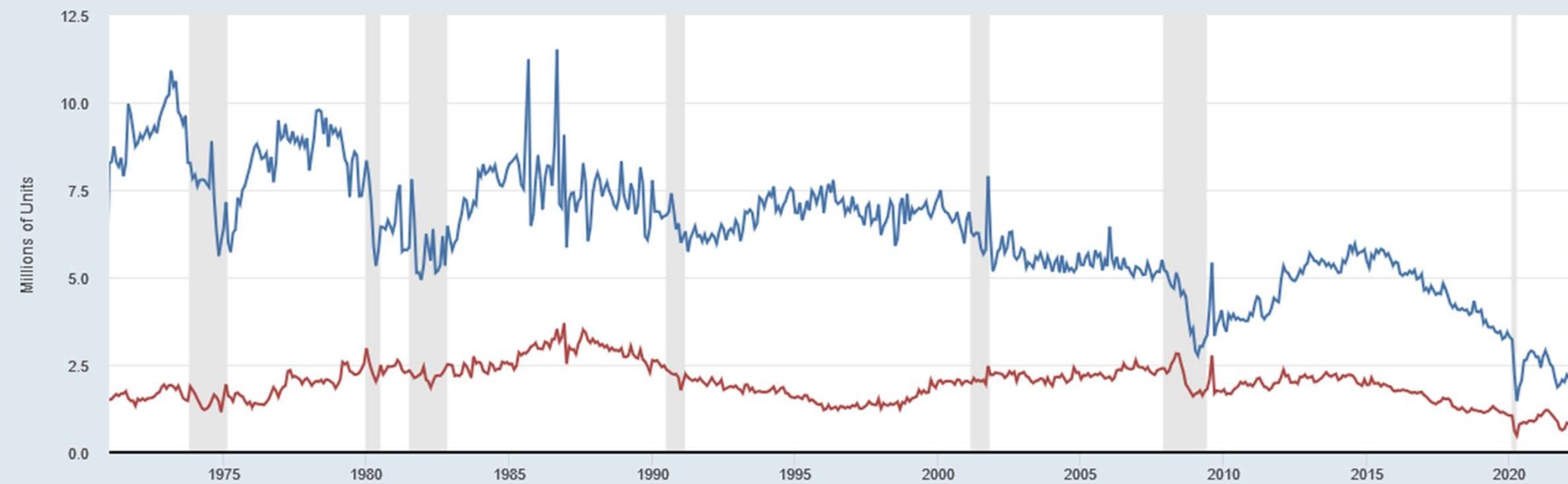


Weights in U.S. consumer price index (from <https://www.bls.gov/cpi/tables/relative-importance/2020.htm>)

- 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 $R^2 = 77\%$





Shaded areas indicate U.S. recessions.

Source: U.S. Bureau of Economic Analysis

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