

The Effect of Rising Energy Prices amid geopolitical developments and supply disruptions

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Crude oil price changes and recession fears

Hamilton (1983): All but one U.S. recession since World War II has been preceded by a dramatic increase in the price of crude oil...What now?



Source: FRED, Economic data, St.Louis FED

Plan of talk

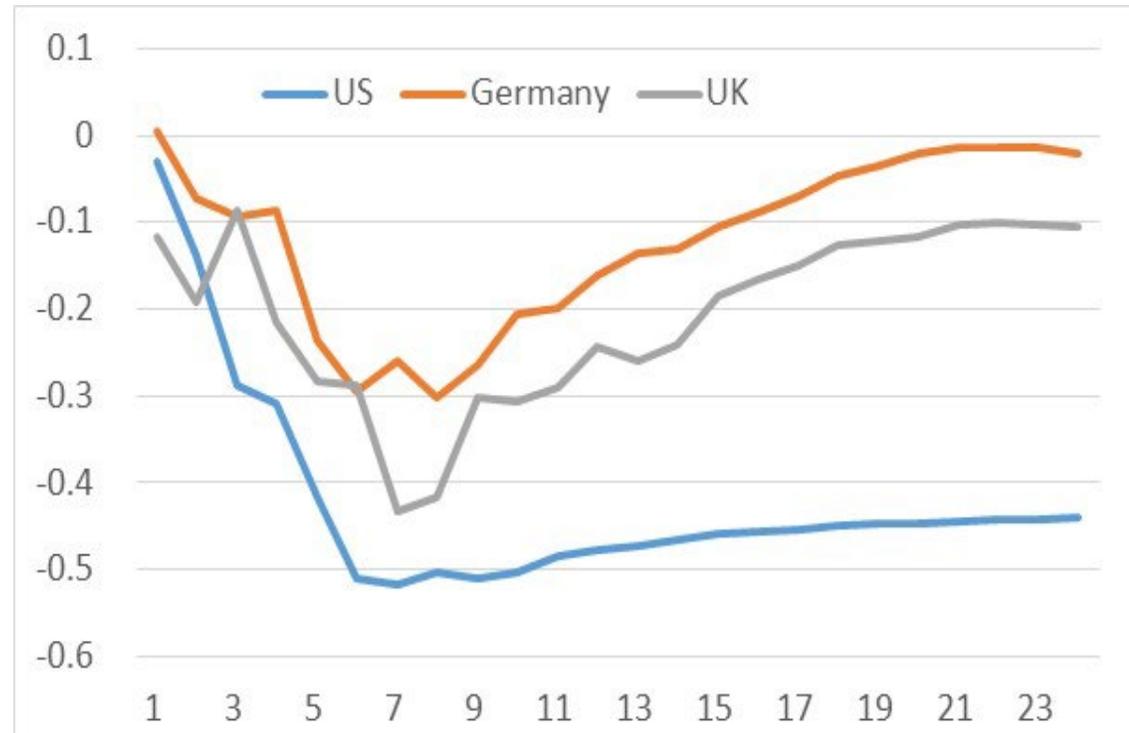
- I. The oil-macroeconomic relationship
- II. The role of inflation expectation in transmitting oil price shocks to inflation
- III. High oil price volatility exacerbates the adverse effects of oil price shocks
- IV. The oil price increase, its effect on Europe and implications for monetary policy

I. Oil price - macroeconomic relationship

- Since Hamilton (1983), a growing body of literature has predicted an inverse relationship between oil price changes and aggregate activity, i.e.
 - *Burbidge and Harrison (1984), Gisser and Goodwin (1986), Bjørnland (2000), Hamilton (1996, 2003, 2009), Barsky and Kilian (2002), Kilian (2009), Lippi and Nobili (2012), Kilian and Murphy (2012, 2014), Cashin, Mohaddes, Raissi, and Raissi (2014), Aastveit (2014), Aastveit, Bjørnland and Thorsrud (2015) and Stock and Watson (2016), Baumeister and Hamilton (2019), Caldara, Cavallo and Iacoviello (2019) and Kanzig (2021) ...*
- Higher energy prices lead to an increase in production costs and inflation, thereby reducing demand, as consumers/producers have to pay more for energy products
- But, disagreement as to magnitude of the relationship, i.e., role of monetary policy; Bernanke, Gertler, and Watson (1997) versus Hamilton and Herrera (2004)

a) Demand and supply shocks as a driver of oil prices

- Early papers focused on response of the macroeconomy to exogenous changes in the price of oil
- More recent papers model oil prices as an endogenous process
- Bjørnland (2000): First study that let oil prices and macro variables be jointly determined by demand and supply shocks, plus oil (specific) price shocks



Source: Bjørnland (2000)

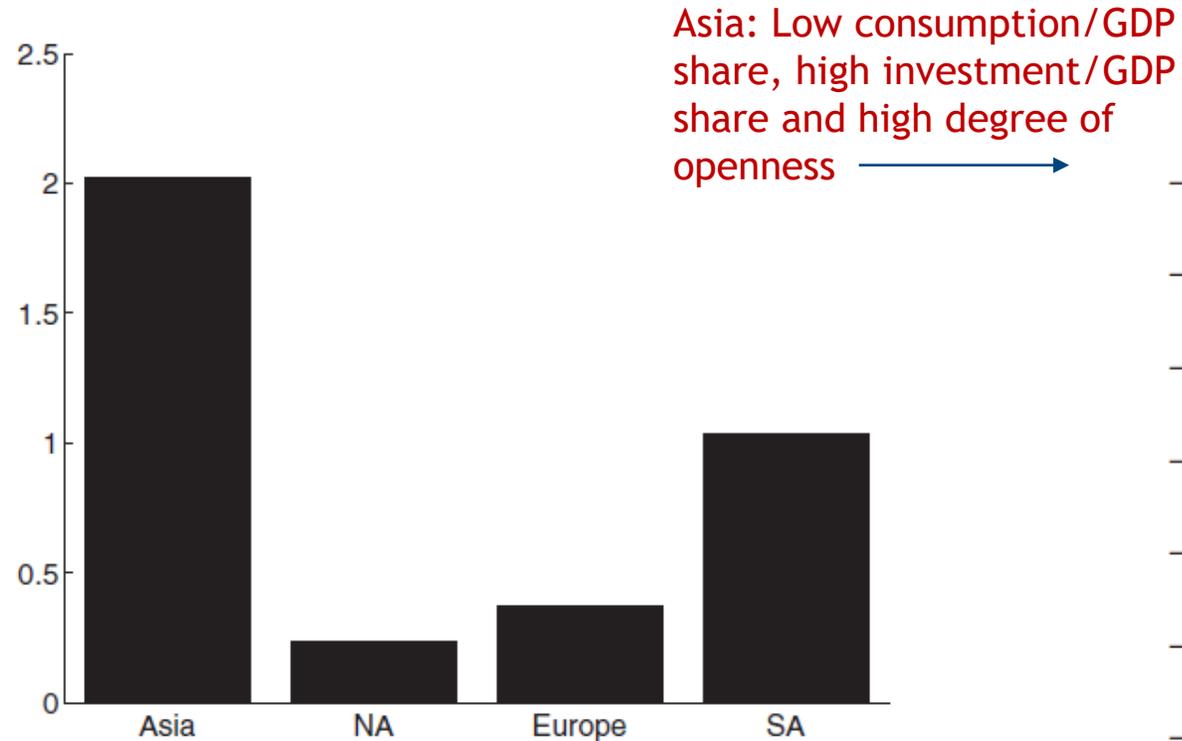
Note: The effect of an oil specific shock that increases oil prices with 14 pct. on impact

b) The role of the global economy

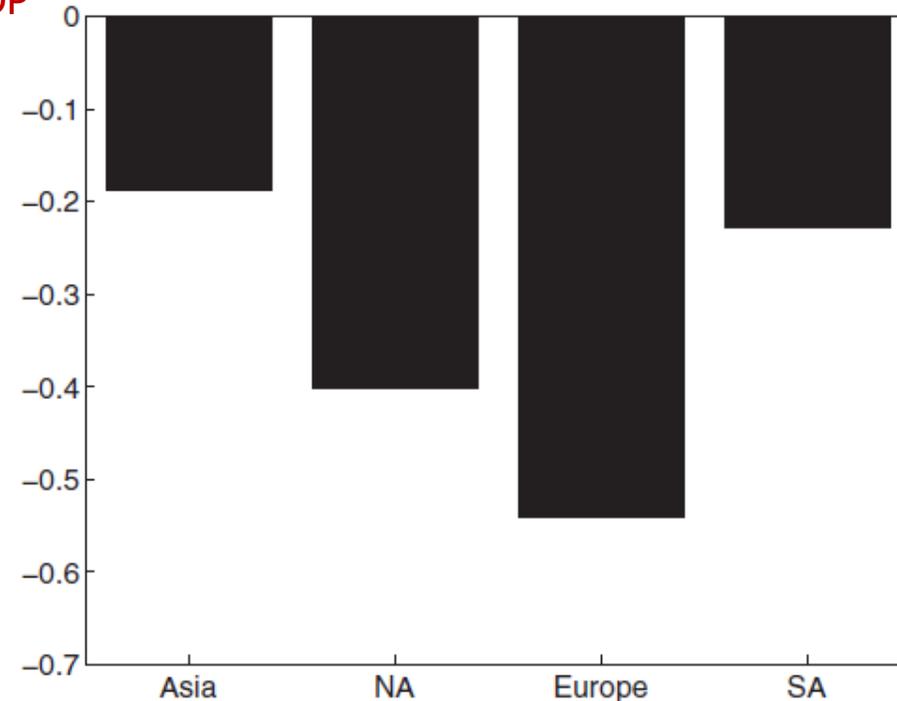
- Barsky and Kilian (2002): Reverse causality from global economy to the oil price
- Kilian (2009): The price of oil is driven by distinct global demand and supply shocks which can have very different effects on the oil price and macroeconomy
- During last decades, the global economic landscape has shifted dramatically. Emerging market economies have experienced rapid growth, outperforming developed countries
- Aastveit, Bjørnland and Thorsrud (2015): Implications of developed and emerging economies for oil market dynamics
 - Demand from emerging economies (i.e., Asia) more than twice as important as demand from developed countries in driving the real oil price
 - Geographical regions respond differently to adverse oil market shocks; Asia insignificant, versus Europe a strong negative response

Effect of two different oil market shocks on the level of GDP in different regions. Shocks are normalized to increase oil prices with 10%

Emerging demand shocks



Oil-specific shocks (scarcity of future oil supply)



Source: Aastveit, Bjørnland and Thorsrud (2015)

Note: The y-axis reports the median response at the 2-year horizon across countries within the same geographical region: Asia, Europe, North America (NA) and South America (SA).

C) The short run price elasticity and the importance of supply shocks

- Kilian (2009), Kilian and Murphy (2012, 2014) and many subsequent papers assume short run price elasticity of oil production to be zero, or small
- Baumeister and Hamilton (2019), Caldara, Cavallo and Iacoviello (2019) and Kanzig (2021) relax the strict assumption. Doing so they find supply shocks to be more important. I.e., **negative effects could be more severe**
- Higher short run price elasticity also supported by recent micro studies:
 - Shale oil producers respond positively and significantly to favourable oil price signals; Bjørnland, Nordvik, Rohrer (2021), Bornstein, Krusell, Rebelo (2021), Aastveit, Bjørnland, Gundersen (2022)
 - The increased flexibility among shale producers can potentially stabilize oil prices in the long run; Bornstein, Krusell, Rebelo (2021)

d) Energy exporters and importers - implications for Europe

- Oil exporters may benefit from higher oil prices through higher income, increased activity and spillovers to other industries, i.e.,
 - Peersman and Van Robays (2012), Bjørnland and Thorsrud (2016), Arezki, Ramey, Sheng (2016) and Bjørnland, Thorsrud, Torvik (2019)
- US has gained momentum as oil and gas producer due to shale oil boom
 - Positive local spillover to non-oil employment and income; Allcott and Keniston (2018)
 - Positive spillovers to other industries and states; Bjørnland and Skretting (2022)
 - Higher oil prices no longer bad news to the US economy
- Still, little to suggest the real effects from US's shale oil boom will spill over to European countries, as the direct trade linkages are likely to have a modest impact on activity.
- But shale oil revolution might be beneficial to oil importers by supporting non-OPEC supply growth and thus, mitigating oil price volatility (Bornstein, Krusell, Rebelo, 2021)

II. The role of inflation expectations as transmitters of oil price shocks to inflation

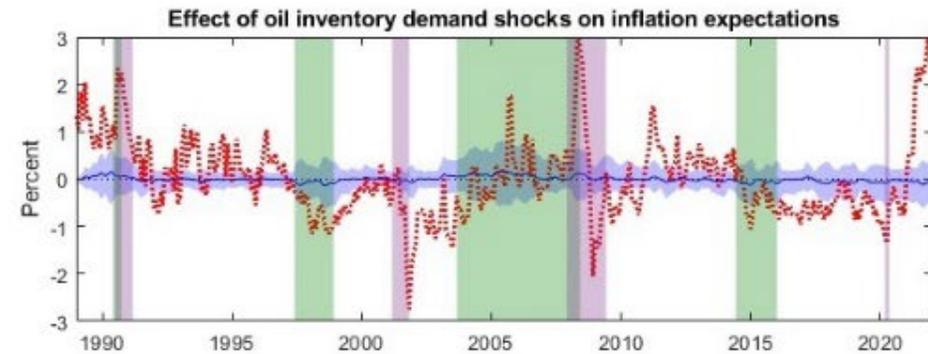
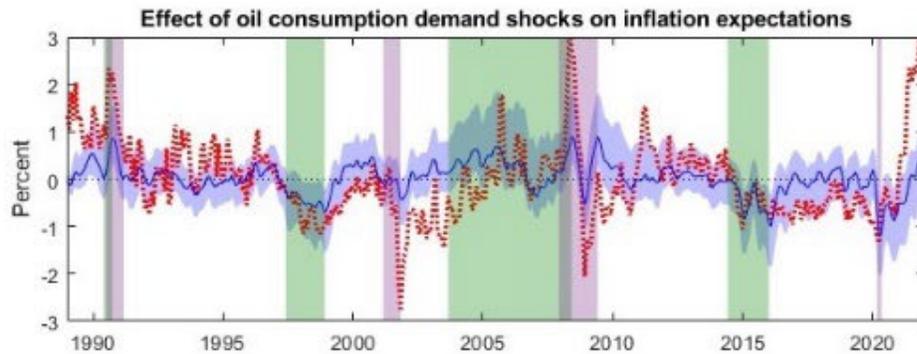
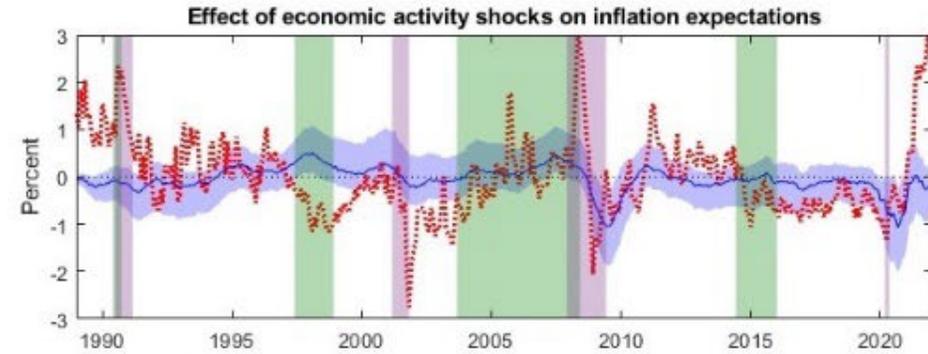
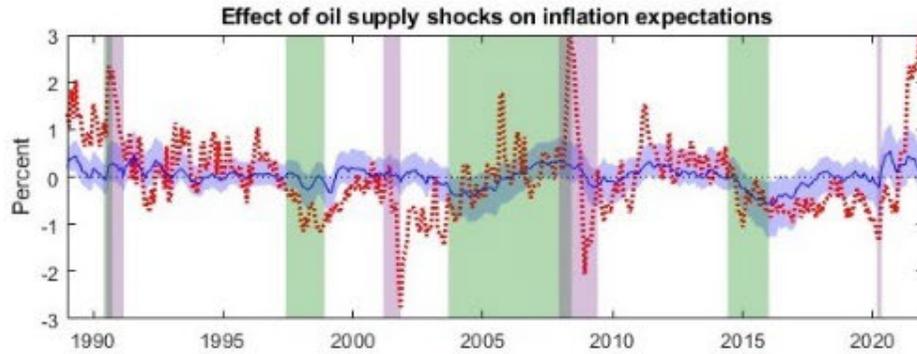
- Expected and actual inflation are sensitive to oil price shocks. Two mechanisms for oil price pass-through to actual inflation: Direct cost channel or indirect expectations channel
- Empirical strength of indirect channel is debated
 - Coibion and Gorodnichenko (2015): High sensitivity of household's inflation expectations to oil prices can help explain the missing deflation puzzle of the Great Recession
 - Blanchard and Gali (2007) and Wong (2015) suggest that this mechanism is weak at best, and may have altogether disappeared since the 1990s.
- Aastveit, Bjørnland and Cross (2022) question whether inflation expectations and any associated oil price pass-through depends on demand and supply conditions underlying the global market for crude oil.
- Households may form their expectations of inflation differently when faced with long sustained increases in the oil compared to short and sharp price increases.

Key findings

1. Inflation expectations (one-year ahead) are sensitive to oil price shocks, but degree of sensitivity depends on the underlying source of oil market shock.
2. Demand for oil associated with unexpected large global economic activity shocks, such as the early millennium oil price surge of 2003-08, elicits a persistent response in both expected and actual inflation
3. In contrast, when the economy is hit by brief shocks to oil prices due to supply etc., both expected and actual inflation initially increase but then gradually revert back to zero

This suggests that the way in which households form their expectations differs depending on the type of oil price shock underlying the global market for crude oil, or more precisely, the persistent effect of the shock

Oil price shocks have increased inflation expectations recently

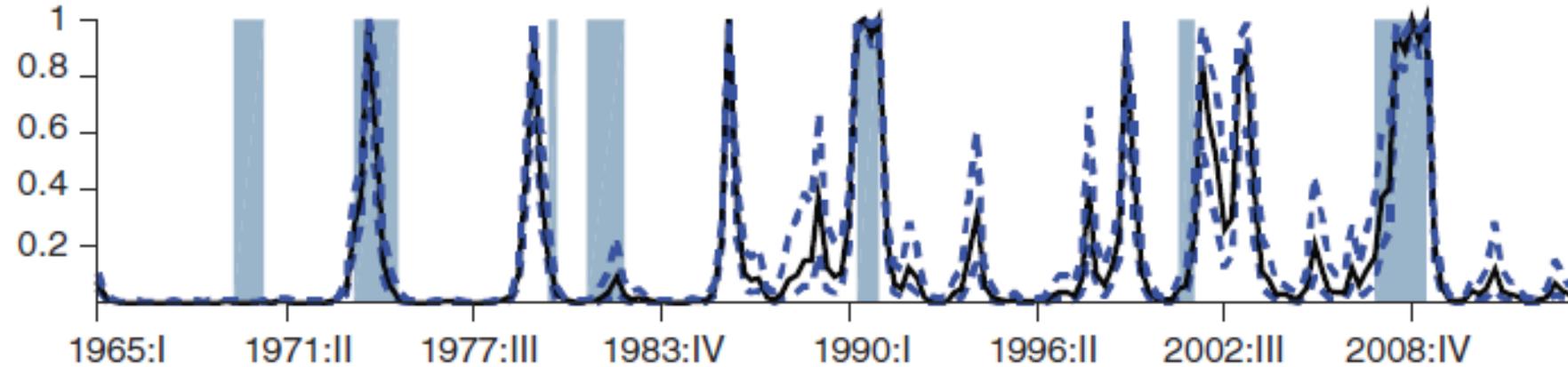


Source: Aastveit, Bjørnland and Cross (2022) and updated calculations

III. High oil price volatility and time-varying changes

- There is a growing literature focusing primarily on the time-varying changes in the response to oil price changes, i.e.,
 - Mork (1989), Hamilton (1996, 2003, 2011), Baumeister and Peersman (2013a,b), Bjørnland, Larsen and Maih (2018) ...
- Bjørnland, Larsen and Maih (2018): Analyse different regimes of high and low oil prices volatility using a New Keynesian model with regime switching.
- To what extent does these periods coincide with period of the great moderation, i.e., the period of more stable macroeconomic environment since the mid-1980s?

Panel B. High oil price volatility



Note: Probability of high oil price volatility

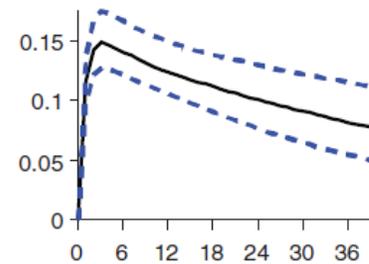
- No evidence of decline in oil price volatility coinciding with Great Moderation, but short periods of heightened oil price volatility throughout, many preceding NBER recessions (shaded area)
- High oil price volatility exacerbate the effect of oil price shocks

Source: Bjørnland, Larsen and Maih (2018)

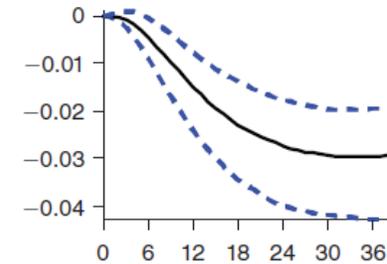
Impulse responses to a generalized oil price shock

- A standard deviation shock to oil price (15 percent) lowers US GDP by 0.4-0.5 pct. within 2 years
- Profit, capital accumulation and investment by firms falls, and eventually household consumption
- Substitution of labor, increase in use of labor that push up wage growth and inflation by 0.2-0.3 pp. Motivates an increase in interest rates by 0.1 pp.

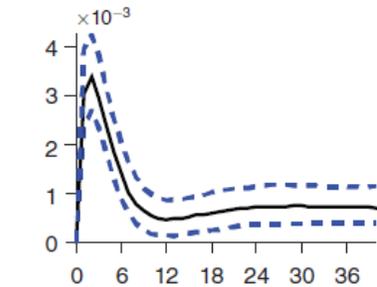
Panel A. Price of oil



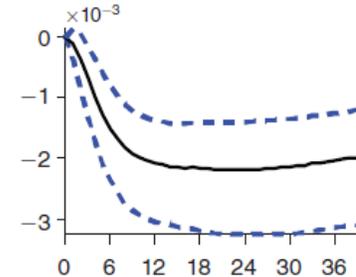
Panel B. Capital



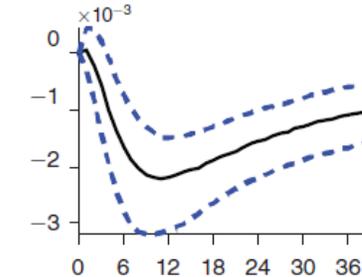
Panel C. Labor



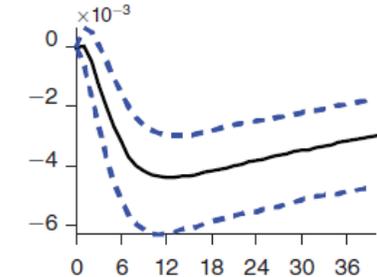
Panel D. Aggregate cons.



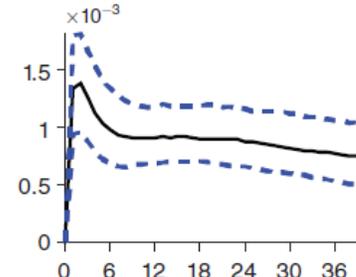
Panel E. Investment



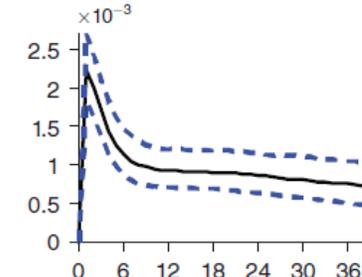
Panel F. Output



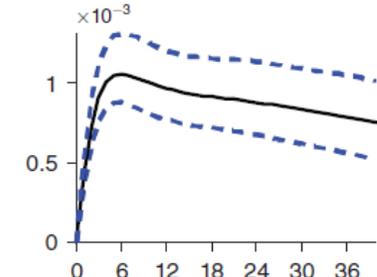
Panel G. Wage inflation



Panel H. Inflation



Panel I. Interest rate



Oil price volatility and the role of monetary policy

1. An independent role for oil price shocks in the past and present recessions, i.e., recessions not only due the Federal Reserve's contractionary response to inflationary concerns
 2. The negative effect on output of an oil price shock is magnified when the policymakers are in the high policy response (hawkish) regimes, while the variance in inflation is magnified in the dovish regimes
 3. Still, there is a substantial share of variance in inflation explained by the oil price shocks in the hawkish regime when oil price volatility is high.
- This suggests that during periods of high oil price volatility, stabilizing inflation is difficult

The importance of oil price shock; High versus low volatility

TABLE 2—VARIANCE DECOMPOSITION—CONTRIBUTION OF OIL PRICE SHOCKS

<i>Variable \ Horizon</i>		1	4	8	20
GDP growth	Regime 7	0.06	0.70	1.20	1.20
	Regime 5	0.82	8.50	13.00	14.00
CPI-inflation	Regime 7	14.00	12.00	12.00	13.00
	Regime 5	68.00	65.00	63.00	67.00
Wage-inflation	Regime 7	3.30	2.70	2.50	3.60
	Regime 5	31.00	27.00	26.00	33.00
Interest rate	Regime 7	1.00	5.90	10.00	15.00
	Regime 5	12.00	45.00	61.00	70.00

Source: Bjørnland, Larsen and Maih (2018)

Notes: For each variable, top row (Regime 7) shows the variance explained when the economy is in a regime of low oil price volatility and hawkish policy, while bottom row (Regime 5) shows the variance explained when the economy is in regime of high oil price volatility and hawkish policy

Conclusions so far

1. The effect of higher oil prices depends on sources of shocks and geography. European countries are among the most negatively affected globally by adverse oil market shocks
2. Shale oil revolution might be beneficial to net oil importers by supporting non-OPEC supply growth and thus, mitigating oil price volatility
3. Inflation expectations and associated pass-through of oil price shocks depend on demand and supply conditions in the global oil market. Economic activity (demand) shocks have a significant long lasting effect on inflation expectations and actual inflation
4. High oil price volatility can exacerbate the effect of oil price shocks. An independent role for oil price shocks in the past and present recessions, (i.e., not only Fed's response)
5. A substantial share of variance in inflation explained by the oil price shocks even though monetary policy is 'hawkish'. During periods of high oil price volatility, stabilizing inflation is difficult (implications for policy)

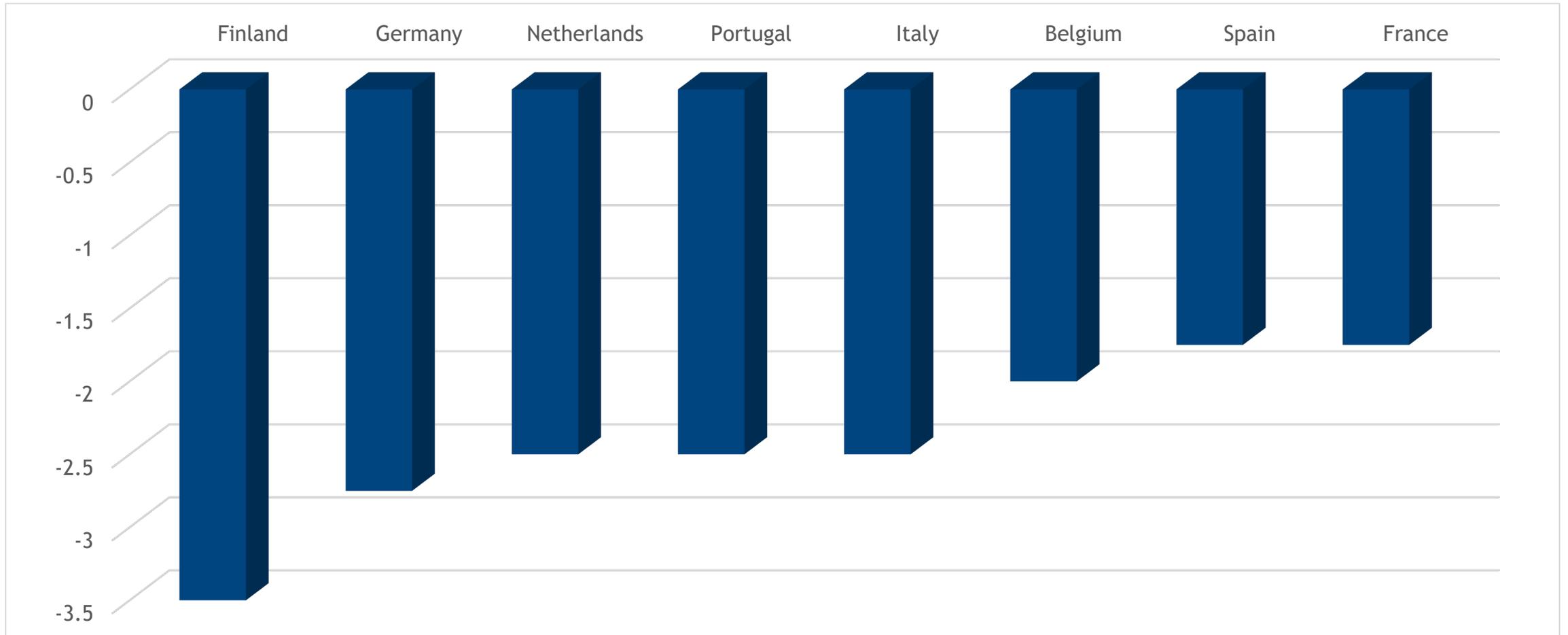
IV. The oil price increase, its effect on Europe and implications for monetary policy



Drivers of the commodity price and its effect

1. Initial plunge in oil prices spring 2020 as the pandemic hit, followed by gradual increase in 2020/2021 as demand for oil increased due to higher growth
2. Geopolitical tensions and subsequent Russian invasion of Ukraine push oil prices up from fall 2021 (by 50 pct.) and volatility has also increased
3. Supply is constrained due to lack of investment, little spare capacity and long lags (except shale producers) between investment and production. Push for diverting capital investment from oil and gas towards green investments
4. Other commodity prices are on the rise - effects on growth and inflation

The effect of 50 pct. increase in oil prices, due to oil specific shocks (precautionary demand) Percentage change in GDP

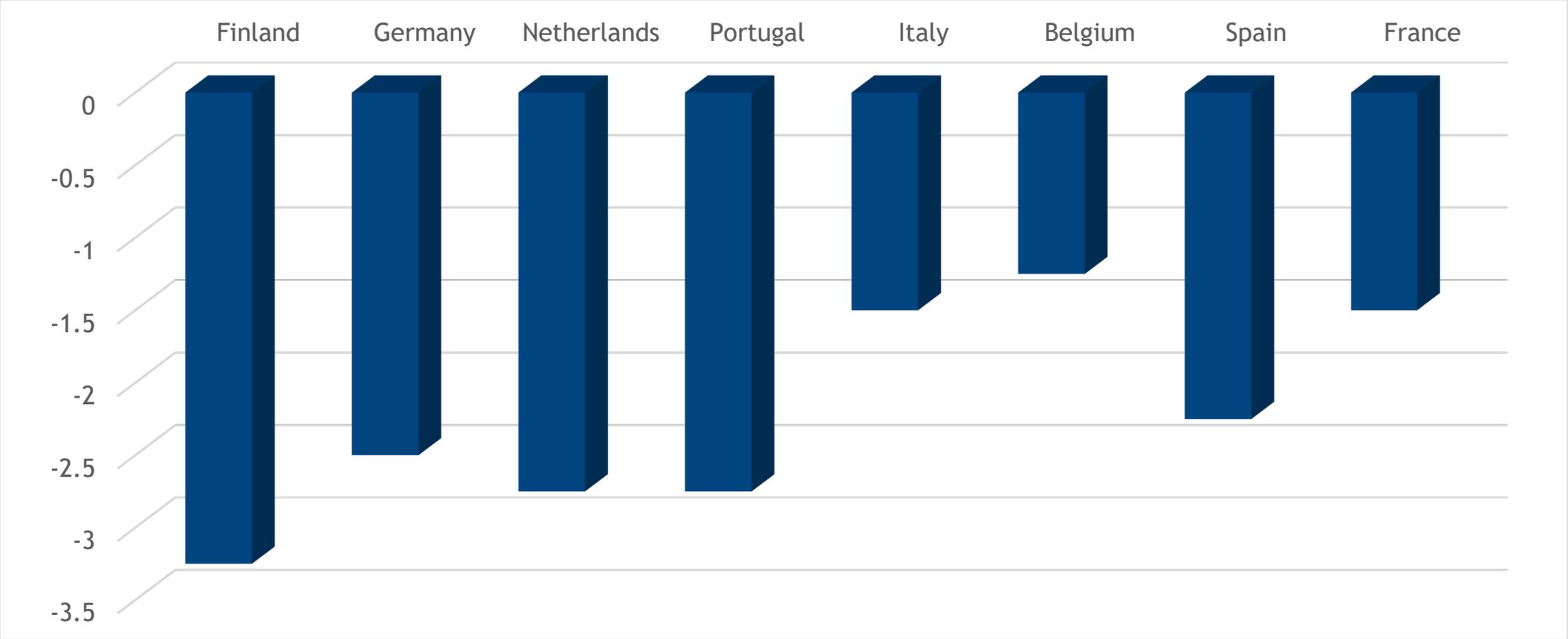


Source: Aastveit, Bjørnland and Thorsrud (2015)

Note: An oil specific shock (precautionary demand due to fear of scarcity of supply)

The effect of 50 pct. increase in oil prices, due to oil supply shocks

Percentage change in GDP



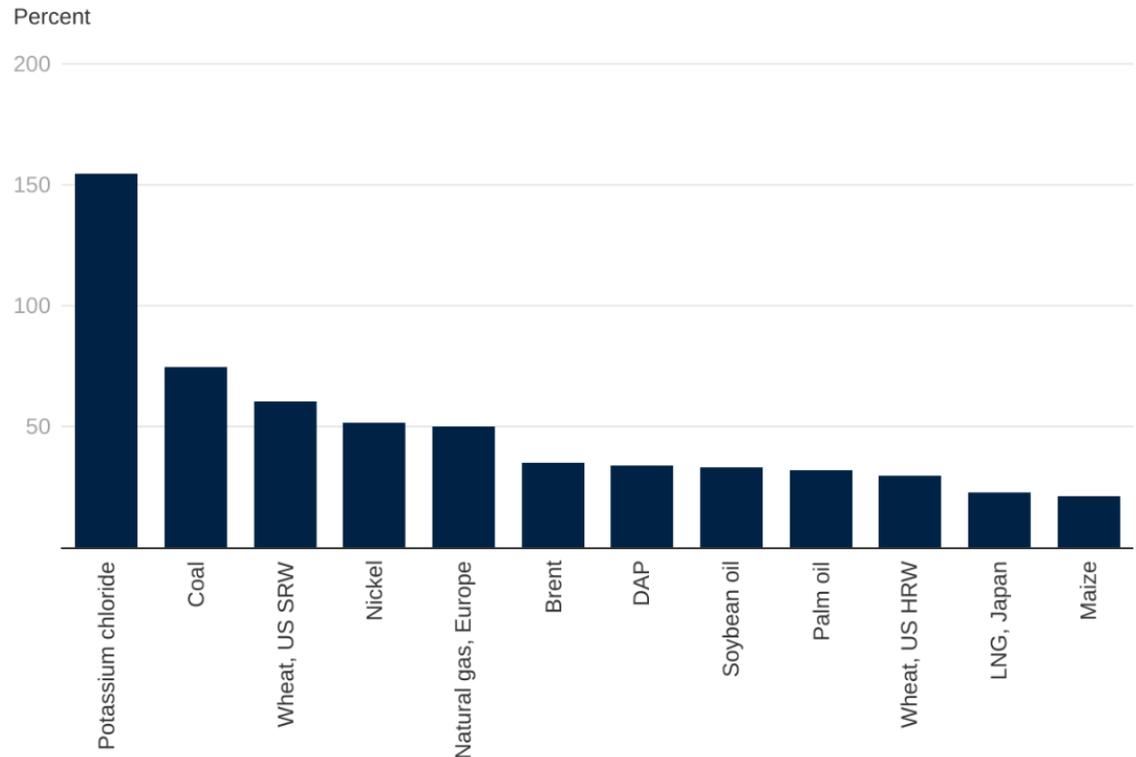
Source: Aastveit, Bjørnland and Thorsrud (2015)

Note: The effect of oil supply shocks on oil prices are gradual, max effect after 2 years

Commodity prices and effects on growth and inflation

- Peersman (2022): Exogenous shifts in international food commodity prices can explain 30% of euro-area inflation volatility over the medium term.
- Direct transmission channel through the food production chain, but also indirect effects via depreciation of the euro and, rising wages
- Differences of the effects across member states depend on wage responses and importer/exporter

Commodity price changes in 2022



Note: Three-month change in commodity prices through end March 2022. LNG stands for liquefied natural gas.
Source: World Bank

Effects on growth and inflation in Europe

- Increase in energy prices; adjustments from decline during the pandemic (small effects in isolation) + supply disruptions/fear of scarcity of supply (large effects) will erode growth in Europe and increase inflation. High volatility exacerbates the effect
- High and volatile (food) commodity prices pose further risks to the economic recovery and inflation in Europe. Modest growth boost for commodity exporters, will only partly offset the output losses of commodity importers (Peersman, 2022, Igan et al., 2022)
- With a multiple of commodity prices on a persistent rise, I believe probability of a recession scenario for Europe has increased substantially
- Stagflation of the 1970s? Shocks have been smaller than the 1970s oil shocks, but involve more commodities and are more persistent. Yet, more credible policy frameworks and nominal anchors, make stagflation less likely. Hinges on swift response of monetary policy.

Implications for monetary policy

- Short term inflation expectations and inflation are on the rise, while probability of recession has increased
 - Importance of monetary policy for stabilizing long term inflation expectations requires swift actions from policy makers now to prevent wage-inflation spiral building up
 - Yet, during periods of high oil price volatility, stabilizing inflation is difficult, and the cost on growth and employment may be severe
- The combined adverse effect of higher commodity prices on growth (and asset prices, c.f., Bjørnland and Leitemo, 2009) and elevated inflation, suggests policy makers should be balanced in their response going forward

Thank you!

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