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Estimating the effects of oil price shocks on the Danish economy

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Abstract

This paper studies how changes in oil prices affect the Danish economy. To study the effects, I use recent identification design developed by Känzig (2021) where high-frequency financial data around OPEC announcements are exploited. The identified oil news shocks are incorporated into a local projection framework to estimate the dynamic response of Danish macroeconomic variables. In contrast to previous studies, I find that the Danish economy is vulnerable towards rises in oil prices. A 10 percent increase in oil prices reduces real GDP by around 0.8 percent after roughly two years. Private consumption declines by about 0.7 percent, while investment falls more strongly by approximately 2.5 percent. The labour market deteriorates as employment falls and the unemployment rate rises by roughly 0.25 percentage points. Inflation increases temporarily, peaking at about 0.3 percent within the first year before gradually returning to baseline. Overall, the results suggest that oil price increases generate a temporary stagflationary episode in the Danish economy characterised by higher inflation and lower economic activity.

1 Introduction

The macroeconomic effects of oil price fluctuations have been widely studied in the past four decades (see e.g. Hamilton (1983) and Baumeister and Kilian (2016)). Understanding how oil price changes transmit to inflation and real economic activity is particularly important because oil prices are highly volatile and affect both production costs and household purchasing power. A central question in the literature is whether increases in oil prices generate stagflationary effects, characterised by rising inflation and declining economic activity. Recent turbulence in global energy markets has renewed interest in how oil price shocks affect advanced economies.

In this paper, I revisit the question of how changes in oil prices affect the Danish economy. Theoretically, an increase in oil prices affects the economy through several channels. First, firms face higher energy costs, which raise production costs and may reduce output. Second, higher oil prices can increase inflation expectations and consumer prices. Third, workers may demand higher nominal wages in response to rising energy costs, potentially reinforcing inflationary pressures (Conflitti and Luciani (2019)).

Despite these mechanisms, previous studies generally find that energy and commodity price shocks have only modest and short-lived effects on the Danish economy (Spange (2011)), and that oil price shocks in particular generate relatively muted macroeconomic responses (Kronborg (2021)).

In this paper I show that this conclusion changes when oil price shocks are identified using recent high-frequency methods. Specifically, I employ the identification strategy proposed by Känzig (2021), which isolates oil supply news shocks using changes in oil futures prices in a narrow window around OPEC production announcements. This approach exploits institutional features of OPEC announcements and allows the researcher to identify unexpected changes in expectations about future oil supply. The resulting oil news shocks are then incorporated into a local projection framework à la Jordà (2005) in order to estimate the dynamic responses of Danish macroeconomic variables.

Identifying causal effects of oil price changes on the macroeconomy is challenging because oil prices are endogenous and respond to global economic conditions. Earlier studies have therefore relied on structural VAR models with sign restrictions (e.g. Baumeister and Hamilton (2019)) or narrative identification approaches (e.g. Caldara

et al. (2019)). However, these methods do not explicitly isolate the expectation-driven component of oil price movements. The high-frequency identification approach of Känzig (2021) addresses this issue by measuring changes in oil futures prices within a tight time window around OPEC announcements, thereby isolating news about future oil supply.

Using this approach, I find that the Danish economy responds significantly to increases in oil prices. Figure 3.1.1 shows impulse responses of key macroeconomic variables to a 10 percent increase in the oil price. The results indicate that oil price increases have contractionary effects on economic activity while temporarily increasing inflation.

Real GDP declines gradually following the shock and reaches a trough of roughly 0.8 percent below baseline after around two years. Private consumption falls by approximately 0.7 percent, while investment declines more strongly by about 2.5 percent. The larger investment response is consistent with firms postponing capital expenditures when production costs rise and economic uncertainty increases.

The labour market also deteriorates. Employment falls persistently following the shock, while the unemployment rate increases by around 0.25 percentage points after roughly two years. Real wages decline moderately, suggesting that workers partly absorb the higher energy costs through lower real purchasing power.

Not surprisingly, oil price increases also affect international trade. Exports decline by roughly 1.8 percent and imports by about 2 percent at their troughs, reflecting weaker domestic demand and reduced economic activity.

Inflation, measured by the harmonised consumer price index, rises temporarily following the oil price increase and peaks at approxi-

mately 0.3 percent within the first year before gradually returning towards baseline. Asset prices also respond to the shock: house prices fall by roughly 2–3 percent, and firm building investment declines significantly.

Overall, the results suggest that increases in oil prices generate a temporary stagflationary episode in the Danish economy characterised by higher inflation and weaker real economic activity. The findings also indicate that the primary transmission channel of oil price shocks operates through reductions in consumption and investment demand, consistent with the mechanism emphasised by Kilian and Murphy (2012).

2 Econometric framework

2.1 Oil price shock estimation

When estimating the effect of changes in the oil prices on the Danish economy, I make use of oil price shocks estimated by Känzig (2021).[1] In particular, the estimated oil price shocks are best thought of as a news shock about future oil supply. Similar to monetary policy shocks estimated in the HFI literature, Känzig exploits variation in futures prices around OPEC announcements as an instrument to oil *supply* news shock. To tackle the issue that oil prices are endogenous and respond to global macroecnomic conditions, the author utilizes variation in oil futures prices around OPEC production announcements. By measuring the changes in oil futures prices in a tight window around the announcements, Känzig claims that one can

[1] Shock data is publicly available `https://www.diegokaenzig.com/research`

isolate the impact of news about future oil supply. Reverse causality of the global economic outlook can be plausibly ruled out because it is already priced in at the time of the announcement and is unlikely to change within the tight window.

2.2 Estimating impulse responses

The shocks obtained are monthly oil supply news shock extracted from the SVAR from Känzig (2021) and are placed directly into a local projection (LP) framework. Before regressing the oil supply news shocks on the variable of interest, I aggregate them to quarterly frequency as some of the data used in this study is only available on quarterly frequency. The data is therefore on quarterly frequency and spans from 1999Q1 until 2020Q1. Data and their sources are presented in Table A.0.1.

Impulse responses are constructed as the following LP regression Jordà (2005):

$$y_{t+h} = \beta_0 + \beta_{1,h} shock_t + \beta_{\mathbf{h}} \mathbf{X_{t-1}} + e_{t,h} \tag{1}$$

where the outcome variable of interest is y_{t+h}, h is the projection period, $shock_t$ is the oil supply news shock identified from the external instruments VAR in Känzig (2021), and $\mathbf{X}_{t-j}$ is a vector of controls while $e_{t,h}$ is a potentially serially correlated error term.[2] We are interested in estimating $\beta_{1,h}$ as it measures the impulse response to the oil supply news shock of variable y_t at horizon h. I estimate the

[2]The control variables are the following Danish macrovariables; real GDP, real consumption, real export and inflation measured as HICP. All these variables are in lagged and logarithmic form. Following Ramey (2016), I also include lags of the shock variable and a trend variable.

LP with four lags (p=4).[3]

3 Effects on the Danish economy

3.1 Macroeconomic effects of oil price shocks

Figure 3.1.1 presents impulse responses of selected Danish macroeconomic variables to a 10 percent increase in the oil price driven by an oil news shock. Most real variables are expressed in log deviations, while the unemployment rate and the Danish 12-month interest rate are in levels.

The results indicate that higher oil prices have contractionary effects on the Danish economy. Real GDP declines gradually following the shock and reaches its trough after approximately two years. Private consumption and investment both fall, with investment displaying the strongest response. This is consistent with firms postponing capital expenditures when production costs increase and economic uncertainty rises.

Labour market indicators also deteriorate. Employment declines persistently while the unemployment rate increases over the following quarters. Real wages fall modestly, suggesting that workers partly absorb the higher energy costs through lower real purchasing power.

The responses of external trade are also negative. Both exports and imports decrease after the shock, reflecting weaker domestic demand and lower economic activity.

[3]Using the shock identified from a VAR instead of the HFI oil supply surprises directly alleviates the challenges regarding the statistical power of the responses to macroeconomic variables. Känzig (2021) show that responses estimated from the VAR and the LP-IV approach produce comparable results.

Inflation, measured by the harmonised consumer price index, increases temporarily after the shock and peaks within the first year before gradually returning toward baseline. This pattern suggests that oil price increases are passed through to consumer prices relatively quickly but that the inflationary effects are not persistent.

Financial and asset price variables also respond to the shock. House prices decline following the oil price increase, and firm building investment falls noticeably. The Danish 12-month interest rate decreases slightly after a few quarters, which may reflect monetary policy responding to the weakening in economic activity.

Overall, the results suggest that oil price increases generate a temporary stagflationary episode in the Danish economy, characterised by higher inflation and weaker real economic activity.

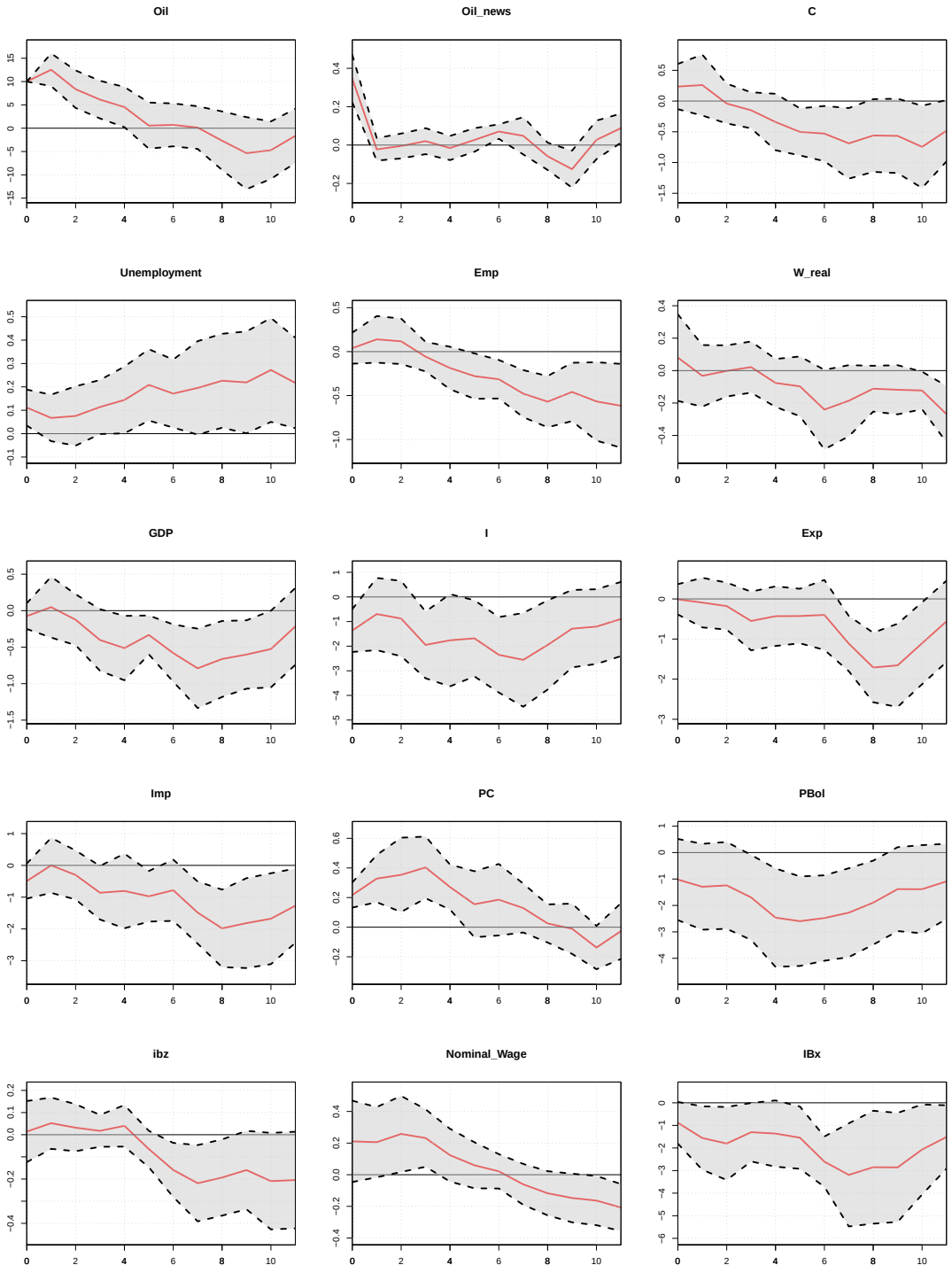

Figure 3.1.1: Impulse responses to a 10 percent increase in the oil price. The figure shows the response of Danish macroeconomic variables to an oil news shock identified using high-frequency changes in oil futures prices around OPEC announcements. Solid red lines denote point estimates and dashed lines denote 90 percent confidence intervals. Most variables are expressed as 100 × log deviations, while unemployment and the Danish 12-month interest rate are in levels. One period is one quarter. Variable names are described in Table A.0.1.

4 Conclusion

This paper studies the macroeconomic effects of oil price shocks on the Danish economy. To identify exogenous oil price movements, I employ the high-frequency identification strategy proposed by Känzig (2021), which exploits changes in oil futures prices around OPEC production announcements to isolate oil supply news shocks. The identified shocks are incorporated into a local projection framework to estimate the dynamic responses of Danish macroeconomic variables.

The results show that increases in oil prices generate noticeable and persistent effects on the Danish economy. A 10 percent increase in oil prices reduces real GDP by roughly 0.8 percent after around two years. Private consumption declines by approximately 0.7 percent, while investment falls more strongly by about 2.5 percent. The labour market also deteriorates: employment declines persistently and the unemployment rate increases by roughly 0.25 percentage points.

At the same time, inflation rises temporarily following the shock. The harmonised consumer price index increases by about 0.3 percent during the first year before gradually returning towards baseline. Asset prices also respond negatively to the oil price increase. House prices decline by roughly 2–3 percent, and firm building investment falls significantly. Overall, the results suggest that oil price increases generate a temporary stagflationary episode in the Danish economy, characterised by higher inflation and weaker economic activity.

The findings contribute to the literature by providing new evidence on the macroeconomic effects of oil price shocks in a small open economy using a recent high-frequency identification approach. While earlier studies have suggested that oil price shocks have only modest effects

on the Danish economy, the results presented here indicate that the effects may be larger when shocks are identified using unexpected changes in oil supply expectations.

From a policy perspective, the results highlight that oil price shocks can simultaneously increase inflation and reduce economic activity, posing challenges for macroeconomic stabilisation policies. Although the inflationary effects appear temporary, the decline in economic activity and investment is more persistent, suggesting that energy price shocks can have meaningful real economic consequences.

References

Baumeister, C. and Hamilton, J. D. (2019), 'Structural interpretation of vector autoregressions with incomplete identification: Revisiting the role of oil supply and demand shocks', *American Economic Review* **109**(5), 1873–1910.

Baumeister, C. and Kilian, L. (2016), 'Forty years of oil price fluctuations: Why the price of oil may still surprise us', *Journal of Economic Perspectives* **30**(1), 139–160.

Caldara, D., Cavallo, M. and Iacoviello, M. (2019), 'Oil price elasticities and oil price fluctuations', *Journal of Monetary Economics* **103**, 1–20.

Conflitti, C. and Luciani, M. (2019), 'Oil price pass-through into core inflation', *The Energy Journal* **40**(6), 221–248.

Hamilton, J. D. (1983), 'Oil and the macroeconomy since world war ii', *Journal of political economy* **91**(2), 228–248.

Jordà, Ò. (2005), 'Estimation and inference of impulse responses by local projections', *American economic review* **95**(1), 161–182.

Känzig, D. R. (2021), 'The macroeconomic effects of oil supply news: Evidence from opec announcements', *American Economic Review* **111**(4), 1092–1125.

Kilian, L. and Murphy, D. P. (2012), 'Why agnostic sign restrictions are not enough: understanding the dynamics of oil market var models', *Journal of the European Economic Association* **10**(5), 1166–1188.

Kronborg, A. F. (2021), 'Estimating foreign shocks in a var model', *Danish Research Institute for Economic Analysis and Modelling* .

Ramey, V. A. (2016), 'Macroeconomic shocks and their propagation', *Handbook of macroeconomics* **2**, 71–162.

Spange, M. (2011), 'Råvarepriser og inflation i danmark', *Danmarks Natiolnalbank, Kvartalsoversigt* .

A Additional table

Table A.0.1: Variables used in the impulse response analysis

Variable	Description	Source	Comment
Oil	Brent crude oil price	FRED	Global price of Brent crude oil in US dollars (POILBREUSDM).
C	Private consumption (real)	Eurostat	Household and NPISH final consumption expenditure, chain-linked volumes.
Unemployment	Unemployment rate	Eurostat	Percentage of labour force unemployed.
Emp	Employment	Eurostat	Total employed persons in the domestic economy.
W_real	Real wage	MONA	Hourly wage in industry deflated by the private consumption deflator.
GDP	Real gross domestic product	Eurostat	Chain-linked volumes, index 2010=100.
I	Total investment	Eurostat	Gross capital formation, chain-linked volumes.
Exp	Exports of goods and services	Eurostat	Real exports of goods and services, seasonally adjusted.
Imp	Imports of goods and services	Eurostat	Real imports of goods and services, seasonally adjusted.
PC	Consumption deflator	MONA	Private consumption price deflator.
PBol	House prices	MONA	Housing prices deflated by the consumption deflator.
ibz	Danish 12-month interest rate	Eurostat	12-month Danish bond yield.
Nominal_Wage	Nominal wage	MONA	Hourly wage in industry.
IBx	Firm building investment	MONA	Business sector building investment excluding energy extraction.

Note: MONA refers to the macroeconomic model database maintained by Danmarks Nationalbank. Eurostat series are seasonally adjusted and expressed in chain-linked volumes where applicable.