Estimating the Macroeconomic Effects of Oil Supply News*

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Abstract

We show that structural oil-market shocks identified in prominent SVAR models, as well as high-frequency oil price changes around OPEC announcements, are predictable, indicating informational deficiencies in standard oil-market VARs and contamination of commonly used instrumental variables. We resolve these identification problems for oil supply news shocks by augmenting the econometrician's information set with financial indicators, yielding markedly different results: the shocks induce a sharper short-run output contraction, are less inflationary, contribute less to oil price variation, exhibit greater stability over time, and account for a substantial share of S&P 500 volatility.

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1 Introduction

Structural vector autoregressions (SVARs) are commonly used to quantify the macroeconomic effects of oil-market disturbances. A striking—and potentially consequential—fact is that the "structural" oil-market shocks recovered from several prominent SVAR models appear to be predictable. Table 1 shows that common macroeconomic factors from McCracken and Ng (2016), as well as a range of financial variables, Granger-cause the oil price shocks and reduced-form oil price innovations identified in Kilian (2009), Baumeister and Hamilton (2019), and Känzig (2021). The first two studies disentangle different types of oil supply and demand shocks, all of which are predictable, while Känzig (2021) estimates the macroeconomic effects of oil supply news shocks. Because Känzig's specification features the richest information set among these models, we report only the tests for his oil price residuals, although oil price residuals in Kilian (2009) and Baumeister and Hamilton (2019) are likewise predictable. Predictability also extends to Känzig's high-frequency instrumental variable—changes in oil futures prices around OPEC quota announcements—which has been widely used to study related questions.[1]

The predictability of the shocks and oil price residuals indicates that a necessary condition for identification—the assumption of (partial) invertibility—is not fulfilled in these benchmark VAR models. Specifically, a necessary condition for partial invertibility is that no variables outside the VAR Granger-cause the residuals of the relevant VAR equation, and that the identified structural shocks are orthogonal to past information (Forni and Gambetti, 2014; Stock and Watson, 2018).[2] Non-invertibility implies that the structural shock(s) of interest

[1]Examples are Bruns (2021), Gagliardone and Gertler (Forthcoming), Nguyen et al. (2024), Castelnuovo et al. (2024), Kilian (2024), Degasperi et al. (2026), Caravello and Martinez-Bruera (2024), Patzelt and Reis (2024), Forni et al. (2025).

[2]See Forni and Gambetti (2014) and Stock and Watson (2018) for formal discussions, and Miranda-Agrippino and Ricco (2023) for the general conditions required for identification in SVAR-IV models. We followed the approach proposed in these studies. Using an alternative methodology, Forni et al. (2025) conclude that Känzig's baseline VAR is invertible.

Table 1: P-values Granger causality tests

	Kilian (2009)			Baumeister and Hamilton (2019)				Känzig (2021)				VAR with financial variables		
	Oil supply	Aggr. demand	Oil-spec. demand	Oil supply	Econ. activity	Oil cons. demand	Oil inv. demand	News shocks	Oil price residuals	Z_t	$Z_t^{\perp}$	News shocks	Oil price residuals	$Z_t^{\perp}$
Common factors (all)	**0.00**	0.16	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	0.40	0.34	0.28	0.54	0.98	0.61
F1	0.15	0.67	0.90	0.43	**0.01**	0.10	0.11	0.99	0.99	0.32	0.68	0.99	1.00	0.97
F2	0.09	0.44	0.16	0.14	**0.00**	0.08	0.07	0.99	0.99	0.14	0.87	0.97	1.00	0.88
F3	**0.02**	0.68	0.16	**0.04**	**0.04**	0.41	0.08	0.98	0.99	0.64	0.98	1.00	1.00	0.99
F4	0.39	0.52	0.85	0.14	0.29	0.14	**0.01**	0.22	0.31	0.13	0.40	0.98	0.97	0.92
F5	**0.02**	0.67	0.52	0.15	**0.01**	0.45	0.09	0.49	0.87	0.89	0.87	0.91	0.98	0.97
F6	0.07	0.70	0.79	0.15	**0.01**	0.48	0.20	0.08	0.19	0.07	0.16	0.86	0.64	0.81
F7	**0.01**	**0.01**	**0.02**	0.06	**0.01**	**0.02**	0.20	**0.02**	**0.01**	0.43	0.41	0.97	0.96	0.97
F8	0.57	0.24	0.45	**0.01**	0.25	0.39	0.81	0.74	0.74	0.40	0.53	0.47	0.75	0.52
Global Financial Cycle	0.28	**0.00**	**0.03**	**0.01**	**0.01**	0.06	0.07	0.06	**0.02**	0.36	0.68	0.86	0.19	1.00
OECD Global CLI	0.19	0.06	0.06	0.47	**0.00**	**0.01**	0.56	0.49	0.52	0.17	0.55	0.85	0.96	0.84
S&P 500	**0.02**	0.16	0.37	**0.03**	**0.03**	0.29	**0.01**	**0.05**	**0.04**	0.44	0.37	1.00	1.00	1.00
MSCI World	0.44	**0.04**	0.13	0.35	**0.02**	0.22	**0.04**	**0.05**	**0.01**	0.72	0.90	0.45	0.07	0.98
VXO	**0.05**	0.20	0.20	0.60	**0.01**	0.48	0.11	**0.04**	0.06	**0.00**	**0.05**	1.00	1.00	1.00
Financial uncertainty	0.51	0.54	0.30	0.90	0.07	0.25	0.85	0.91	0.65	**0.00**	**0.01**	0.14	0.53	0.67
Macro uncertainty	**0.05**	**0.04**	0.18	0.92	**0.00**	**0.03**	0.34	0.36	0.33	**0.04**	0.33	0.94	0.63	0.84
Excess bond premium	0.42	0.33	**0.01**	**0.05**	**0.02**	0.06	0.57	0.09	0.26	**0.04**	0.41	0.07	0.24	0.56
BAA-AAA spread	0.11	0.57	0.44	**0.02**	**0.00**	0.20	0.09	0.68	0.81	**0.05**	0.50	0.92	0.96	0.55
US 1-year interest rate	**0.03**	0.50	0.45	0.22	0.18	0.06	**0.00**	0.22	0.33	0.26	0.43	1.00	1.00	1.00
USD exchange rate	0.65	**0.00**	0.98	0.17	0.35	0.44	0.18	0.51	0.62	0.77	0.89	0.40	0.82	0.92

Note: P-values of (robust) F-statistic for the null hypothesis that the lagged variables do not Granger-cause the structural shocks, the oil price residuals, the IV, and the IV orthogonalized to the impact of the lagged VAR variables. The sample period is 1974-2017 and the tests are conducted using six lags. For S&P 500 and MSCI, we consider log differences. The common factors are obtained from McCracken and Ng (2016), financial and macro uncertainty from Ludvigson et al. (2021), the Global Financial Cycle from Miranda-Agrippino and Rey (2020), and the Excess bond premium from Gilchrist and Zakrajsek (2012). Numbers are in bold when p<0.05.

cannot be accurately recovered from linear combinations of current and past VAR variables, pointing to informational deficiencies and non-fundamental shocks. When a shock is forecastable using variables outside the VAR, this signals that the econometrician's information set does not span the information available to agents, and that the recovered shock series may partly reflect omitted information, potentially distorting the estimations.

Moreover, Miranda-Agrippino and Ricco (2023) show that, under partial invertibility, identification in SVAR-IV models requires an additional restriction to the instrument beyond the standard relevance and contemporaneous exogeneity conditions. Specifically, the instrument must satisfy a *limited lead–lag exogeneity* condition: the component of the instrument that is orthogonal to the VAR information set must be unpredictable by variables omitted from the VAR. If shocks not captured by the model correlate with the instrument at any leads or lags, their effects will be absorbed by the instrument, leading to biased estimates. The fact that changes in oil futures prices around OPEC quota announcements are predictable—as documented in Table 1, including after orthogonalization with respect to the lagged VAR variables—therefore implies a violation of this condition and contamination of the instrument by other shocks. Importantly, this condition must also hold for methods that do not rely on invertibility, such as SVARs that incorporate the instrument internally or local projections, implying that these approaches may also be distorted (Plagborg-Møller and Wolf, 2021).[3] At the same time, using high-frequency data, we show in Appendix A that oil price changes around OPEC announcements are not predictable by financial variables within the month, suggesting that the contemporaneous exogeneity of the instrument remains intact.

In general, invertibility can be restored by expanding the VAR information set to better align with that of economic agents (Forni and Gambetti, 2014; Stock and Watson, 2018). Similarly, the limited lead–lag exogeneity condition can be satisfied by including variables

[3]The orthogonalized instrument is equivalent to the structural shocks series identified by ordering the instrument first in a recursive VAR, following the approach of Plagborg-Møller and Wolf (2021). These tests can thus also be viewed as a direct assessment of the "structuralness" of the shocks obtained from such a VAR.

that render the instrument conditionally exogenous (Miranda-Agrippino and Ricco, 2023). In this paper, we address these identification challenges within the SVAR-IV framework of Känzig (2021). Unlike oil supply news shocks, the shocks identified in Kilian (2009) and Baumeister and Hamilton (2019) are not solely predictable by financial variables, and expanding their information sets introduces complexity into the identification strategy. We leave this extension for future research.

We show that both the invertibility requirement and the limited lead–lag exogeneity condition can be satisfied in oil supply news SVAR-IV models by augmenting the information set with a small set of financial indicators: the US one-year interest rate, the S&P 500, and the VXO. Once these variables are included, the oil price residuals, the identified oil supply news shocks, and the external instrument are no longer Granger-caused by omitted variables. The resulting estimates differ markedly from the baseline, both statistically and quantitatively. Oil price responses are less persistent, oil supply news accounts for a much smaller share of oil price fluctuations, and the macroeconomic effects are substantially revised: world and US industrial production decline more sharply in the short run, while inflationary effects are weaker and less persistent. At the same time, the augmented VAR reveals that oil supply news shocks account for a substantial share of S&P 500 volatility, far exceeding estimates reported in earlier studies of the oil–equity price relationship. Moreover, the revised impulse responses are considerably more stable across subsamples, and the puzzling patterns documented in the baseline specification disappear.

Finally, we find that addressing the invertibility problems and the contamination of the instrument are both important for the estimated effects. In addition, the distortions caused by omitted financial variables cannot be attributed solely to their predictive power: financial variables also play a crucial *contemporaneous* role in identifying oil supply news shocks. Intuitively, in standard oil-market VARs, aside from the real price of oil, the only forward-looking variable is oil inventories, which is insufficient to distinguish between oil price in-

creases driven by expected supply shortfalls and those driven by anticipated demand expansions—both of which tend to raise inventories. Financial variables provide precisely the additional forward-looking information needed for this distinction. For example, equity prices typically rise when oil prices increase due to stronger expected demand, but fall when oil prices rise in response to expected supply disruptions. We show that disregarding this contemporaneous financial information leads to biased effects of oil supply news shocks.

The predictability of oil price shocks does not necessarily imply that investors fail to process information efficiently or leave money on the table. Rather, it can arise from imperfect information about OPEC's reaction function and oil supply behavior more generally. Analogous to the "Fed response to news" channel emphasized by Bauer and Swanson (2023a, 2023b), oil price innovations may reflect market participants' misperceptions about the strength with which oil producers respond to publicly available information. In particular, market participants face substantial uncertainty regarding OPEC's reaction function and may underestimate, ex ante, how strongly oil producers adjust supply in response to economic news. As a result, oil price changes can be correlated with lagged economic conditions in full-sample regressions without violating rational expectations. Consistent with this interpretation, Appendix A shows that the predictability we document generally does not apply ex ante. For example, we find a robust ex post negative relationship between lagged changes in uncertainty measures and oil price shifts around OPEC announcements—indicating a stronger response of OPEC's supply than markets expected on average—while this relationship was not predictable in real time. Although the precise source of the predictability is not central to the paper and cannot be formally tested, an "OPEC response to news" channel provides a plausible explanation.

Our findings are also related to evidence showing that ignoring contemporaneous financial information leads to attenuation bias in estimated monetary policy effects (Caldara and Herbst, 2018). In addition, our analysis relates to Degasperi (2025), who attributes the puz-

zling impulse responses and sample instability to an "OPEC information effect," whereby OPEC announcements also induce imperfectly informed markets to revise their beliefs about demand conditions. To isolate oil supply news, he proposes a refined instrument that uses only those announcement days on which equity prices move in the opposite direction of oil prices, resulting in a much stronger impact of the shocks on economic activity. However, in Appendix F we show that the refined instrument and resulting structural shocks remain predictable when financial variables are excluded from the information set. Conversely, once we condition on an information set that includes financial variables, the impulse responses obtained using the original and refined instruments are not statistically different—and are virtually indistinguishable in sample periods starting in the early 1980s—indicating that incorporating financial variables is sufficient to disentangle supply from demand news and that omitted-variable bias is the primary source of the puzzles.

Section 2 addresses the informational deficiencies and instrument contamination that undermine identification, revisits the macroeconomic effects and historical relevance of oil supply news, and assesses the stability of the results across alternative sample periods. Section 3 examines the role of financial variables in achieving identification and clarifies the additional information they provide beyond the baseline VAR specification. Finally, section 4 concludes.

2 Oil-Market SVAR-IV Model with Financial Variables

Our analysis builds on Känzig's baseline six-variable VAR specification and original dataset, covering the period 1974–2017 and thus predating the COVID-19 pandemic. In Appendix B, we document that COVID-related outliers in early 2020 may distort monthly estimations in models identified using OPEC announcements when the sample includes the pandemic period. Importantly, we also show that our main findings remain robust when the sample

is extended through 2025M12 and COVID-related distortions are addressed by including dummy variables for the period 2020M1–2020M6.

As documented in Table 1, both the oil price residuals and the oil supply news shocks in the baseline SVAR are predictable by financial variables. In particular, McCracken and Ng (2016) show that factor F7 (as well as F6) explains a substantial share of variation in stock market variables. The four series with the highest loadings on F7 are the S&P 500, S&P Industrials, S&P dividend yields, and the VXO. This pattern indicates that financial variables are the primary source of the invertibility problem and informational insufficiency in the baseline VAR. This conclusion is reinforced by the Granger-causality tests for individual financial indicators reported in Table 1.

Turning to the lead–lag exogeneity condition of the instrument, there is strong evidence that OPEC announcement surprises are predictable by measures of uncertainty. In particular, both the VXO and the financial uncertainty index of Ludvigson et al. (2021) Granger-cause the instrument after orthogonalization with respect to lagged VAR variables. For practitioners, it is also noteworthy that in specifications that do not control for the lagged baseline VAR variables, the instrument is also predictable by bond spreads and by the macroeconomic uncertainty index of Ludvigson et al. (2021).[4]

A standard approach to restoring informational sufficiency is to expand the VAR information set by including omitted variables until invertibility and orthogonality of the shocks are achieved (Forni and Gambetti, 2014; Stock and Watson, 2018). Similarly, contamination of the instrument can be mitigated by expanding the information set with variables that

[4]In Mori and Peersman (2024), we also present Granger-causality tests using 12 lags—which yield very similar results—and provide a more detailed discussion of the selection of variables used in these tests. In his empirical analysis, Känzig (2021) follows standard practice in the SVAR literature by assuming full invertibility. He examines the sensitivity of the results to the information set by augmenting the baseline VAR with additional variables, considered one at a time. The resulting robustness suggests no obvious informational deficiencies along these dimensions. To assess potential contamination of the instrument Känzig (2021) presents Granger-causality tests for a set of macroeconomic and financial variables. However, this set does not include measures of uncertainty or bond spreads, which we find to have significant predictive power for the instrument.

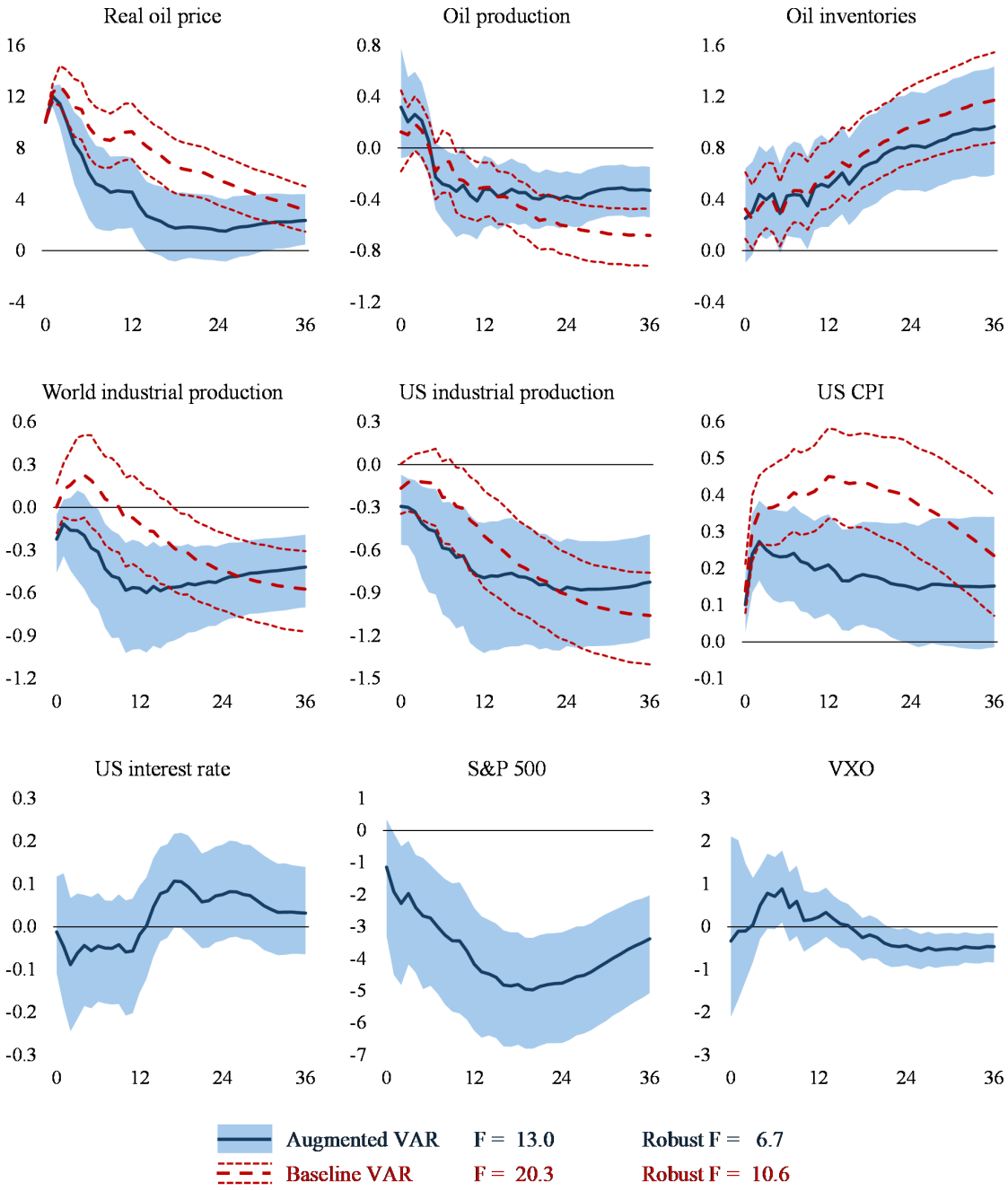
render the instrument conditionally exogenous (Miranda-Agrippino and Ricco, 2023). The Granger-causality evidence in Table 1 suggests that financial variables are central to resolving both problems in SVAR-IV models identified based on OPEC quota announcements. We therefore augment the baseline VAR with three financial indicators: the S&P 500, the VXO, and the US one-year interest rate. These variables are forward-looking and capture distinct dimensions of expectations, including those of the central bank. Most importantly, incorporating these variables restores both invertibility and the limited lead–lag exogeneity of the instrument. As shown in Table 1, once the VAR is augmented, neither the common factors nor other financial indicators Granger-cause the oil price innovations, the identified oil supply news shocks, or the external instrument conditional on the VAR information set. Section 3 explains why this VAR-augmentation approach is preferable to using the same variables only to pre-clean the external instrument.

From a practical standpoint, notice that the results are very similar when we incorporate more or alternative combinations of financial variables into the VAR model (see, e.g., the 19-variables VAR model of Castelnuovo et al., 2024). Due to their ready accessibility, unlike for example the Global Financial Cycle or the financial uncertainty index of Ludvigson et al. (2021), the S&P 500, the VXO and the interest rate form the most obvious combination. It is, however, important to include all three variables in the VAR model. For instance, the structural shocks can still be predicted by the common factors and the excess bond premium when the interest rate is excluded from the information set.

2.1 Revisiting the Macroeconomic Effects of Oil Supply News

Figure 1 reports the impulse responses from the oil-market SVAR model augmented with financial variables. Following Känzig (2021), we adopt a frequentist approach, with confidence

Figure 1: Impact of oil supply news shocks in an SVAR augmented with financial variables



Note: Impulse responses to oil supply news shock that raise oil prices by 10% on impact. Baseline VAR (red dotted responses) versus the VAR model augmented with financial variables (blue full responses). Monthly horizon. 68% confidence intervals constructed using a moving block bootstrap.

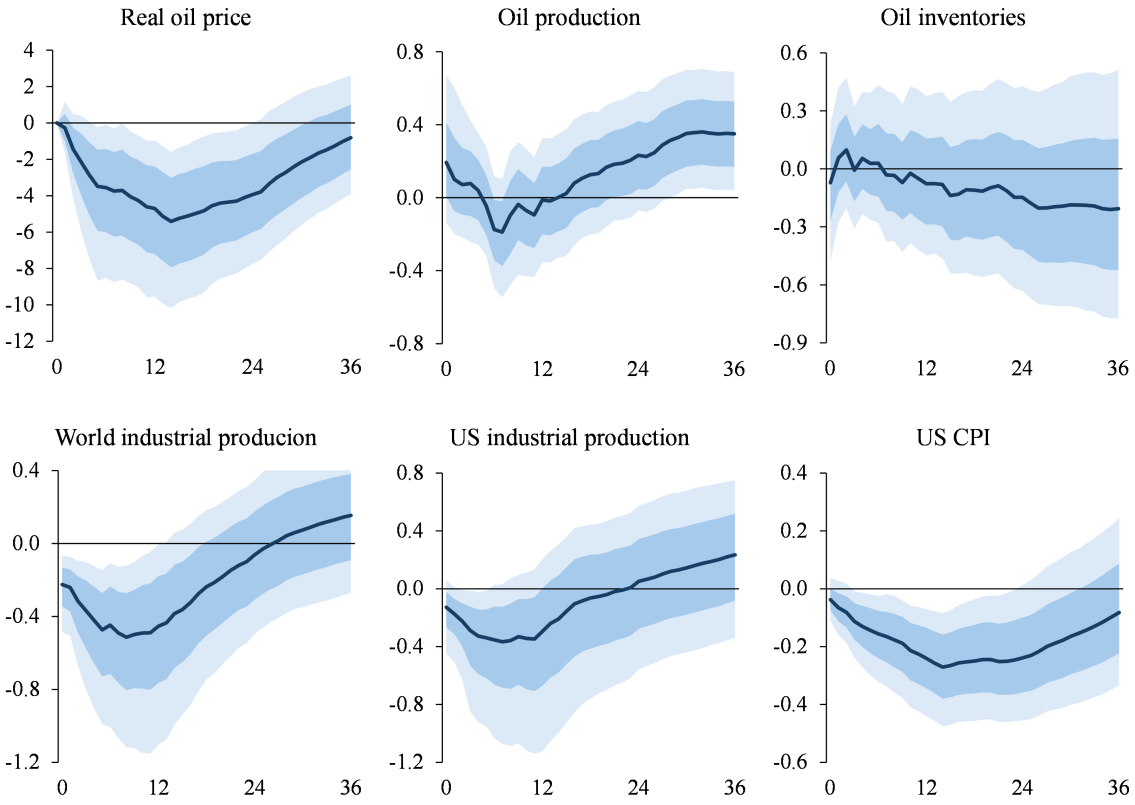
intervals constructed using a moving block bootstrap.[5] To gauge the quantitative importance of incorporating financial variables, Figure 1 also displays the impulse responses from the baseline VAR. Formal statistical comparisons between the impulse responses of both specifications are shown in Figure 2. These tests are conducted by nesting the VARs within the bootstrap procedure. Specifically, for each bootstrap sample of the nine-variable VAR model with financial variables, we also estimate the six-variable baseline VAR and compute the difference between the corresponding impulse response functions. The 16-84 and 5-95 percentiles of these differences (i.e., 68% and 90% confidence intervals) are depicted in Figure 2 and used to assess the statistical significance of the omitted variable bias.

Figure 1 and 2 demonstrate that the results differ significantly from the original estimates, both statistically and quantitatively. First, the rise in real oil prices following unfavorable news about future oil supply is less persistent. In the original VAR, oil prices remain 9.3% above the baseline after one year, whereas this is only 4.6% in the augmented VAR. Additionally, the "output puzzle", with world industrial production rising in the first year following an oil supply news shock, is resolved. Instead, we observe an immediate sharp decline in production, reaching its peak after one year. More specifically, world industrial production decreases by -0.6% after one year, compared to -0.1% in the baseline VAR. For policymakers, such a difference at the one-year horizon is substantial. A similar divergence occurs for US industrial production, although the magnitude is somewhat smaller. As shown in Figure 2, the differences between the output effects are also statistically significant.

The impact on inflation also differs markedly between the two specifications. In the VAR with financial variables, the peak response of US consumer prices is nearly half compared to the original VAR and exhibits much less persistence. This difference in the inflationary

[5]In Appendix C, we report results based on alternative inference methods, including the Bayesian approach of Miranda-Agrippino and Ricco (2021) and the weak-instrument robust inference method of Montiel Olea et al. (2021). The latter addresses possible concerns about the robust F-statistic dropping below 10 in the augmented VAR. Notably, both alternative approaches yield confidence (credible) intervals that are somewhat narrower than those obtained from the block bootstrap.

Figure 2: Tests for differences between augmented and baseline VAR impulse responses



Note: Estimated differences between impulse responses of the VAR model augmented with financial variables and the baseline VAR for oil supply news shocks that raise oil prices by 10% on impact. Monthly horizon. 68% and 90% confidence intervals constructed using a moving block bootstrap.

effects is highly statistically significant (see Figure 2).

Incorporating financial variables into the information set also revisits the relevance of oil supply news for macroeconomic and oil market fluctuations. Appendix D reports the forecast error variance of the VAR variables attributed to oil supply news shocks, as well as the historical contribution of the shocks to some key variables. In the baseline VAR, the shocks account for 73% of the historical variance in real oil prices at the three-year horizon, whereas this share drops to 27% in the VAR model with financial variables. This more limited role of oil supply news shocks as a driver of oil price fluctuations aligns more closely with historical narratives and existing studies, such as Kilian (2009), which typically emphasize

the significant influence of aggregate demand shocks. The contribution to the variance in US consumer prices is also lower in the VAR model augmented with financial variables. However, the reverse holds for output variation. For instance, at the one-year horizon, oil supply news shocks explain 10% and 18% of world and US industrial production fluctuations, respectively, in the VAR with financial variables, compared to just 1% and 4% in the baseline model. In summary, incorporating financial variables is crucial for accurately measuring the macroeconomic effects and historical relevance of oil supply news shocks, as the omitted variables substantially affect the results.

2.2 The Impact of Oil Supply News on Financial Markets

The impact of oil supply news on the financial variables is also presented in Figure 1. Several key observations emerge. First, equity prices experience a significant decline following negative news about oil supply. Specifically, an oil supply news shock that raises oil prices by 10% on impact results in a peak decline of 4.9% in the S&P 500. Furthermore, oil supply news accounts for 41% of the S&P 500's variation at the three-year horizon during the sample period (Appendix D). The relevance of oil supply news shocks in explaining S&P 500 variation is significantly greater than the contributions reported in previous studies examining the relationship between the oil market and equity prices. For example, Kilian and Park (2009) find that oil supply shocks do not significantly affect US stock returns and account for only 6% of their long-run variation. While they also show that shocks to the precautionary demand for oil—potentially driven by news about future supply—have a significant negative impact, these shocks explain only 11% of the long-run variation in stock returns.

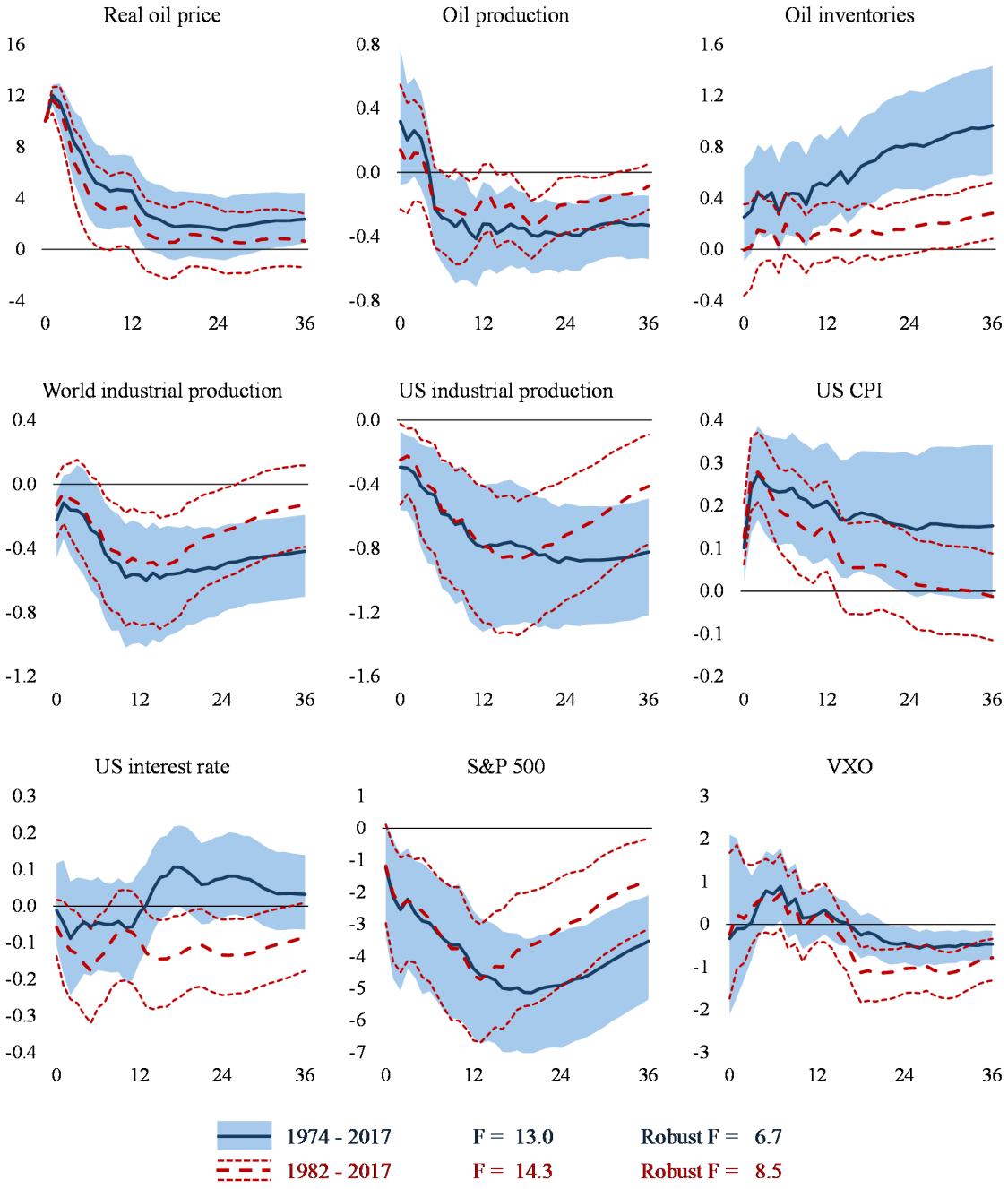
On the other hand, the responses of the one-year government bond yield and the VXO are insignificant in the short run, and the contribution of the shocks to their variability is negligible across all horizons. However, the absence of a significant response does not imply

that both variables are uninformative for estimating the consequences of oil supply news. For example, these responses may play a critical role in disentangling the shocks from innovations in expected demand, which also lead to an immediate increase in oil prices but are typically accompanied by changes in the VXO and interest rates. The analysis in section 3 suggests that this is indeed the case.

2.3 Stability of the Results across Sample Periods

Another notable improvement of the augmented specification is the greater stability of the estimated effects across sample periods. Previous studies have documented that the macroeconomic effects of oil supply news shocks are highly sensitive to the estimation window, with particularly puzzling impulse responses when the sample starts in the early 1980s (Degasperi, 2025; Castelnuovo et al., 2024). This instability is illustrated in Figure A7, which reports impulse responses from the baseline VAR estimated over the periods 1974–2017 and 1982–2017, respectively. In the shorter sample, the response of world economic activity is statistically insignificant and the point estimates even reverse sign, while the response of US inflation is substantially muted relative to the longer sample.

Figure 3: Stability of the SVAR-model augmented with financial variables



Note: Impulse responses to oil supply news shock that raises oil prices by 10% on impact, estimated over sample periods 1974-2017 and 1982-2017, respectively. 68% confidence intervals constructed using a moving block bootstrap.

In contrast, Figure 3 shows that the VAR augmented with financial variables delivers

consistent impulse responses across the same sample splits. In both periods, we observe a pronounced contraction in global economic activity, together with weaker and less persistent inflationary effects. Moreover, as documented in the appendix, these results remain stable when the sample is extended through 2025M12 to include the (post-)COVID period. It is worth noting that the inclusion of post-COVID data leads to a stronger impact of the shocks on consumer prices. However, given the extraordinary nature of the COVID episode, and the issues discussed in Appendix B, these findings should be interpreted with appropriate caution.

The results also prove robust along several other dimensions. In particular, the results are very similar when we exclude the first six years of the instrumental variable or when we re-estimate the augmented SVAR using a sample that starts in 1988M4.[6] Moreover, further enriching the VAR with additional variables—such as the excess bond premium or the principal components of McCracken and Ng (2016)—leaves the impulse responses largely unchanged. Finally, Appendix F shows that potential information effects—namely, the possibility that the instrument captures revisions in expectations about oil demand induced by OPEC announcements, as suggested by Degasperi (2025)—disappear once financial variables are included in the VAR model. Overall, incorporating financial variables into the information set substantially alleviates concerns related to sample-period instability and output puzzles, rendering the instrumental-variable approach more robust and empirically reliable.

3 The Role of Financial Variables for Identification

We now turn to the role of financial variables in estimating the macroeconomic effects of oil supply news. A useful observation for practitioners is that it is not sufficient to simply

[6]Kilian (2024) argues that the initial six years of daily OPEC surprises rely on unsuitable data, and shows that dropping these observations renders the VAR results sensitive to the estimation period.

purge the external instrument of predictable components and then estimate the baseline VAR using this "cleaned" instrument. Pre-cleaning may remove predictable variation from the instrument, but it also mechanically reduces the residual variation available for identification, potentially weakening the instrument and undermining inference. This is one reason why augmenting the VAR with the omitted variables is preferable. Moreover, when we implement the pre-cleaning approach—by regressing the high-frequency OPEC announcement surprises on financial variables and using the residuals as an external instrument—the differences relative to the VAR augmented with financial variables are reduced but not eliminated. Several impulse responses remain statistically different (see Appendix G), indicating that instrument contamination alone cannot fully account for the distortions in the baseline results.

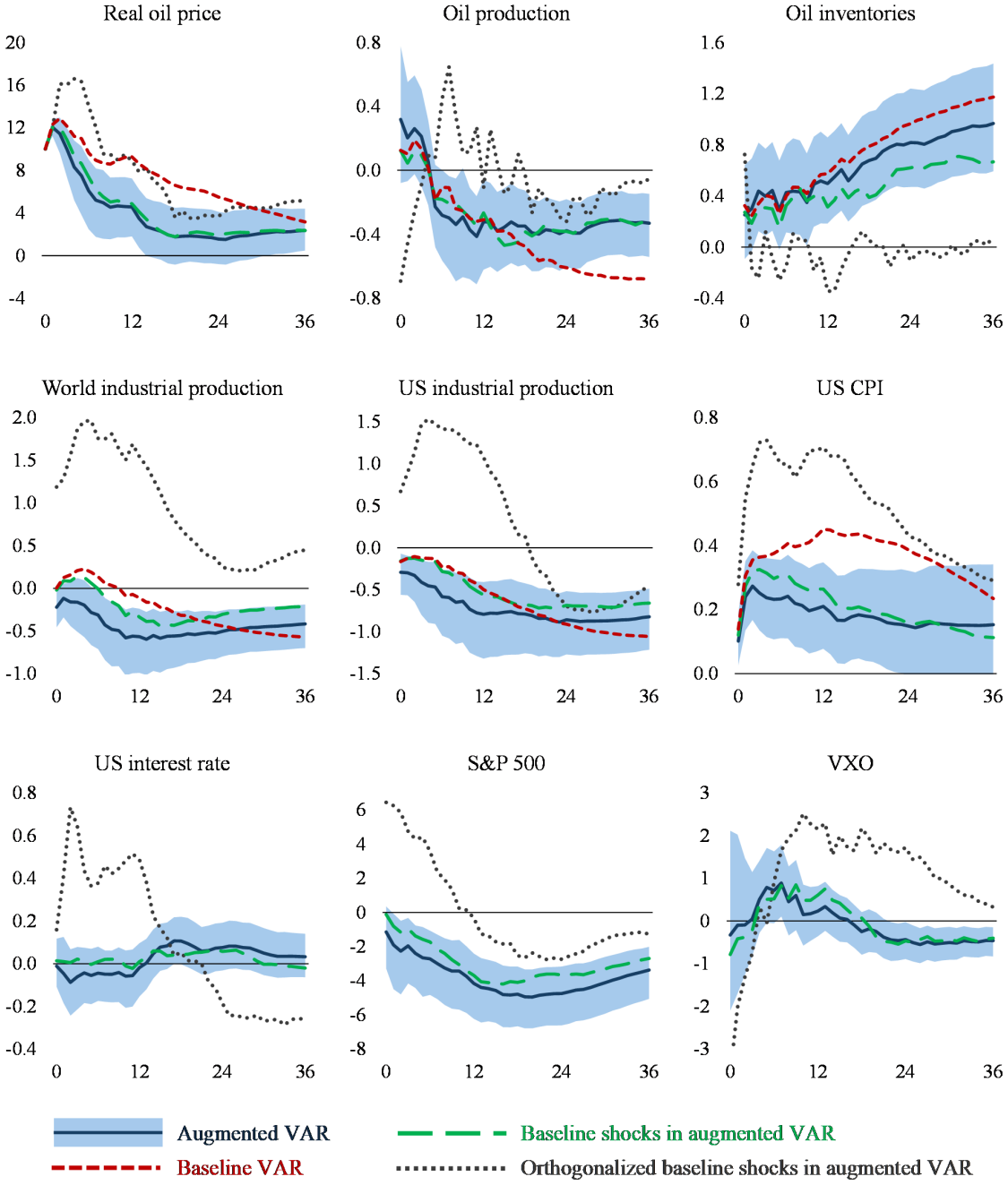
A closer inspection of the results reveals that the distortions arising from omitted financial variables can also not solely be attributed to their ability to forecast the instrument, oil price innovations, and structural shocks, as highlighted by the Granger-causality tests. Financial variables also play a crucial role *at the moment of impact*, by providing contemporaneous information that is essential for accurately recovering the shocks from the VAR residuals—a key requirement for invertibility. This conclusion is illustrated by two complementary exercises reported in Figure 4.

In the first exercise, the green solid lines in Figure 4 show impulse responses obtained from an "intermediate" VAR specification. This model includes the estimated oil supply news shock series from the baseline VAR as the first variable, followed by the financial variables, and is identified using a recursive decomposition. By construction, this intermediate VAR accounts for the information contained in *lagged* financial variables and their influence on the system's dynamics. However, because the shock is ordered first, it remains contaminated by omitted *contemporaneous* financial information. As shown in Figure 4, the "intermediate" impulse responses differ from those of the baseline VAR and align more closely with those of the augmented VAR. This suggests that the omitted lagged financial variables contribute

to the distortions in the baseline VAR. Nevertheless, a notable discrepancy remains between these intermediate responses relative to the fully augmented VAR, which also conditions on contemporaneous financial information. For example, a short-run output puzzle persists for world industrial production, the contraction in U.S. industrial production is weaker and inflationary effects are stronger. A particularly stark difference arises for equity prices: the S&P 500 falls by only –0.1 on impact in the intermediate VAR, compared to –1.1 in the augmented VAR. Taken together, these patterns indicate that the intermediate shocks still reflect endogenous oil price movements driven by aggregate demand, underscoring the importance of contemporaneous financial information for proper identification.

The second exercise in Figure 4 further reinforces this conclusion. Here, we regress the baseline oil supply news shocks on the corresponding shocks obtained from the augmented VAR. The residuals from this regression represent the shocks captured in the baseline VAR but *not* in the augmented VAR. We then embed these residual shocks as the first variable in a VAR that includes the financial variables and identify the system recursively (i.e., they account for information contained in past financial variables). The impulse responses to these residual shocks (gray dotted lines) clearly resemble those of aggregate demand disturbances: they generate strong increases in economic activity, inflation, and equity prices, accompanied by declines in macroeconomic uncertainty and a tightening of monetary policy. This exercise provides direct evidence that the baseline shocks contain a substantial demand-driven component that is eliminated once contemporaneous financial information is incorporated.

Figure 4: The role of financial variables for estimating the effects of oil supply news shocks



Note: Impulse responses to oil supply news shock that raises oil prices by 10% on impact for: (i) the augmented VAR with financial variables, (ii) the baseline VAR, (iii) the baseline shocks embedded in the augmented VAR, and (iv) the baseline shocks orthogonalized to the augmented shocks, embedded in the augmented VAR.

Finally, following Caldara and Herbst (2018), who study the role of bond premiums in identifying monetary policy shocks, we evaluate the presence of distortions by disregarding contemporaneous financial information by the contemporaneous elasticities of real oil prices—conditional on the identification of the structural oil supply news shocks—to changes in the variables included in the augmented VAR. Specifically, the endogenous responses of the real price of oil to unit changes in the S&P 500, the US interest rate, and the VXO are 0.70 (0.00), 2.95 (0.07), and 0.18 (0.23), respectively, with p-values in parentheses. The highly significant coefficient for the S&P 500 suggests that, through the lens of the augmented VAR, the baseline model identifies an oil supply news shock that is contaminated by the contemporaneous endogenous response of oil prices to equity prices.

In summary, the baseline VAR results are distorted by expected aggregate demand shocks due to the omission of both lagged and contemporaneous financial variables. The importance of financial indicators is not surprising, as these variables encapsulate expectations about future economic activity, uncertainty, and the interpretation of oil-market news by policymakers and markets (Gazzani et al., 2024). In the baseline VAR, expectations about future oil-market developments are inferred primarily from past and current oil production and economic activity, with oil inventories being the only explicitly forward-looking variable besides oil prices. This is insufficient to distinguish between oil price increases driven by anticipated supply shortfalls and those driven by expected demand expansions, as both typically raise inventories. Financial variables provide precisely the additional forward-looking information needed for this distinction. The collapse of oil prices by 114% during the onset of the Great Financial Crisis (July-December 2008) illustrates this point. The baseline VAR attributes 76 percentage points of this decline to oil supply news, whereas the augmented VAR attributes only 31 percentage points. This discrepancy arises because the baseline model partially conflates oil supply news with news about future economic activity and oil demand.

4 Conclusions

This paper shows that oil price residuals and structural shocks identified in prominent oil-market SVAR models, as well as commonly used instruments for identifying oil supply news shocks, are Granger-caused by financial variables. This predictability points to informational deficiencies in standard oil-market VARs and contamination of the instrumental variable. We demonstrate that these identification problems can be resolved for oil supply news shocks by augmenting the econometrician's information set with a small set of financial indicators. The resulting estimates differ markedly from the baseline: economic activity contracts more sharply and immediately, inflationary effects are weaker and less persistent, and oil supply news accounts for a substantially smaller share of oil price fluctuations. In addition, the impulse responses are considerably more stable over time and previously puzzling patterns disappear. At the same time, we find that oil supply news shocks explain a substantial fraction of S&P 500 volatility. Put differently, although the informational deficiencies and instrument contamination are quantitatively important, they can be addressed in a relatively straightforward way by incorporating financial indicators into the VAR information set. The increased stability across sample periods and the disappearance of the puzzles also make the instrumental variable approach less vulnerable to critiques raised in the literature.

The *limited lead–lag exogeneity* condition for oil price changes induced by OPEC announcements is also a necessary requirement for the estimation of local projections using instrumental variables (Miranda-Agrippino and Ricco, 2023). In addition, Montiel Olea et al. (2025) argue that, in local projection settings, practitioners should control for variables that strongly predict the outcome variables. Because the financial variables incorporated in our VAR model satisfy both criteria, our results suggest that these variables should also be included as controls in local projection frameworks identified based on OPEC announcements.

The quantitative relevance of informational deficiencies in other prominent oil-market

SVAR models remains an open question. Unlike oil supply news shocks, the predictability of shocks in these models is not confined to financial variables, and the identification strategies typically involve as many structural shocks as endogenous variables. Exploring these issues is left for future research. A possible avenue are factor-augmented VAR models, as in Juvenal and Petrella (2015), Aastveit et al. (2015) and Stock and Watson (2018).

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