What's the Role of Perceived Oil Price Shocks in Inflation Expectations?*

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Abstract

Not much. We identify the perceived oil price shock as well as perceived global demand and supply shocks using sign restrictions in a factor-augmented vector autoregression model that includes forecasts for crude oil price growth, real GDP growth, and inflation across 84 economies. The perceived oil price shock explains only 10% of the fluctuations, on average, in global inflation expectations from January 2012 to December 2022, and accounts for an even smaller fraction during the COVID-19 pandemic. Allowing for oil price noise shock – reflecting exogenous shifts in agents' optimism and pessimism – does not materially change the limited pass-through of the perceived oil price shock to inflation expectations. In contrast, perceived global supply and demand shocks dominate, especially since the onset of the pandemic. Over the first eight months, professional forecasters viewed the pandemic, on net, as a negative demand shock and lowered their short-term inflation expectations. In early 2021, professionals quickly switched their views and sharply increased their inflation expectations amid burgeoning and persistent supply chain disruptions and labor constraints.

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1 Introduction

The recent spikes in global oil prices, partly due to the Russian-Ukraine war, have led to an unprecedentedly high cost of utilities for firms and households. Against this seemingly more permanent high oil prices, economic agents sharply increased their short-term inflation expectations. Then the question is: To what extent has the perceived oil price shock contributed to global inflation expectation?

We address this question by using monthly consensus forecasts of crude oil growth, real gross domestic product (GDP) growth, and Consumer Price Index (CPI) inflation in 84 countries from January 2012 to December 2022. Forecasts for global output growth remained stable before the pandemic, dropped by about 20% in the first two quarters of 2020, then quickly recovered to pre-pandemic levels by the end of 2020. Forecasts for global inflation showed a declining trend before the pandemic, dropped further at the onset of the pandemic, then rose sharply since early 2021 amid burgeoning and persistent supply chain disruption and labor constraints. In contrast to global output growth and inflation, forecasts for West Texas Intermediate (WTI) crude oil price growth were much more volatile over the whole sample period.

We employ a factor-augmented vector autoregression model that includes the one-year ahead forecasts for output growth, inflation, and oil price, and study how these expectations respond to perceived, rather than materialized, shocks. We use sign restrictions to identify three perceived shocks: global demand shock, global supply shock and oil price shock. Our main results can be summarized as follows.

About 90% of the forecast error variance in global inflation can be attributed to perceived global demand and supply shocks, with the remaining 10% explained by the perceived oil price shock. Turning to two country groups, the perceived oil price shock plays slightly larger roles in driving one-year ahead inflation expectations in emerging countries than in advanced economies. Zooming in on the pandemic, professionals viewed the onset of the COVID-19 largely as a negative demand shock and further lowered their short-term inflation expectations. In the end of 2020, professionals' one-year ahead inflation expectations rose sharply alongside their views on supply chain and operating capacity disruptions. Thus, the evolution of inflation forecasts was mainly driven by perceived negative demand shocks in the initial months of the pandemic, and by perceived negative supply shocks at the later stage, and the perceived oil price shock played a negligible role. Allowing for oil price noise shock – identified as a shock to its forecast error – in the model does not materially change the limited contribution of the perceived oil price shock in driving global inflation expectations among professional forecasters.

Our paper builds on the large body of literature that explores the impact of oil prices on the macroeconomy, and more specifically on actual and expected inflation (Kyrtsou and Labys, 2006; Milani, 2009; Binder, 2018; Choi et al., 2018; Nasir et al., 2020; Kilian and Zhou, 2022b; Zhang, 2022). In contrast to these studies, we focus on the *perceived* oil price shock and its contribution across country groups – the perceived oil price shock accounts for about 20% of fluctuations in the expected inflation in emerging economies, compared to 10% in advanced economies.

The present paper also contributes to the burgeoning literature on the impact of the COVID-19 pandemic on economic activity and agents' expectations. For example, Bartik et al. (2020), Balleer et al. (2020), Meyer et al. (2022) and Hassan et al. (2023) found that firms, on net, saw the pandemic in 2020 as a demand shock, lowering their wages, selling prices, and short-term cost expectations. However, as the pandemic unfolded and the economy began to recover from the imposed lockdowns, the supply chain disruptions, shipping bottlenecks, and labor constraints grew in breadth and intensity, impacting the ability of firms to meet the strong surge in demand (Cavallo and Kryvtsov, 2021; Santacreu and LaBelle, 2022; Benigno et al., 2022). Against this swift change, firms rapidly ratcheted up their year-ahead cost expectations. We find that the inflation expectations of professional forecasters are consistent with firms' views of the COVID-19 pandemic. Importantly, we quantify the role of supply versus demand shocks in driving professionals' short-term inflation expectations.

Finally, our paper is related to the broader literature on the identification of shocks in structural vector autoregression (VAR) models. Particularly relevant to our work is a recent paper by Ha et al. (2021). They explore the sources of *actual* global inflation fluctuations based on *materialized* shocks in a factor-augmented VAR framework using sign restrictions. We follow their framework to study what drives global inflation *expectations* based on professional forecasters' *perceived* shocks. Furthermore, we extend their framework by allowing for "oil price noise shocks." Since the introduction of "belief shocks" by Milani (2011), these shocks have been shown as important drivers of the business cycle (Enders et al., 2021; Benhima and Poilly, 2021; Clements and Galvao, 2021;

Barrett and Adams, 2022). We find that the oil price noise shock not only has a direct effect, accounting for more than 20% of the variance in predicting global inflation in the medium term, but also indirectly limits the role of the perceived demand shock.

The rest of the paper proceeds as follows. Section 2 briefly discusses the forecast data set and constructs the global output growth and inflation expectations. Section 3 identifies various perceived shocks and explores their contributions to driving short-term global inflation expectations. Section 4 presents additional results by allowing for oil price noise shocks. Section 5 concludes.

2 Data

Our main data come from Consensus Economics, a macroeconomic survey firm in London, England. Consensus Economics has been conducting monthly surveys asking professional forecasters about their expectations of major macroeconomic indicators since 1989, and expectations of energy prices since 2012.[1] This database has three unique features for our analysis. First, the survey collects forecasts of a wide range of countries and makes it desirable to study the global economic outlook. Second, the survey is not anonymous, providing incentives for professional forecasters to be accurate and attentive. Third, the survey elicits energy price forecasts for multiple horizons, which allows us to match with macroeconomic forecasts made at certain horizons. We use consensus forecasts of real GDP growth, CPI inflation, and WTI crude oil price growth. Limited by the availability of oil price forecasts, our data span from January 2012 to December 2022 on a monthly frequency. The forecasts of GDP growth and inflation consist of a total of 84 countries (33 advanced economies and 51 developing countries), accounting for about 95% of world output and making our sample representative of the global economy.[2]

The challenge in using these GDP and inflation forecasts is that they are fixed-event forecasts. Each month, the respondents report their forecasts for the current and following calendar years. As a result, the forecast horizon shortens and these fixed-event forecasts display strong patterns over horizons, with smaller forecast errors and lower forecast dispersion on average at shorter horizons.[3]

[1] This database has been frequently used in the literature to study the expectation formation process, see, for example, Dovern et al. (2012) and Baker et al. (2020), among many others.

[2] See Table A1 for the list of countries by development stages.

[3] The evolution of forecast errors and forecast disagreement over forecasting horizons is of great interest (Lahiri and Sheng, 2008; Patton and Timmermann, 2010; Giacomini et al., 2020), but is beyond the scope of the current study.

To abstract from the forecasting horizon impact, we follow Dovern et al. (2012) to transform fixed-event forecasts for the current and following calendar years into fixed-horizon forecasts for the next 12 months:

$$F_{i,t+12|t} = \frac{k}{12} F_{i,t+k|t} + \frac{12-k}{12} F_{i,t+12+k|t}, \tag{1}$$

where $F_{i,t+k|t}$ and $F_{i,t+12+k|t}$ are the two fixed-event forecasts based on the information set at time t with horizons of $k \in 1, ..., 12$ and $k + 12$ months, respectively. The fixed-horizon forecast for the next 12 months is approximated as the average of the two fixed-event forecasts weighted by their shares in the forecast horizon.

Table 1: Summary Statistics of GDP Growth, Inflation and Oil Price Growth Expectations

	GDP Growth (%)			Inflation (%)			Oil Price Growth (%)
	All	AE	EM	All	AE	EM	
A. Full Sample: 2012M1 - 2022M12							
Mean	2.97	2.09	3.53	4.12	1.86	5.59	7.94
Std Dev	1.98	1.47	2.06	5.00	1.38	5.88	9.69
Obs	11088	4356	6732	11088	4356	6732	132
B. Pre-pandemic Period: 2012M1 - 2018M12							
Mean	3.01	1.92	3.71	3.90	1.60	5.39	9.54
Std Dev	1.91	1.33	1.91	3.80	0.80	4.21	8.69
Obs	7056	2772	4284	7056	2772	4284	84
C. Post-pandemic Period: 2019M1 - 2022M12							
Mean	2.90	2.39	3.23	4.51	2.31	5.94	5.13
Std Dev	2.09	1.64	2.27	6.59	1.94	7.99	10.76
Obs	4032	1584	2448	4032	1584	2448	48

Notes: This table shows summary statistics of GDP growth, inflation and oil price growth forecasts. Fixed-horizon forecasts are approximated as weighted averages of fixed-event forecasts in equation (1). Means and standard deviations are calculated across countries and time periods. AE: advanced economies, EM: emerging economies.

Table 1 provides summary statistics for the fixed-horizon forecasts by country groups and over three different sample periods. Comparisons across country groups reveal that forecasts of GDP growth and inflation among emerging economies are generally higher than those of advanced economies, possibly reflecting the catching-up of emerging economies. Furthermore, for most countries included in our sample, professionals increased their post-pandemic expectations for one-year-ahead output growth and inflation, while they lowered oil price growth expectations. Importantly, professionals increased their forecast disagreement significantly due to pandemic-induced uncertainty.

As our analysis focuses on global economic outlook, we estimate global inflation forecast f_t^{π} and global output growth forecast f_t^{y} using the following dynamic factor models:

$$\pi_t^i = \beta^{\pi,i} f_t^{\pi} + \epsilon_t^{\pi,i}, \tag{2}$$

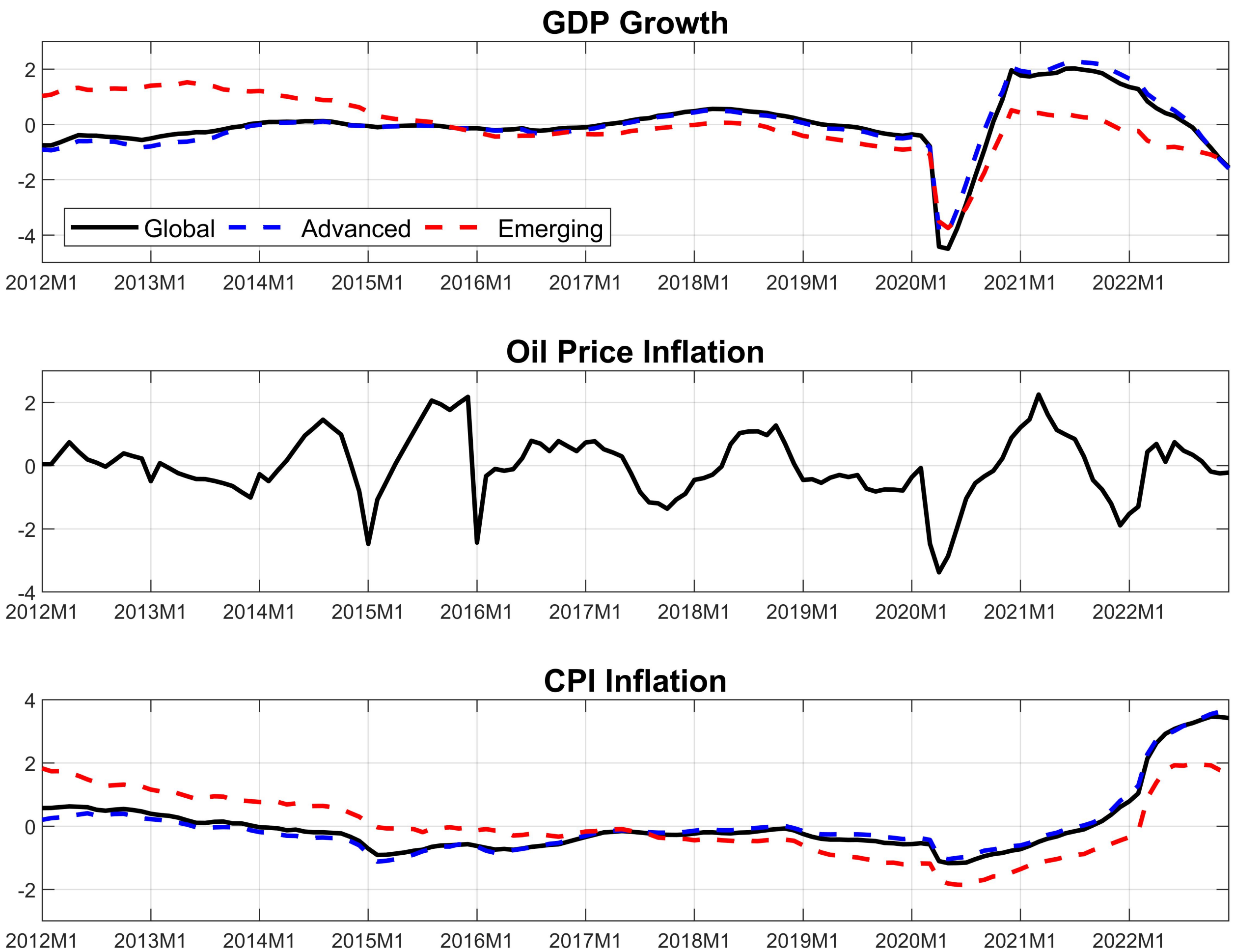
$$y_t^i = \beta^{y,i} f_t^{y} + \epsilon_t^{y,i}, \tag{3}$$

where π_t^i and y_t^i are the 12-month-ahead forecasts for inflation and output growth for country i in time t, weighted by the total output in U.S. dollars, respectively. As shown in Figure 1, forecasts for global output growth remained stable before the pandemic, dropped by 20% in March to June 2020, quickly rebounded to pre-pandemic levels by December 2020, and fell again after mid-2021. The movement in the global output growth forecast is largely driven by the dynamics in advanced economies (note that the correlation in output growth forecast between global and advanced economies is 0.98, compared with 0.48 between global and emerging economies in Table A2).

Forecasts of global inflation showed a declining trend before the COVID-19 pandemic, which was more pronounced in emerging economies than in advanced economies. At the onset of the pandemic, professionals viewed the COVID-19, on net, as a demand shock, and further lowered their one-year-ahead inflation expectations. As the pandemic wore on, amid burgeoning and (eventually) seemingly persistent supply chain disruption and labor constraints, professionals' one-year ahead inflation expectations rose quickly, and hit 40-year high for many countries, including the U.S.

On the other hand, forecasts for oil price growth were much more volatile over the whole sample period. The fluctuations from 2014 to 2016 were mainly driven by the mismatch between growing supply and changing economic growth expectations. Thereafter, the drop in 2020 was caused by multiple factors, including the failure of both Organization of the Petroleum Exporting Countries (OPEC) and non-OPEC oil producers' to agree to extend production cuts; the U.S. Shale Revolution; and most importantly, the declining demand due to the COVID-19. The surge in 2021 was caused by the imbalance of the strong, stimulus-fueled demand and reduced supply due to the crude oil output cut agreement among the OPEC, Russia, and other oil producers. The subsequent rise in 2022 was driven by the Russian-Ukraine war. As further shown in Table A2, inflation expectations have become rather insulated from oil price fluctuations – the correlation between forecasts of global inflation and oil price growth is only 0.09.

Figure 1: Forecasts of Global GDP Growth, Oil Price Growth, and Global Inflation



Notes: This figure shows the forecasts of global GDP growth, oil price growth, and global inflation. Forecast data come from the Consensus Economics covering from January 2012 to December 2022. All series are normalized to have a unit standard deviation. The global, advanced and emerging GDP growth and inflation series are estimated using dynamic factor models specified in equations (2) and (3) for all, advanced economies, and emerging economies, respectively.

3 Empirical Analysis

In this section, we analyze what drives short-run global inflation expectations. We begin by identifying perceived shocks using sign restrictions and proceed by estimating the relative contribution of each shock in explaining inflation expectations.

3.1 Identification of Perceived Shocks Using Sign Restrictions

We rely on a factor-augmented vector autoregression (FAVAR) model with sign restrictions to estimate the role of perceived shocks in driving one-year-ahead global inflation expectations. This model specification closely follows a few recent studies, such as Charnavoki and Dolado (2014) and Ha et al. (2021). Unlike these studies, however, we employ the forecasts, rather than actual data, of economic growth, inflation, and oil price, and study how these expectations respond to perceived, rather than materialized, shocks. Using forecast data has the added advantage of relatively high frequency, as the survey was conducted monthly, compared to quarterly actual inflation and output growth available for many developing countries. This minimizes the concerns over endogeneity among macro variables.

Utilizing expectations of oil price growth, global output, and inflation, the FAVAR model, in its structural form, can be specified as:

$$A_0 X_t = \sum_{p=1}^{P} A_p X_{t-p} + \varepsilon_t. \tag{4}$$

The vector X_t includes forecasts, in the following order, of global output growth, oil price growth, and global inflation. The vector of orthogonal structural shocks ε_t consists of a shock to expected global supply, a shock to expected oil price growth, and a shock to global demand. We impose sign restrictions to identify these shocks. Assuming that A_0 is invertible and has a recursive structure, the reduced-form errors can be written as $u_t = A_0^{-1}\varepsilon_t$, with the following sign restrictions:

$$\begin{bmatrix} u_t^{GrowthExp} \\ u_t^{OilPriceExp} \\ u_t^{InflationExp} \end{bmatrix} = \begin{bmatrix} + & - & + \\ + & + & + \\ + & + & - \end{bmatrix} \begin{bmatrix} \varepsilon_t^{PerceivedDemand} \\ \varepsilon_t^{PerceivedOilPrice} \\ \varepsilon_t^{PerceivedSupply} \end{bmatrix} \tag{5}$$

A perceived positive global demand shock is assumed to increase forecasts of global output, oil price, and global inflation. Meanwhile, a perceived positive oil price shock is assumed to suppress global output forecasts, but increase both oil price and global inflation forecasts. Finally, a perceived positive global supply shock is assumed to lead to forecasts of higher global output and oil price, but lower global inflation. Our identifications on perceived global demand and supply shocks are in line with the earlier literature (Kilian and Lutkepohl, 2017), and the assumption on identifying perceived oil price shock closely follows recent studies (Charnavoki and Dolado, 2014; Ha et al., 2021). Importantly, the perceived oil price shock is not driven by perceived global supply or demand shocks.[4]

3.2 Drivers of Global Inflation Expectations

We impose the sign restrictions for the first six months. The estimation follows the standard Gibbs sampling procedure and records the first 1,000 successful draws in the Bayesian estimation. Figure 2 shows the response of global inflation expectations to perceived global demand shock, oil price shock, and global supply shock for all economies and by country group.

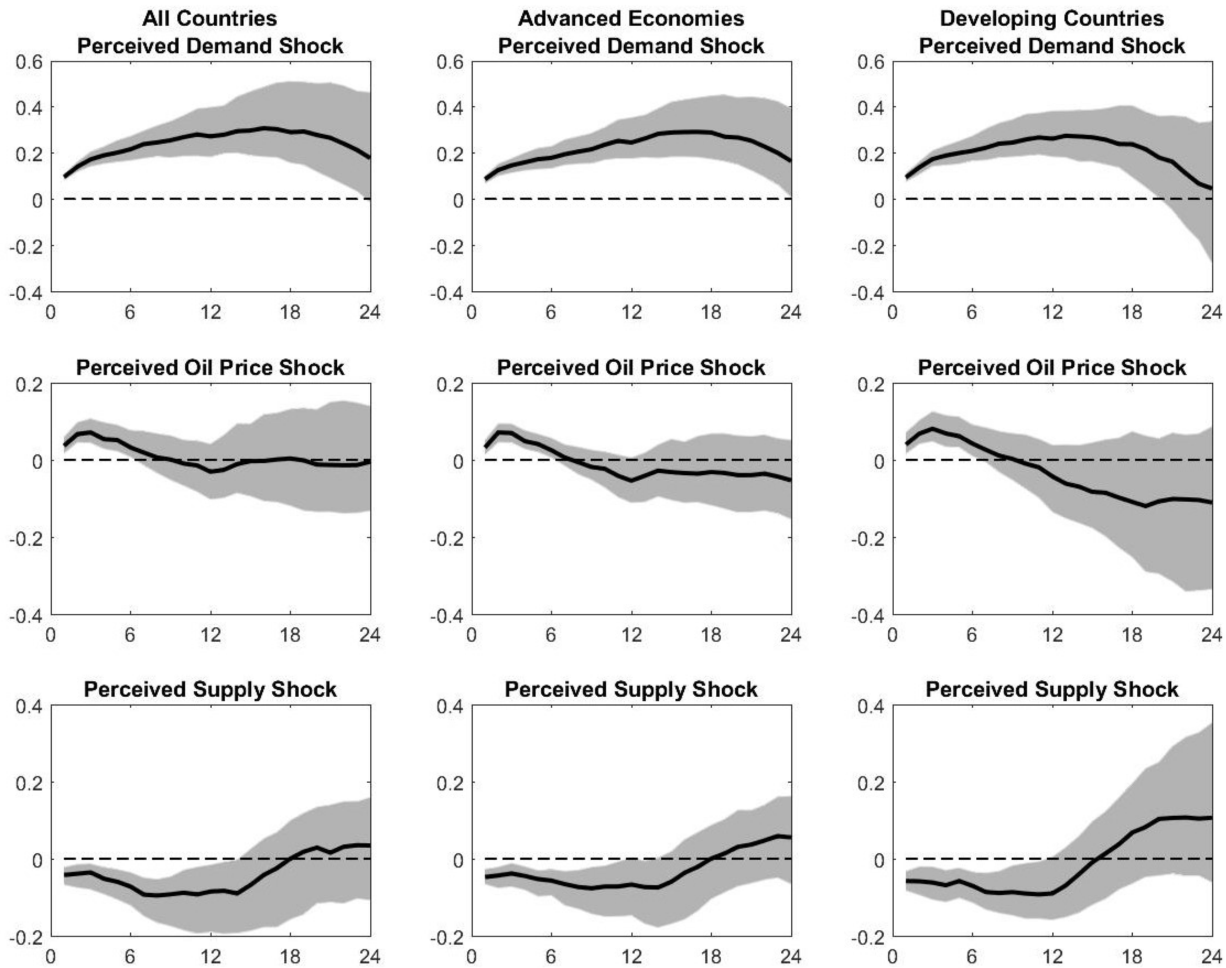
As expected, inflation expectations respond positively to the perceived global demand shock. However, such responses are very persistent among all three types of shocks that were considered. This result is different from the typically-documented, short-lived impact of the materialized demand shock. Comparisons between the two country groups indicate that the persistent impact on inflation expectations is mainly driven by the inflation outlook in advanced economies.

Following the perceived oil price shock, global inflation expectations increase, but only briefly. For all economies, the peak impact occurs in three months and fades away in about six months. This result, based on a sample of 84 countries, is consistent with Kilian and Zhou (2022a) and Kilian and Zhou (2022b), which document the transitory impact of gasoline price shocks on U.S. inflation and inflation expectations.

A positive perceived global supply shock is generally followed by large declines in global inflation expectations. This is not surprising given the sign restriction in identifying the supply shock. What is intriguing is that, compared to the demand shock, the perceived global supply shock has a much less persistent effect. Next, we delve deeper into the relative importance of demand versus supply shocks.

[4]As an example of perceived oil price shocks, on March 8, 2020, Saudi Arabia announced the unexpected price discount of 6 to 8 USD per barrel. This announcement triggered WTI and Brent crude oil to fall by 20% and 30%, respectively. As another example, WTI crude oil decreased from 60 USD per barrel in December 2019 to 16.6 USD by the end of April 2020, because of the break-up in dialogue between the OPEC and Russia over the proposed oil production cuts.

Figure 2: Responses of Global Inflation Expectations to Perceived Shocks

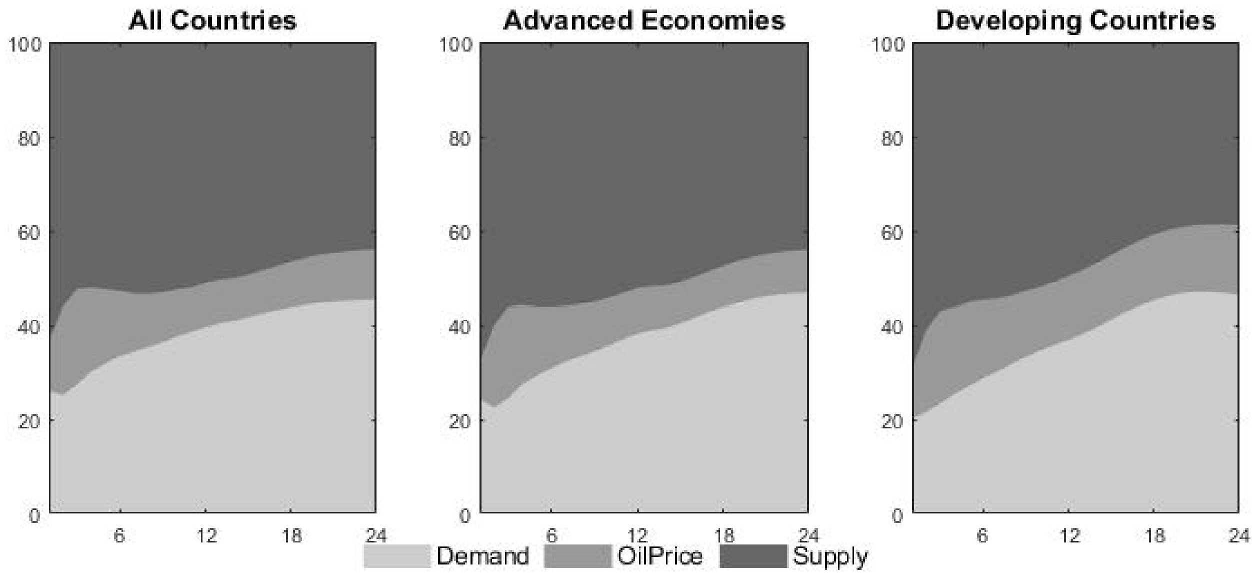


Notes: This figure shows the responses of global inflation expectations to perceived demand, oil price, and supply shocks. The responses are estimated based on the sign-restricted VAR model specified in equations (4) and (5).

We estimate the relative contributions of various perceived shocks in driving one-year-ahead global inflation expectations and present the forecast error variance decomposition result in Figure 3. The perceived oil price shock explains about 10% of global inflation expectation variance in one month, 20% in three months, and about 10% in the medium term on average. There exists substantial heterogeneity across country groups – the perceived oil price shock accounts for 20% of fluctuations in expected inflation in the medium term for emerging economies, compared with 10% for advanced economies.

Turning to the role of perceived demand and supply shocks, both shocks jointly account for about 90% of fluctuations in the global inflation expectations in the medium term. For inflation expectations in both advanced and emerging economies, perceived supply shocks dominate in the short run (i.e. less than 12 months), but both shocks contribute roughly equally in the medium term (i.e. 24-month ahead).

Figure 3: Drivers of One-year-ahead Global Inflation Expectations



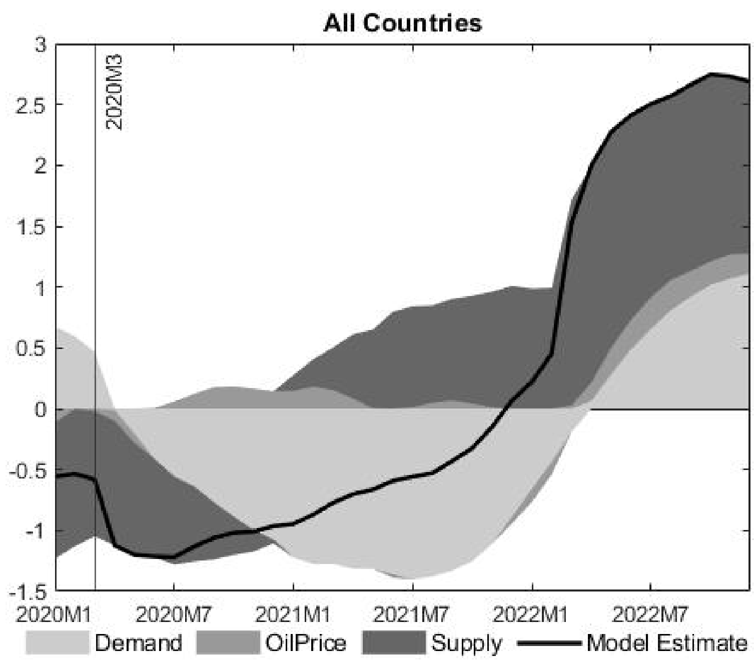
Notes: This figure shows the forecast error variance decomposition in predicting one-year-ahead global inflation based on the sign-restricted VAR model in equations (4) and (5).

Figure 4 zooms in on the COVID-19 pandemic period. Before the pandemic, professional forecasters viewed demand and supply shocks as being positive, and the oil price shock as negative. The low inflation expectations were attributed to the perceived positive global supply shock and, to a much less extent, negative oil price shock, but its deflationary impact was partially offset by the perceived positive global demand shock.

At the outset of the pandemic, mandated lockdowns shuttered many nonessential businesses and left households in their homes, resulting in dramatic falls in consumer spending and business investment. Professional forecasters, on net, largely saw the COVID-19 over the first year as a negative demand shock and lowered their one-year-ahead inflation expectations. This is consistent with the results documented in recent literature that firms viewed the beginning of the pandemic as a demand shock, lowering their near-term cost expectations and selling prices; see, e.g., Bartik et al. (2020), Balleer et al. (2020), Meyer et al. (2022), and Hassan et al. (2023).

Yet, by the end of 2020, broadening and intensifying supply chain disruption led to elevated costs and item stockouts (Cavallo and Kryvtsov, 2021), much higher producer price index (Santacreu and LaBelle, 2022), and accelerated transportation costs (Benigno et al., 2022). These supply chain disruptions and bottlenecks, along with labor constraints, placed significant upward pressure on professionals' one-year-ahead inflation expectations. Entering into 2022, especially since the beginning of the Russian-Ukraine war, these negative supply shocks were perceived as being more permanent. In the meantime, professionals switched their views on the demand shock from being negative to positive. The imbalance of the strong, stimulus-fueled demand and reduced supply contributed to the 40-year high global inflation expectations.

Figure 4: Zooming in on the COVID-19 Pandemic Period



Notes: This figure shows the forecast error variance decomposition in predicting one-year-ahead global inflation during the COVID-19 pandemic period, based on the sign-restricted VAR model in equations (4) and (5).

4 Impact of the Oil Price Noise Shock

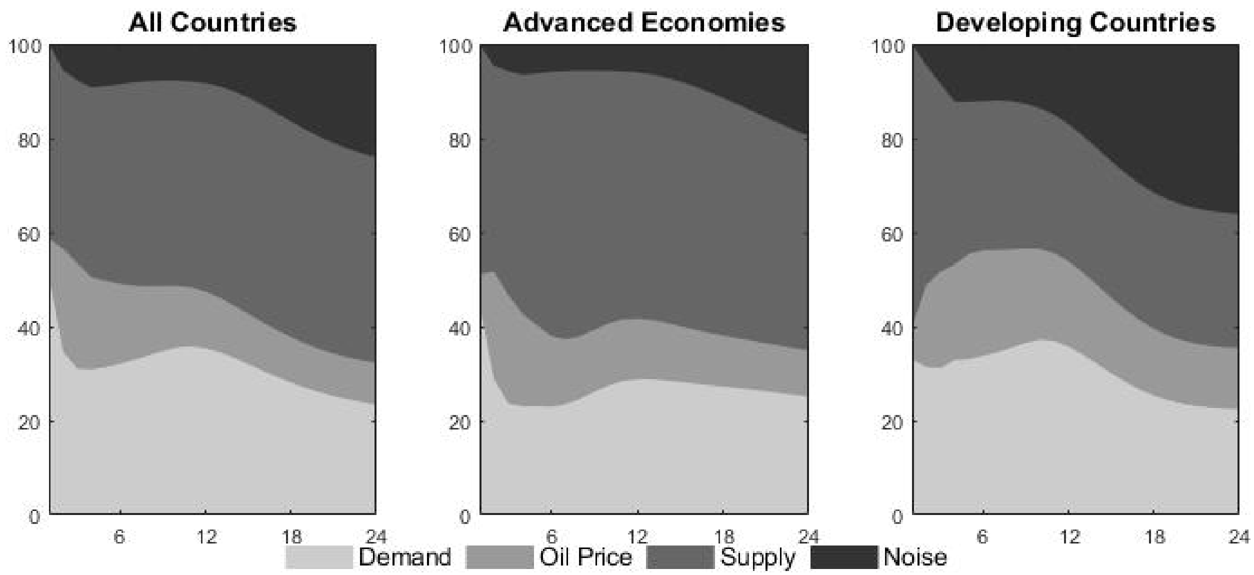
In line with recent studies that emphasize "noise shocks" as important drivers of the business cycle, in this section, we extend the FAVAR framework by allowing for oil price noise shock, reflecting exogenous shifts in agents' optimism and pessimism.[5] Our goals are to investigate the effect of oil

[5] Enders et al. (2021) define belief shocks as shocks to expectations about the current situation of the economy. Benhima and Poilly (2021) identify supply noise and demand noise shocks based on survey forecast errors about output growth and inflation. Clements and Galvao (2021) use GDP data revisions to isolate expectation shocks. Barrett and Adams (2022) identify the expectation shock as that which causes measured inflation expectations to

price noise shock on inflation expectations and to study how it alters the impacts of the three other perceived shocks, if any.

Specifically, we include oil price forecast error as an additional variable in the VAR specification. These forecast errors are not available to professionals at the time making their forecasts, and thus affect three other variables – forecasts for output growth, inflation and oil price growth – with at least a one-month lag. For this reason, we rank the oil price forecast error as the fourth variable in the VAR model specification and identify the oil price noise shock as the shock to its forecast error. Forecast errors, defined as the difference between actual values and forecasts, are negative for most of the sample period, indicating that professional forecasters were a bit too pessimistic with their oil price growth expectations; see Figure A1. Since the onset of the COVID-19 pandemic, however, professionals became overly optimistic by making positive, sizable, and persistent forecast errors, echoing the earlier result documented in Alquist et al. (2013) that the Consensus Economics oil price forecast data are poor predictors.

Figure 5: Drivers of Global Inflation Expectations by Allowing for Oil Price Noise Shock



Notes: This figure shows the forecast error variance decomposition in predicting one-year-ahead global inflation in the VAR framework. The model includes four variables in the following order: forecasts of global output growth, oil price growth, and global inflation, as well as oil price forecast errors. The perceived global demand, oil price, and global supply shocks are identified using sign restrictions as specified in equation (5). The oil price noise shock is identified using Cholesky decomposition as the shock to its forecast errors.

diverge from rationality.

As shown in the forecast error variance decomposition in Figure 5, adding an oil price noise shock does not directly affect inflation expectations on impact, but its contribution quickly increases over horizons. As the forecast horizon gets longer from 1 month to 24 months, the oil price noise shock becomes an important driver of inflation expectations. This effect is even more pronounced in developing countries than in advanced economies.

Furthermore, having the oil price noise shock in the model indirectly limits the role of the perceived demand shock in the medium term, which explains about 20%-30% of the variance in predicting global inflation, compared with 40%-50% in the baseline result (Figure 3).

5 Conclusions

By utilizing monthly professional forecasts of real GDP growth and CPI inflation in 33 advanced economies and 51 developing countries, we estimate global output growth and global inflation forecasts as the underlying common factors in the principal component analysis. We then study how short-term global inflation forecasts respond to various perceived shocks – global demand shock, global supply shock, and oil price shock. Under a factor-augmented VAR framework, we identify these perceived shocks using sign restrictions.

The perceived oil price shock explains about 10% of the forecast error variance in global inflation over the whole sample period covering January 2012 to December 2022, and plays a negligible role during the COVID-19 pandemic period (beginning March 2020). Allowing for oil price noise shock – which captures exogenous shifts in agents' optimism and pessimism in the VAR model – does not materially change the limited pass-through of the perceived oil price shock to inflation expectations among professional forecasters.

In contrast, perceived global supply and demand shocks jointly account for about 90% of the fluctuations in global inflation expectations on average. In particular, professional forecasters viewed the pandemic over the first eight months, on net, as a negative demand shock and lowered their short-term global inflation expectations. In the end of 2020, however, professionals quickly increased their global inflation expectations amid burgeoning and (eventually) seemingly persistent supply chain disruptions and labor constraints. Entering into 2022, professionals switched their views on the demand shock from being negative to positive. The imbalance of this strong demand

and limited supply contributed to the 40-year high global inflation expectations.

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Appendix

Table A1: Country List

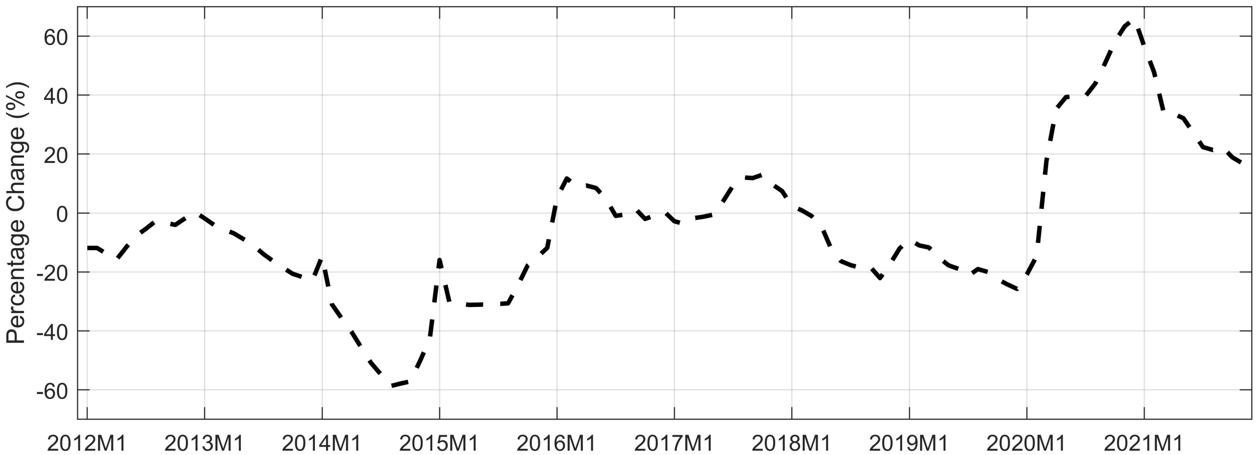
Advanced Economies	Emerging Markets and Developing Economies	
Australia	Albania	Panama
Austria	Argentina	Paraguay
Belgium	Armenia	Peru
Canada	Azerbaijan	Philippines
Cyprus	Bangladesh	Poland
Czech Republic	Belarus	Romania
Denmark	Bolivia	Russia
Estonia	Bosnia and Herzegovina	Saudi Arabia
Finland	Brazil	Serbia
France	Bulgaria	South Africa
Germany	Chile	Sri Lanka
Greece	China	Thailand
Hong Kong SAR	Colombia	Turkey
Ireland	Costa Rica	Turkmenistan
Israel	Croatia	Ukraine
Italy	Dominican Republic	Uruguay
Japan	Ecuador	Uzbekistan
Korea	Egypt	Vietnam
Latvia	El Salvador	
Lithuania	Georgia	
Netherlands	Guatemala	
New Zealand	Honduras	
Norway	Hungary	
Portugal	India	
Singapore	Indonesia	
Slovak Republic	Kazakhstan	
Slovenia	Malaysia	
Spain	Mexico	
Sweden	Moldova	
Switzerland	Nicaragua	
Taiwan PRC	Nigeria	
United Kingdom	Macedonia	
United States	Pakistan	

Table A2: Correlation Among Forecasts of Real GDP Growth, Inflation, and Oil Price Growth

	Real GDP Growth			CPI Inflation			Oil Price
	All	AE	EM	All	AE	EM	Growth
Real GDP Growth							
All	1						
AE	0.98	1					
EM	0.48	0.34	1				
CPI Inflation							
All	0.14	-0.01	0.81	1			
AE	0.30	0.21	0.53	0.83	1		
EM	-0.05	-0.20	0.81	0.85	0.41	1	
Oil Price Growth							
Oil	0.44	0.40	0.35	0.09	0.01	0.17	1

Notes: This table shows correlations among real GDP growth, inflation, and oil price growth forecasts. Fixed-horizon forecasts are approximated as weighted averages of fixed-event forecasts in equation (1). AE: advanced economies, EM: emerging economies.

Figure A1: Crude Oil Price Growth Forecast Error



Notes: This figure shows the crude oil price growth forecast error, defined as the difference between the actual value and the forecast. Fixed-horizon forecast errors are constructed following equation (1). Forecast data are retrieved from the Consensus Economics, and actual values are retrieved from the Organisation for Economic Co-operation and Development (OECD) database.