FPAS and prudent risk management in Colombia

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Outline

Three points about the recent Colombian experience:

- Integrating supply and weather-related shocks in our FPAS
- Incorporating alternative narratives into FPAS
- Building alternative scenarios from predictive densities

Supply and weather-related shocks

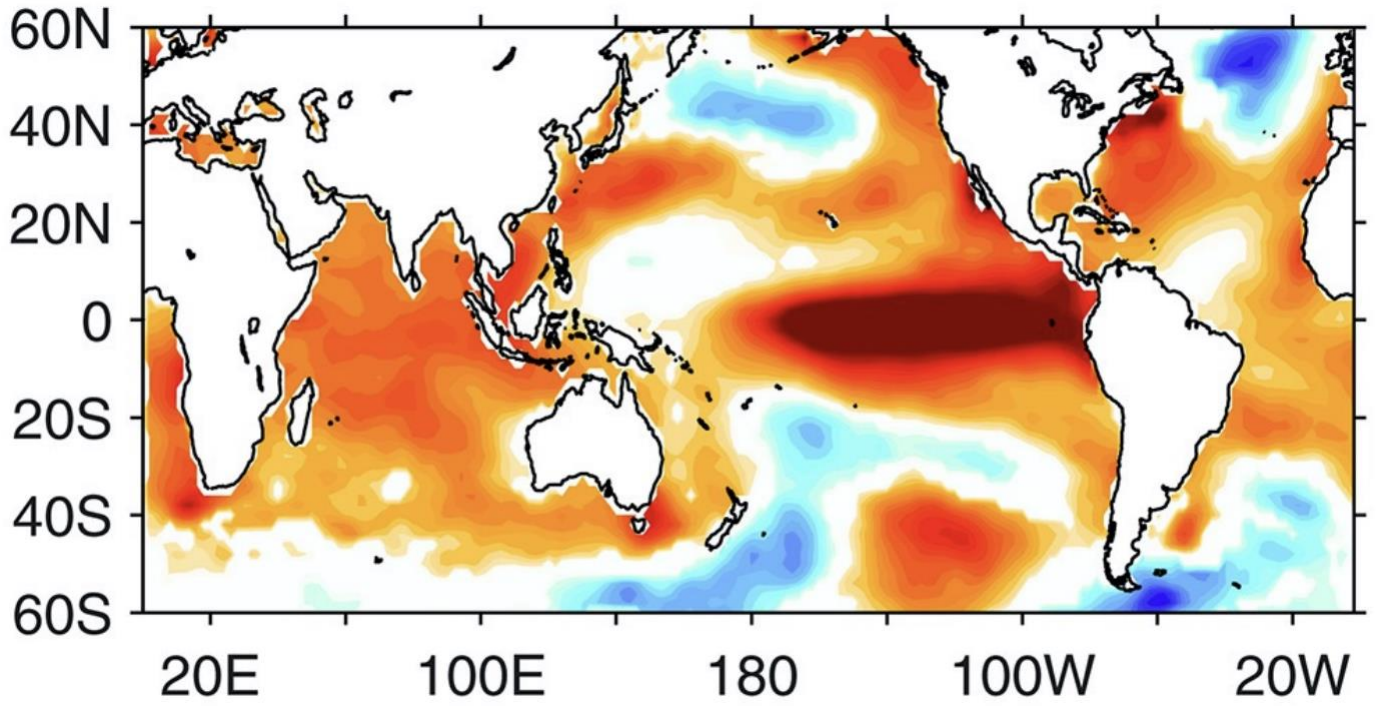
FPAS and supply and weather-related shocks

- The Colombian economy has been susceptible to supply shocks and weather fluctuations, (particularly attributable to the El Niño Southern Oscillation (ENSO)).
- Weather shocks coexist with diverse shocks that buffett small open economies affecting inflation, expectations, and the monetary policy response.
- Accurately discerning these distinct shocks holds intrinsic value beyond mere forecasting enhancements.
- It serves as a guiding compass amid economic turbulence, enabling agile and informed policymaking.
- Disentangling the intricate impacts of supply shocks and weather variations, we aim to fortify our predictive models, equipping policymakers with insights crucial for proactive and adaptable strategies.

SUPPLY AND WEATHER SHOCKS: The significance of ENSO IN COLOMBIA

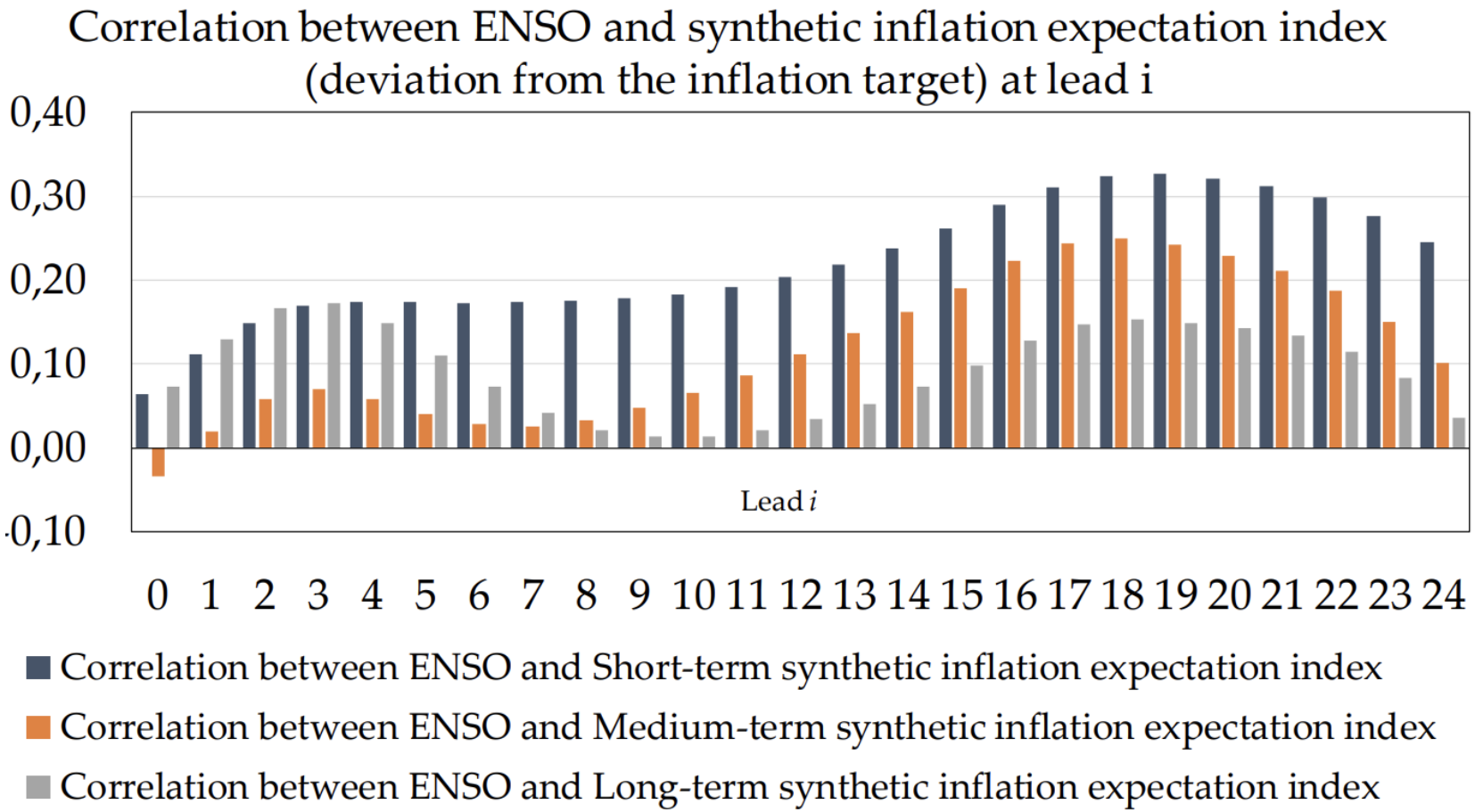
The ENSO is a recurring climate pattern involving changes in the temperature of waters in the central and eastern tropical Pacific Ocean. The oscillations in the warming and cooling pattern directly affect the rainfall distribution in the tropics.

In 2014-2016 the ENSO episode was particularly strong and had a significant impact in Colombia



Source: Santoso et al (2017). Notes: Sea Surface Temperature (SST) anomalies at the mature phase of the 2014 -2016 El Niño event

ENSO fluctuations and inflation expectations in Colombia



Source: Weather Shocks and Inflation Expectations in Semi-Structural Models (Romero et al., 2023).

TWO approaches: BVAR

To assess the impact of ENSO shocks on the inflation expectations we use and empirical approach and a semi structural model that incorporates the ENSO weather channels

The first approach is a BVARx that takes the following form:

$$y_t = Ay_{t-1} + Bx_t + \mu_t$$

The residuals are distributed according to:

$$\mu_t \sim \mathcal{N}(0, \sum)$$

the vector y_t is given by:

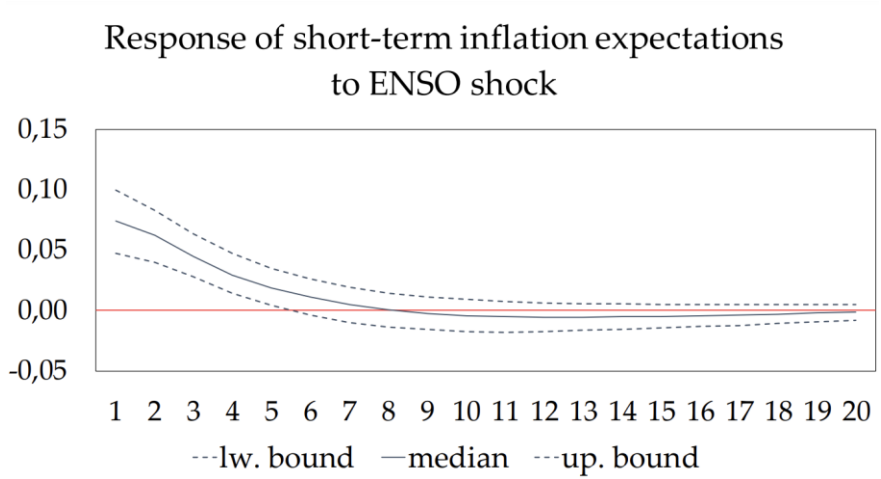
$$y_t = \begin{matrix} p_t^{f*} \\ RER_t \\ \pi_t^s \\ RP_t \\ IP_t \\ \pi_{i,t} - \bar{\pi} \end{matrix}$$

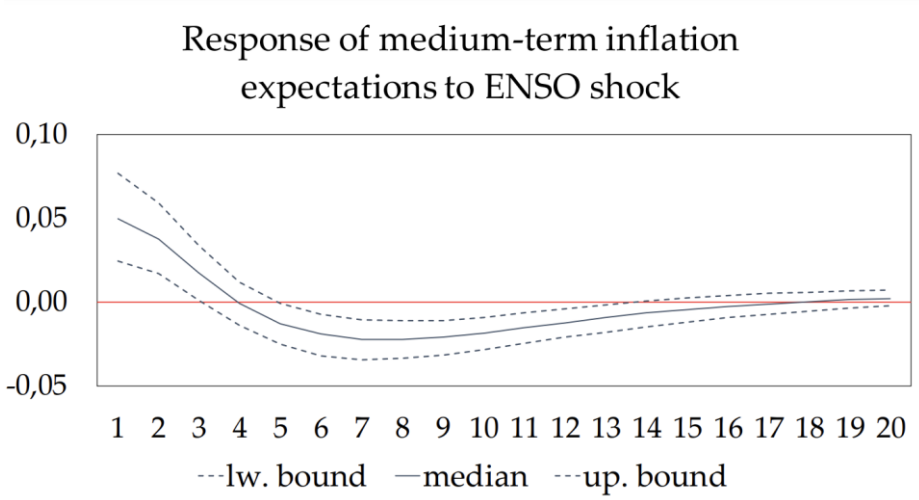
Where $p_t^{f*}, RER_t, RP_t \text{ and } IP_t$ denote the log-deviations of the World Bank's international food price index, the real exchange rate, the relative price of local food prices, and industrial production from the HP filter trend, respectively

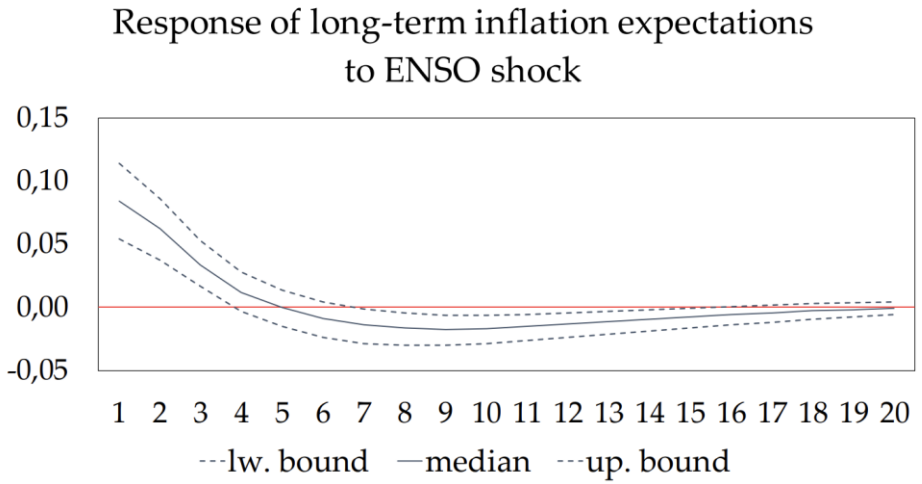
π_t^s represents the short-term monthly inflation surprises that are obtained from Banco de la República's monthly survey and $\pi_{i,t} - \bar{\pi}$ refers to different the inflation measures as a deviation from the inflation target. In x_t we include the ENSO index.

FIRST approach: BVAR

Response of our synthetic inflation expectations indicators (as deviations from the inflation target) after one standard deviation shock in the ENSO index. The weather shock associated with droughts in Colombia increase the deviation of inflation expectations from the inflation target.







SECOND approach: SEMI-STRUCTURAL NEOKEYNESIAN MODEL

Weather shocks affect inflation expectations, even after controlling for other supply-related shocks and fundamentals potentially making second round of effects relevant for monetary policy.

So, use a SOE NKM where weather shocks have direct impact on (key prices like food and regulated items) inflation and inflation expectations depending on the degree of credibility of the central bank.

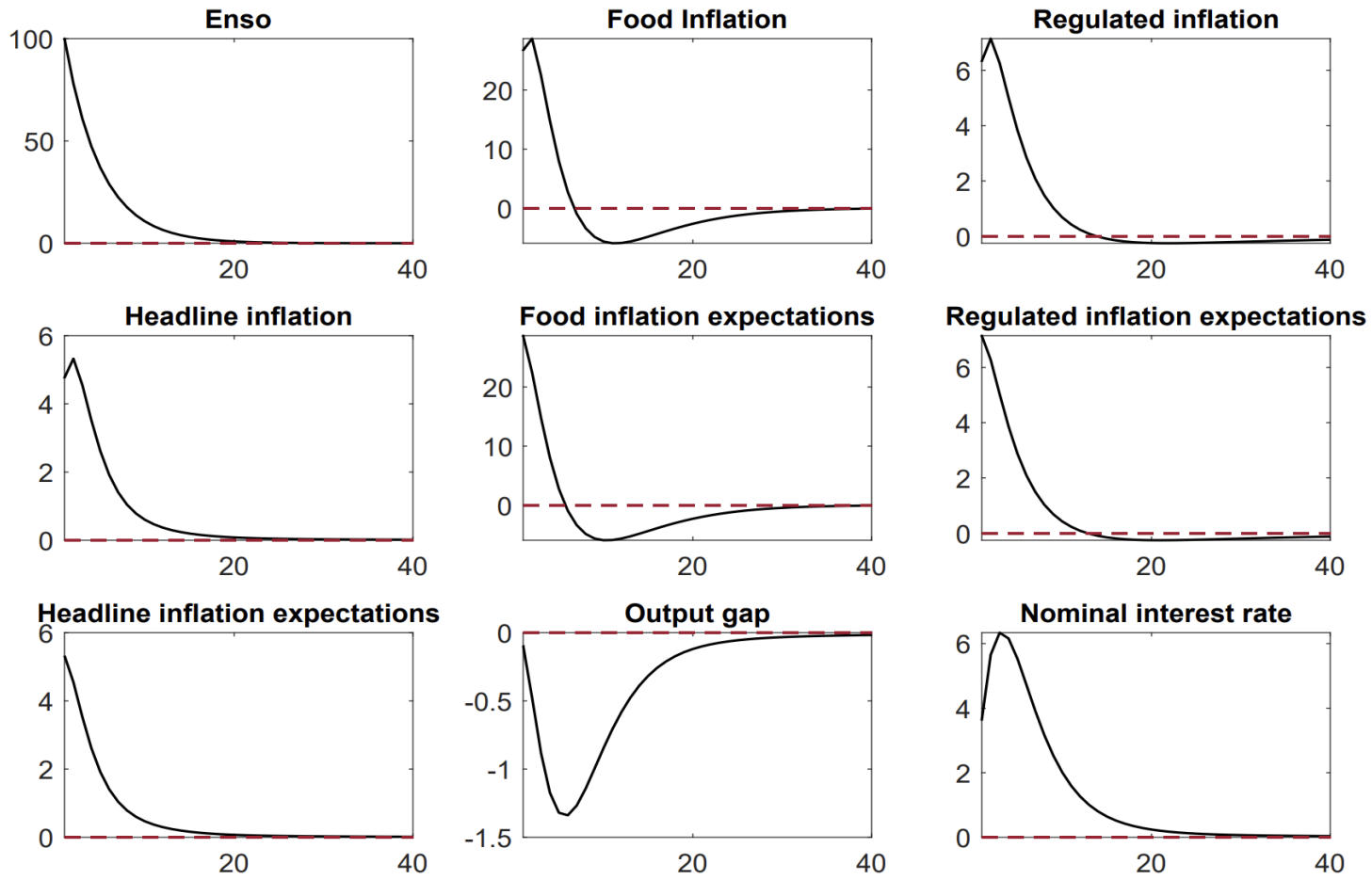
Four block model:

1. IS Curve
2. Phillips curves for Food, regulated, goods and services
3. Risk adjusted UIP
4. Taylor Rule

The Phillips curve's marginal cost for food and regulated goods is influenced by the ENSO index. Consequently, a rise in oceanic temperatures triggers an impulse in overall inflation and its expectations (affected by cost of credibility)

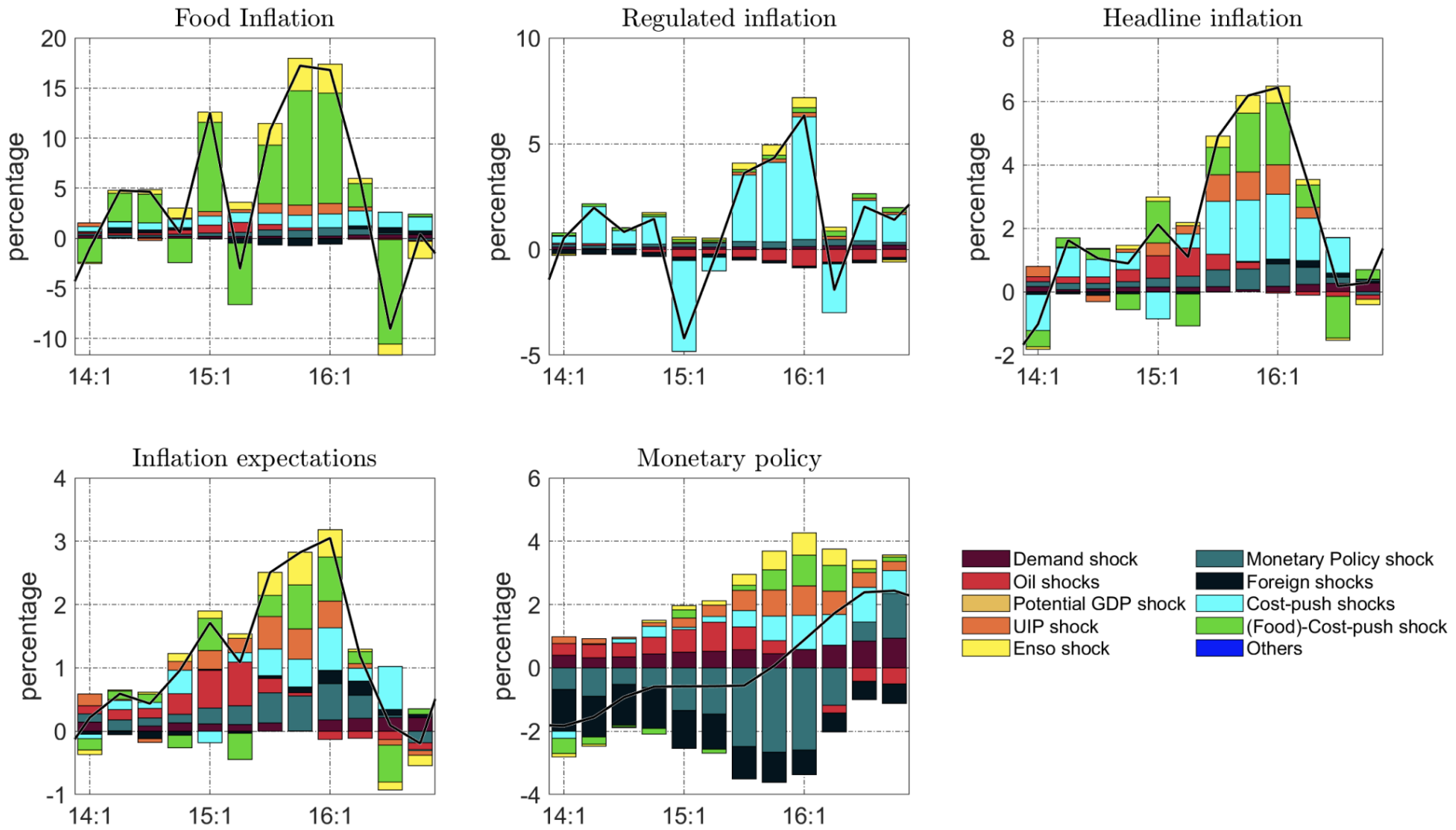
SECOND approach: SEMI-STRUCTURAL MODEL

Response of selected variables(deviation from the steady state) to a one-unit (100pb) Enso shock. The responses of the endogenous variables are in basis points



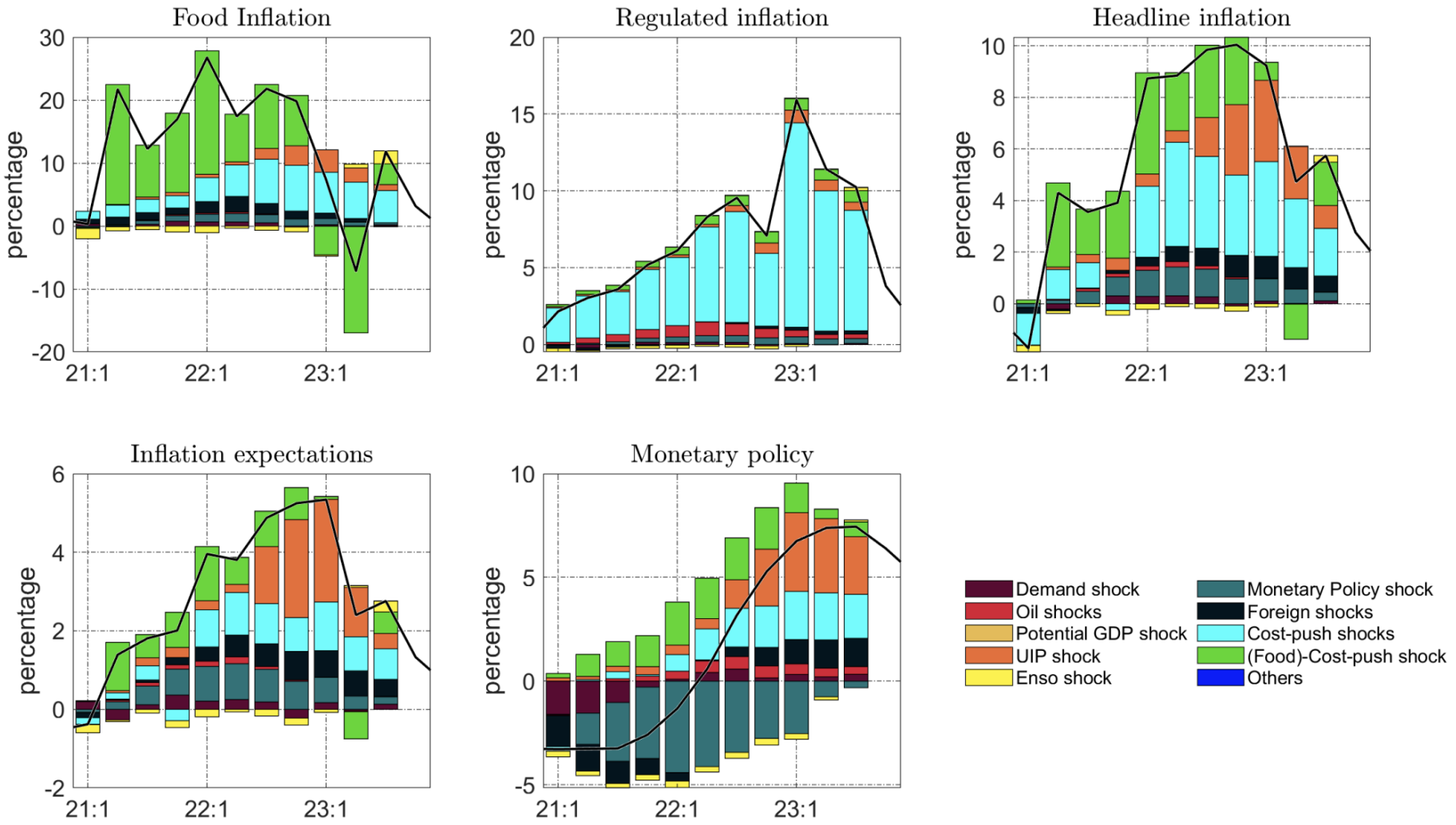
SECOND approach: SEMI-STRUCTURAL MODEL

2014-2016 Historical Decomposition as the deviation from the steady state.



SECOND approach: SEMIESTRUCTURAL MODEL

2021-2023 Historical Decomposition as the deviation from the steady state.



Professional forecasters narratives during the pandemics

Macroeconomic narratives and FPAS

Comprehensive use macroeconomic forecasts of professional forecasters collected through surveys to assess “narratives” about shocks hitting the economy.

Compare narratives in terms of a comparable measure across forecasters i.e. the shocks (e.g. demand, supply, monetary policy, etc.) driving the professional forecasters and Central Bank of Colombia (CBC) projections of a set of policy-relevant variables.

Shocks (and other policy-relevant variables) are derived from the projections of the professional forecasters and the CBC using a benchmark economic model of the Colombian economy as an interpreter.

By comparing the concordance of the narratives of the professional forecasters with the views of the CBC may help gauge the uncertainty surrounding a certain outlook

*Find details of this work in: Unravelling the narratives behind macroeconomic forecasts (De Castro et al., 2022).

A reverse engineering approach

Idea:

- Use the semi-structural New Keynesian model of a small open economy as a multivariate filter to interpret forecasts in terms of shocks. This way we have a **rigorous and invariant** interpreter across agents

- This may not be the true model of each analyst, but it captures all the core macroeconomic relationships and can be seen as a plausible characterization of the way analysts think about the Colombian economy

Useful approach to:

- Compare how do agents' forecasts differ from central bank's narratives.
- Identify the main shocks behind projected endogenous variables and study how these might evolve through time for the CBC and the analysts.
- Explain and track market's uncertainty about the future in terms of analysts' disagreement with the Central Bank about the shocks.

The interpreter

Semi-structural New-Keynesian model for a small open economy based on the canonical model of IMF (Carabenciov et al., 2008).

- Standard in Macro and has flexibility with free parameters.
- Well-behaved in the empirical validation

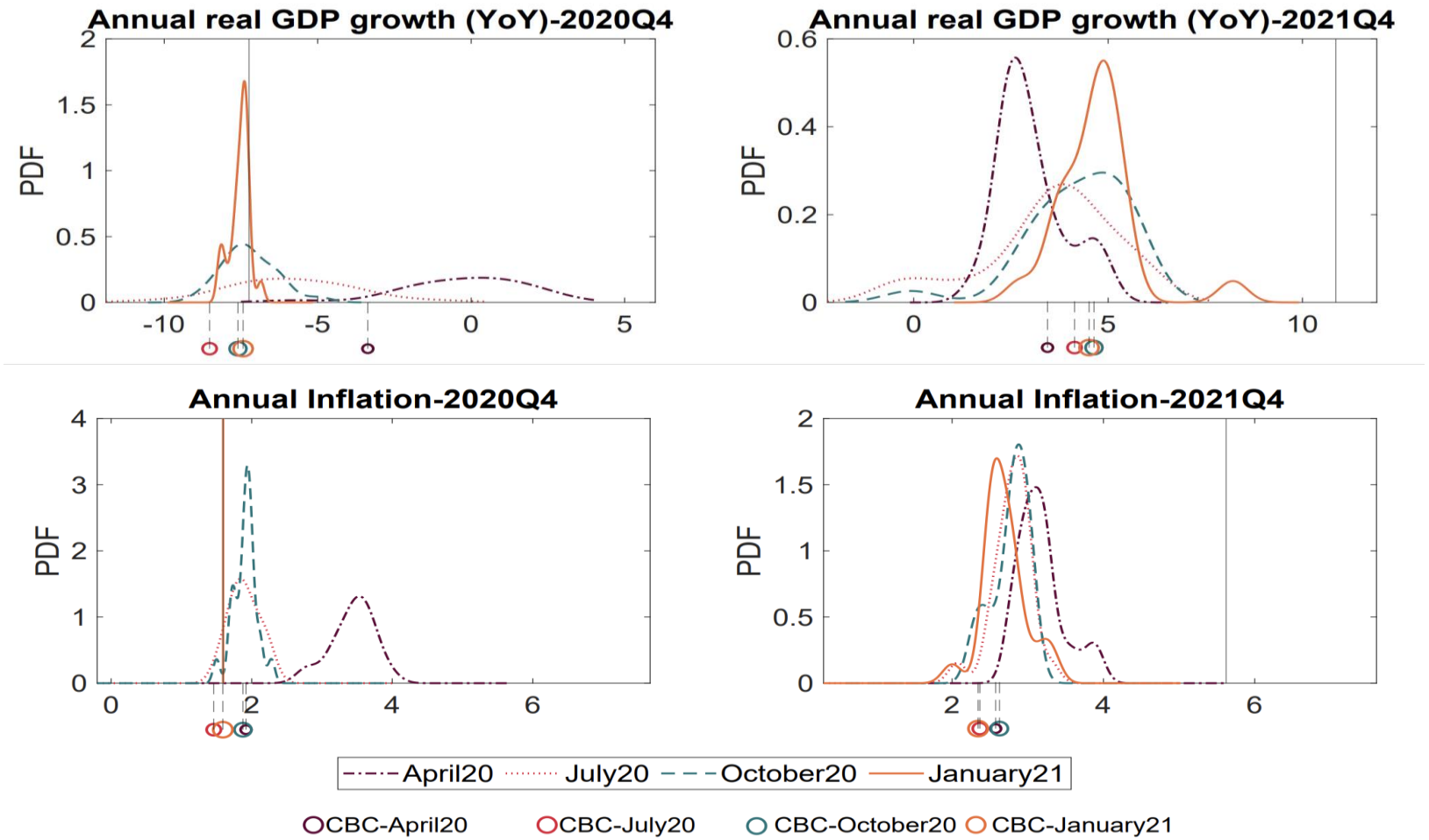
The model is divided into four blocks:

1. IS Curve
2. Phillips curves for Food, regulated, goods and services
3. Risk adjusted UIP
4. Taylor Rule

Pandemic narratives

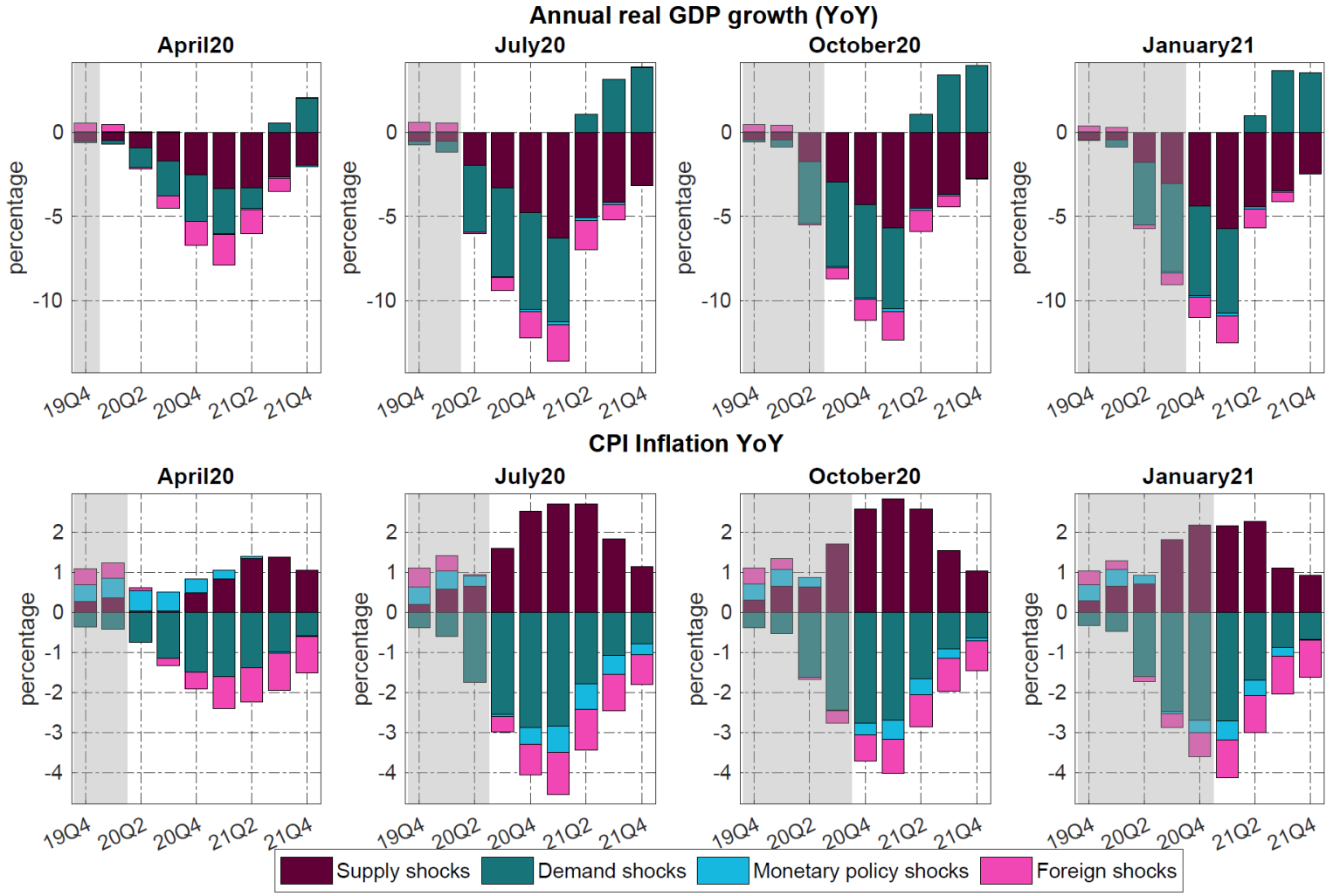
In 2019:Q4 professional forecasters expected growth close to potential (3.5%) and inflation on target (3%). Then came the pandemics…

Central Bank Forecasts and Analysts' Forecasts Distributions



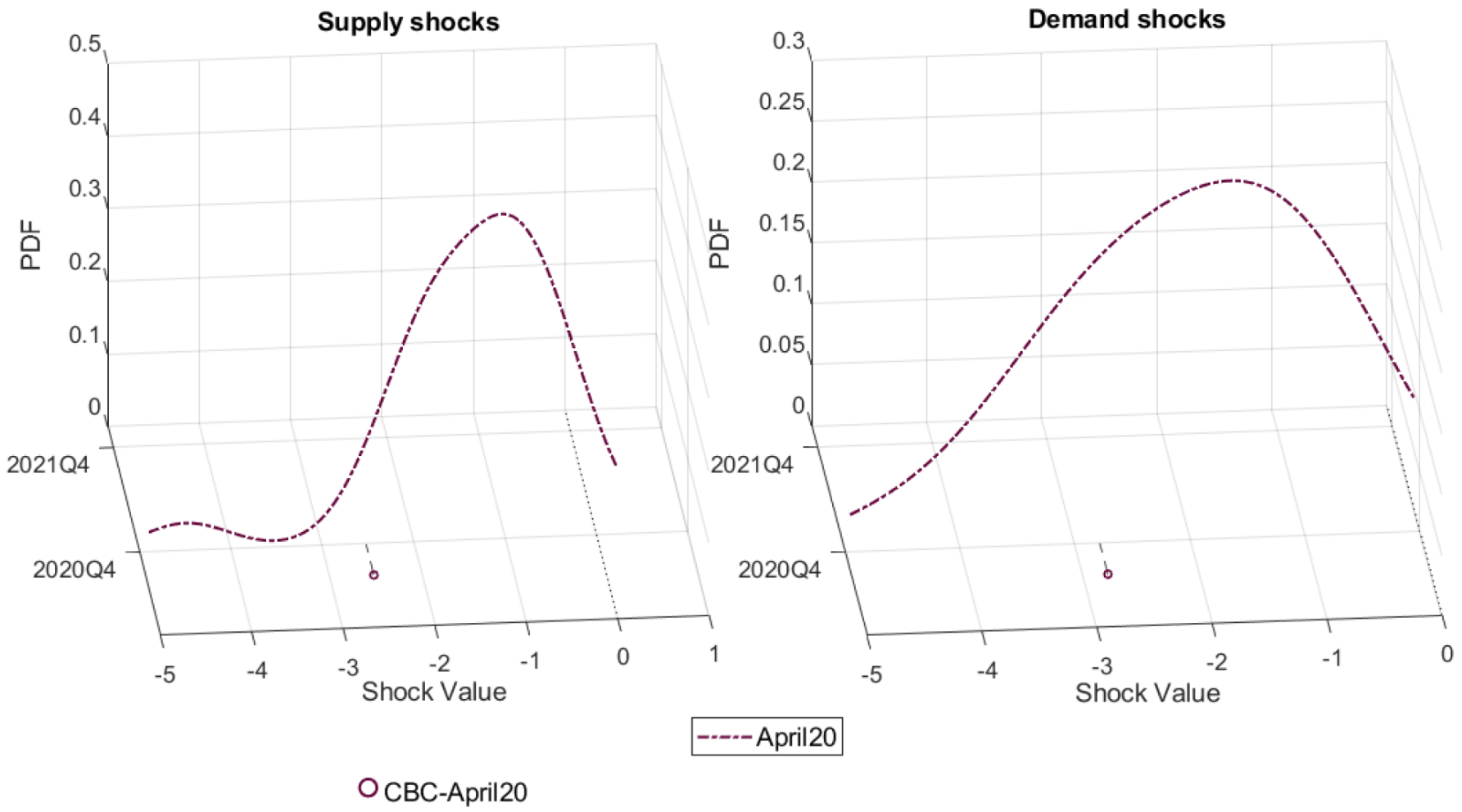
Change in narrative of the median professional forecaster during 2020-2021

COVID-19 was seen as a combination of negative supply and demand shocks. MP shocks was seen as quite restrictive but quantitatively much smaller.



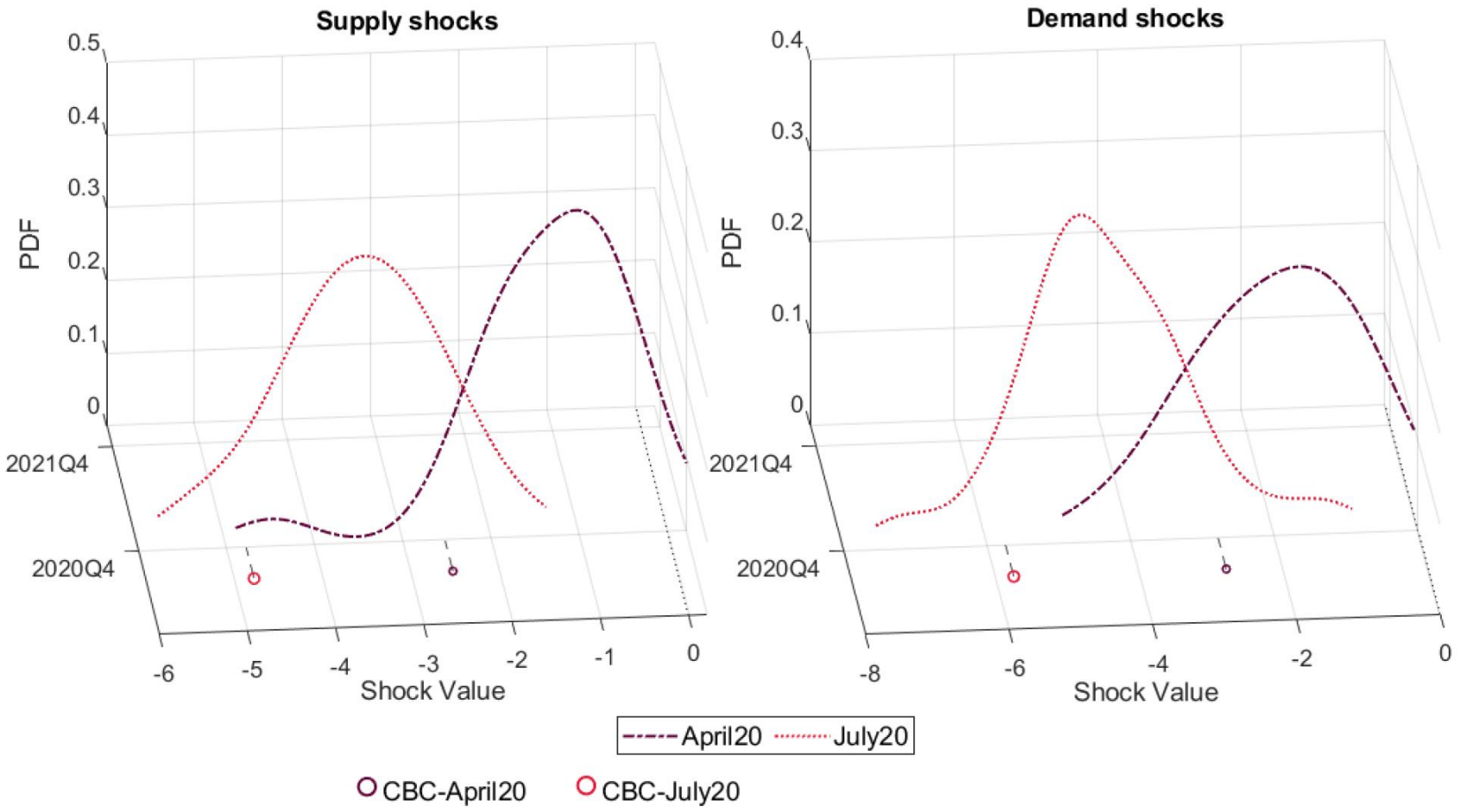
Pandemic narratives- Analyst agree?

At first, the CBC estimated more adverse supply and demand shocks than most analysts



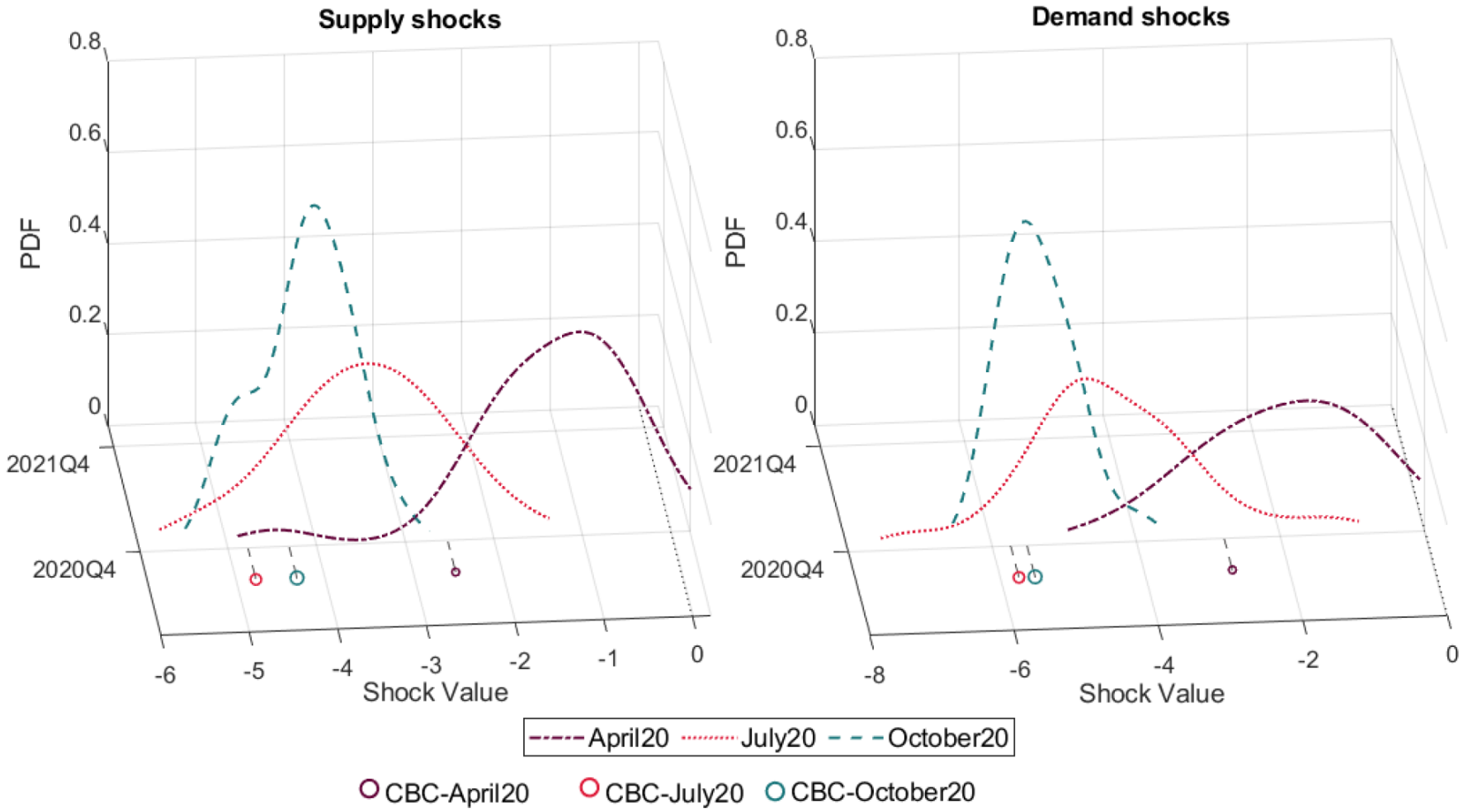
Pandemic narratives- Analyst agree?

In July20, all analysts and CBC expected more negative supply and demand shocks. Uncertainty among analysts about the magnitudes of the shocks did not decrease.



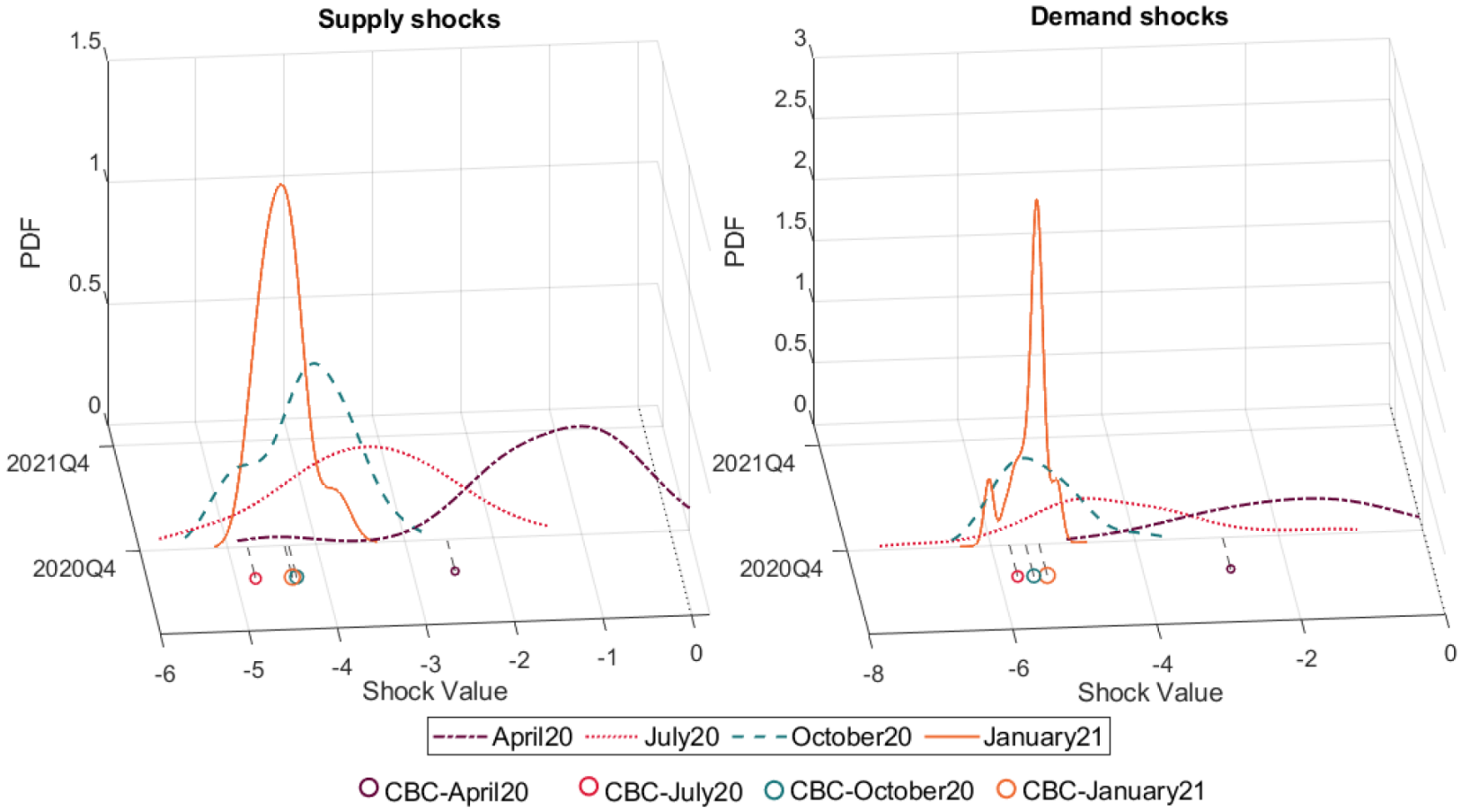
Pandemic narratives- Analyst agree?

In October 2020, the mean of the distribution of supply and demand shocks got closer to the central bank's projection.



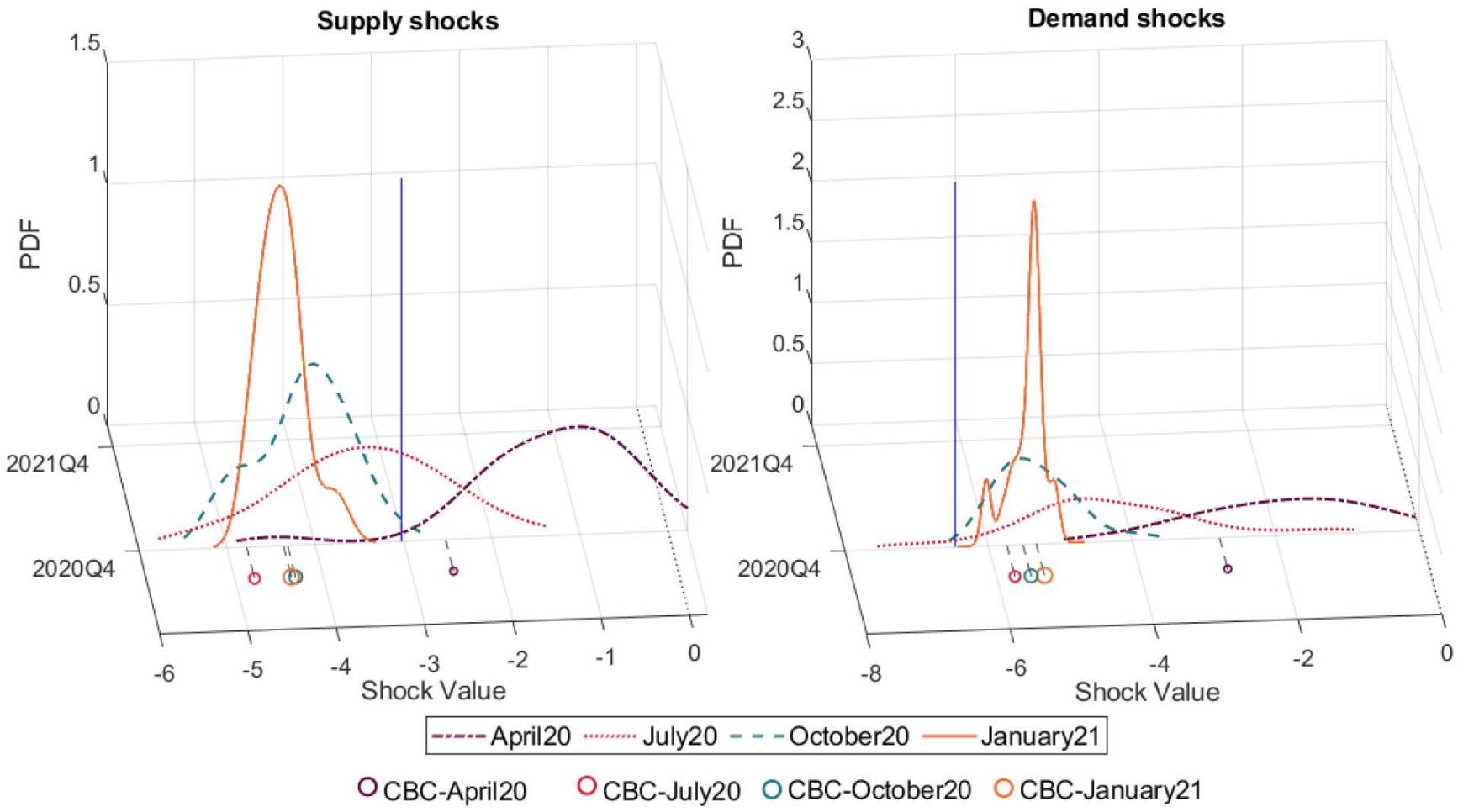
Pandemic narratives- Analyst agree?

In October20, the mean of the distribution of supply and demand shocks got closer to the CBC's projection. Supply shocks were less negative and demand shocks more severe than expected in January21



Pandemic narratives- Analyst agree?

Analysts' expectations of supply and demand shocks explaining 2021 GDP growth moved towards similar values to the ones expected by the CB



FPAS scenario building and predictive densities

Macro Models and Monetary Policy Framework

- Stabilize inflation around target and output around sustainable level

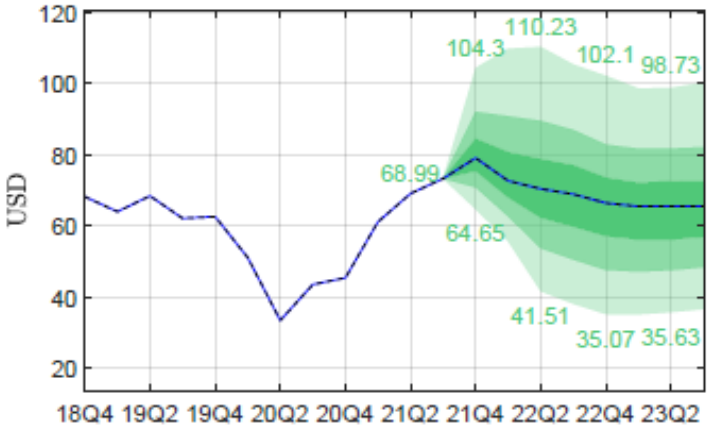
$$Loss = \sum \beta^k \{(\pi_{t+k} - \pi^*)^2 + \alpha(y_{t+k} - y_t^*)^2\}$$

subject to the structure of the economy (i.e. CB's models)

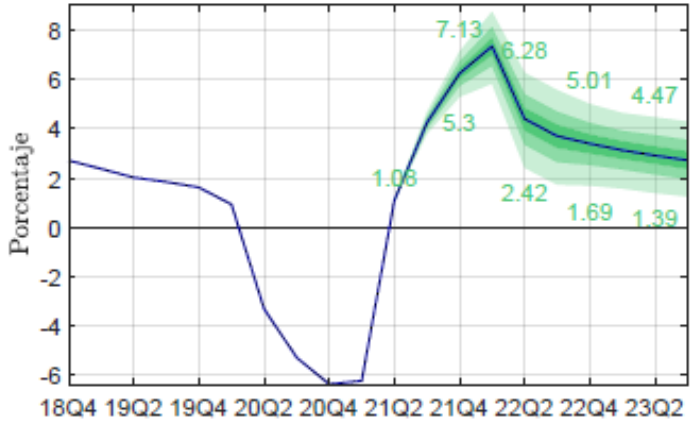
- Monetary policy lags -> need to forecast π and y
- Macro forecast conditioned to:
  - Assessment of current state of the economy and shocks (SD's)
  - Transmission mechanisms of shocks (IRF's)
  - Probability distribution of shocks -> Probability distribution of endogenous variables (including MP response!)
- DSGE models play a key role as analytical framework to analyze and set policy, and publish and communicate the macroeconomic forecast (a probability distribution) of the technical staff to the public.
- The staff judgement is fundamental. In fact, it is the staff's forecast, not the model's!

Judgement of exogenous factors, using Bayesian predictive densities

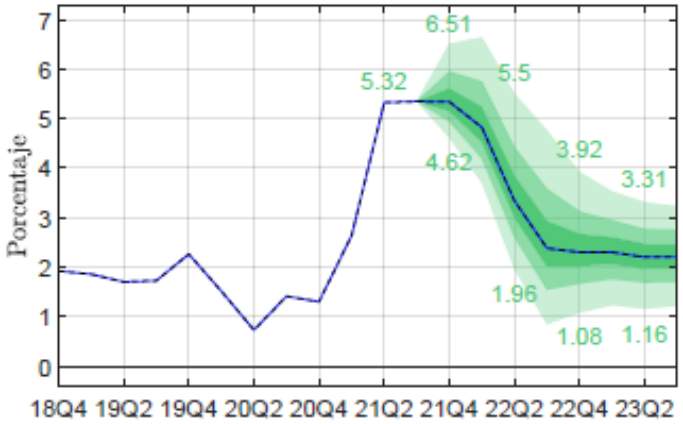
Oil Price, BRENT (USD)



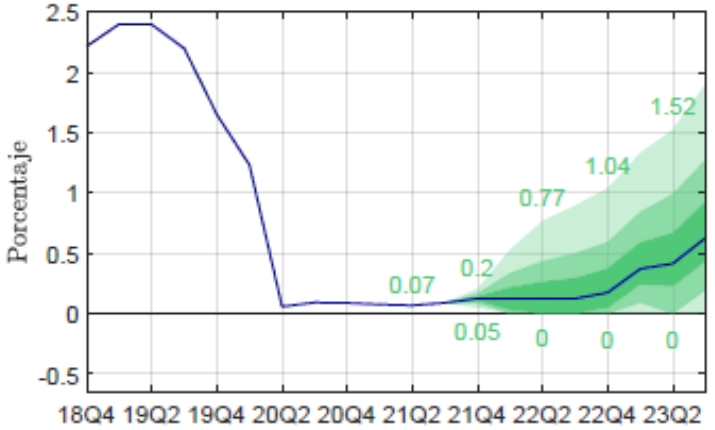
GDP commercial partners (%, yoy)



US Consumer Price Index (%, yoy)



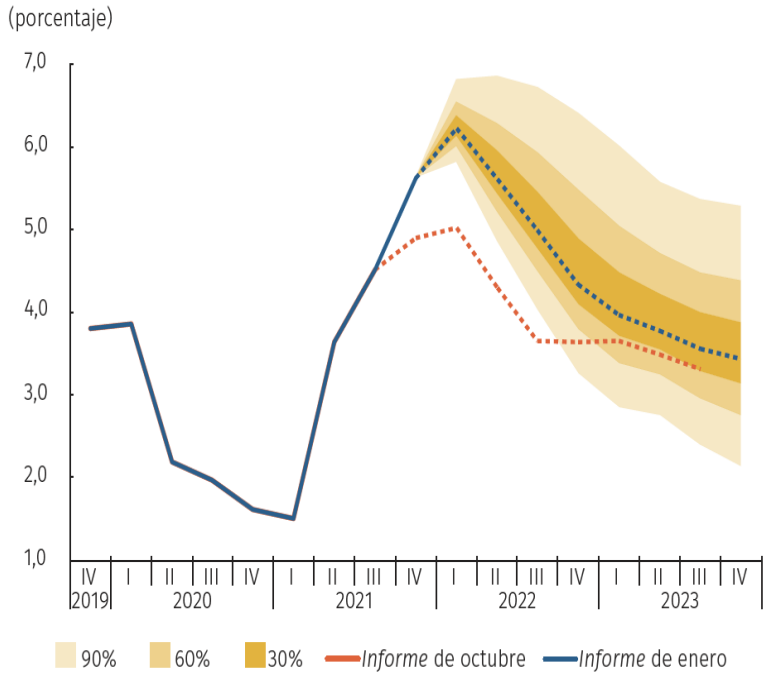
Federal Funds Rate (%, APR)



Macro forecast MPR 2022:1

Consumer Price Index (%, yoy)

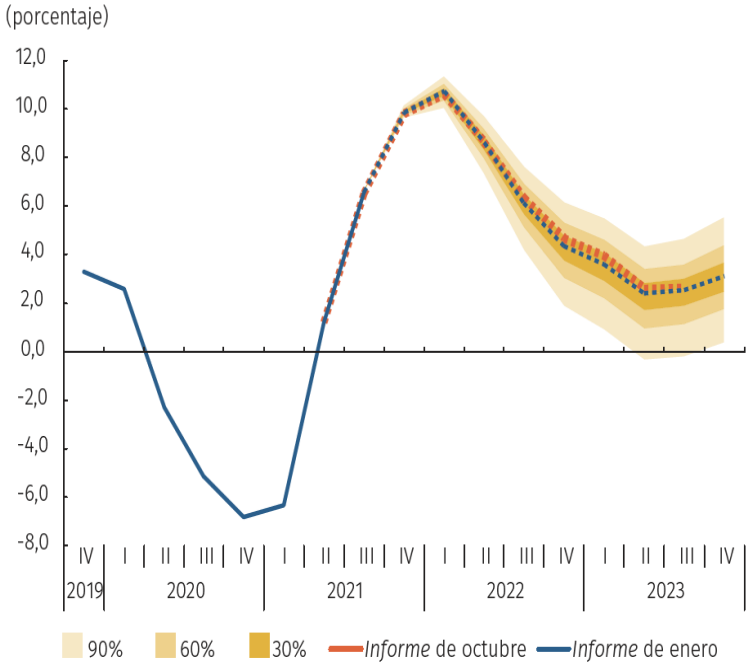
Índice de precios al consumidor[a/, b/]
(variación anual, fin de período)



a/ El gráfico presenta la distribución de probabilidad del pronóstico para un horizonte a 8 trimestres. La densidad caracteriza el balance prospectivo de riesgos con áreas del 30%, 60% y 90% de probabilidad alrededor del pronóstico central (moda), mediante la combinación de las densidades del Patacon y 4GM.
b/ La distribución de probabilidad corresponde al ejercicio de pronóstico del *informe* de enero.
Fuente: DANE; cálculos y proyecciones del Banco de la República.

Gross Domestic Product, 12 m (%, yoy)

Producto interno bruto, acumulado 4 trimestres[a/, b/, c/]
(variación anual)



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b/ Series desestacionalizadas y ajustadas por efectos calendario.
c/ La distribución de probabilidad corresponde al ejercicio de pronóstico del *informe* de enero.
Fuente: DANE; cálculos y proyecciones del Banco de la República.

References

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