Unpacking Commodity Price Developments: Reading the News to Understand Inflation

Dimitris Malliaropulos [1, 2] Evgenia Passari [3, 4] Filippos Petroulakis [1]

[1]Bank of Greece

[2]University of Piraeus

[3]Université Paris Dauphine-PSL

[4]CEPR

AEA, 2024 Annual Meeting

[1]The views presented here are those of the authors alone and may not necessarily represent those of the Bank of Greece, the European Central Bank, or the European System of Central Banks.

Commodities and Inflation

Rapidly rising prices for globally traded commodities *have been the* ***major source*** *of the relatively high rates of* ***inflation*** *we have experienced in recent years, underscoring the* ***importance*** *for policy of both* ***forecasting*** *commodity price changes and* ***understanding the factors that drive those changes****.*

(Ben Bernanke, Speech at the FRB of Boston, 2008)

Motivation

- Monetary authorities acknowledge that fluctuations in **commodity prices** are key to understanding **inflation**.
- Commodity-price fluctuations arise from **hedging** and **speculative** activities, **aggregate** and **precautionary demand**, **supply-chain disruptions**, or as the aftermath of **geopolitical developments**.
- **Separately identifying** the driving forces behind commodity price movements is important for pinning down inflation dynamics because **different drivers** result in **different pass-through** and **persistence**.
- Unpacking the link between commodity prices and inflation can inform **monetary policy**.

State-of-the-art

Research has shown that **oil**, and **commodity prices** in general, can add **value** to **inflation forecasts**.

- Results **not robust** across different country panels and time periods; weak link post 1985 [Stock and Watson, 2003].
- **Not all sources** of commodity price variation have **inflationary** consequences [Gospodinov and Ng, 2013].
- Inflation dynamics **obscured** when one **aggregates categorical inflation measures** [Shapiro, 2022].

This Paper: Disagreggated Commodity Measures for Inflation

Application of **toolkit** that cuts through sources of confusion in understanding of inflation dynamics.

- Use of **automated**, **narrative measures** of **supply** and **demand** across different commodities derived from business news [Mouabbi, Passari, and Rousset Planat (2023)].
- We separately estimate the **relative contribution** of each type of commodity-price development to inflation.

The proposed text-based measures can help:

- Identify **common** and **idiosyncratic** drivers of demand and supply across commodities.
- Test which **drivers** have inflationary implications.
- **Distinguish** among price developments of **different nature**, across a wide range of commodities.

Commodities on Business News

EBRD: Inflation has peaked, but rising gas prices will pressure households

By **Jorgelina Do Rosario**

May 16, 2023 5:13 AM GMT+1 · Updated a month ago

Ukraine fears losing millions of tons of crops after dam collapse

Reuters

June 8, 2023 3:05 PM GMT+1 · Updated 4 days ago

Contribution

Twofold contribution:

- Application of **narrative measures** of **commodity-price decomposition** that employs computer linguistics for **inflation prediction**.
- Contribution to the growing literature that uses **textual analysis** techniques for the study of various **economic** and **financial outcomes** [Tetlock, (2007); Gentzkow and Shapiro (2010); Alexopoulos and Cohen (2015); Baker, Bloom and Davis (2016); Hassan et al. (2019); Engle et al. (2020); Caldara and Iacoviello (2022); Shapiro and Wilson (2022)].

Supply & demand contain information about future inflation

- **Drivers** of demand and supply disturbances provide **intuition** regarding **magnitude** and **persistence** of inflation **not apparent** to market participants, forecasters, or households.
- Including text-based measures **reduces out of sample forecast error** in inflation by 20-30% and fare better in the post-COVID-19 era.
- Text-based indicators are particularly useful during episodes of **increasing**, **falling** or **stable** headline inflation.
- **Demand-side** developments generally **contribute more** to predictability of different inflation baskets.
- **Supply-side** developments matter in **particular circumstances**;
  i.e. during the past few years and for forecasting the food component of inflation.

Textual Analysis and Narrative Identification of Commodity Price Developments

General Framework: **Mouabbi, Passari, and Rousset Planat [2023]**.

- **Automated**, **narrative** approach for construction of **supply** and **demand** developments in **commodity** markets.
- Construct supply and demand indexes at **market-wide** level.
- Tailor analysis to span the **universe** of tradable commodities.

News reading simulated in **three steps**:

- **Identify** words and word combinations within sentences attributed to supply and demand factors.
- **Refinement** with algorithms to account for negations and exceptions.
- Extensive **human auditing** exercise.

Data Sources

- $>$ 1,000,000 articles from Reuters [May 2000 - June 2023].
- $>$ 3,000,000 articles from Dow Jones [January 2000 - June 2023].
- Commodity-specific news outlets [Oil Daily, Metals Bulletin] for robustness.
- Retain all articles on commodity markets referring to any **constituent** of **Composite Spot Commodity Index** from Standard & Poors, Goldman Sachs Commodity Index (GSCI) spot price series.
- Coverage: **energy, industrial metals, precious metals, grains, softs** and **livestock**.

$\rightarrow$ Intuition: More **important events** lead to **larger** commodity-price **swings**, and get **higher** news **coverage**.

Content Analysis

- **Supervised** and **semi-supervised** methods for learning [dictionaries].
- Search for most **popular** words in business news articles.
- Words classified into **supply** and **demand** lists and **matched** with **directional** words within sentences.
- Process complemented with large number of **human checks**.
- Augmenting the dictionary of the broad commodity indicator with words that capture **commodity-specific** supply and demand elements.

Building the Indexes

- Supply increase, supply decrease, demand increase and demand decrease.
- **Net supply**: supply decrease - supply increase; **Net demand**: demand increase -demand decrease.
- **Standardized version** of indexes divides net supply and demand indicators with total number of articles published per day.

Supply and Demand Increase and Decrease

$$SI_t = \frac{1}{N_t} \sum_{w}^{W_t} \{1[w = Supply] \times 1[|w - pos_{Increase}| \leq i]\}$$

$$SD_t = \frac{1}{N_t} \sum_{w}^{W_t} \{1[w = Supply] \times 1[|w - pos_{Decrease}| \leq i]\}$$

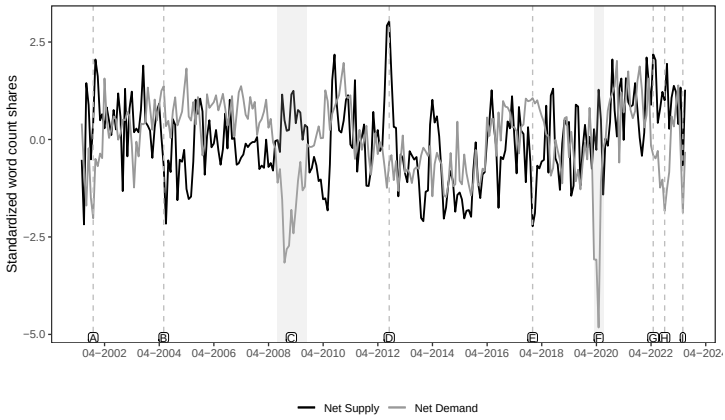
$$DI_t = \frac{1}{N_t} \sum_{w}^{W_t} \{1[w = Demand] \times 1[|w - pos_{Increase}| \leq i]\}$$

$$DD_t = \frac{1}{N_t} \sum_{w}^{W_t} \{1[w = Demand] \times 1[|w - pos_{Decrease}| \leq i]\}$$

Standardized net supply and demand

Global commodity indexes, MPRP (2023)

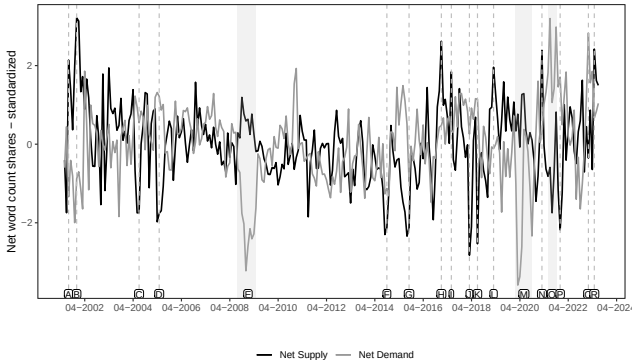
Net supply = supply decrease - supply increase; Net demand = demand increase - demand decrease



[A] US recession and 9/11 weighs on commodity markets. [B] OPEC to raise output quotas. [C] GFC. [D] Worst drought in more than 50 years in US cuts corn and soybeans productions. [E] Oil market oversupply; better-than-expected growth in all major economies bolsters demand. [F] Covid-19 dents demand and disrupts supply chains. [G] Russo-Ukrainian War concerns about supply shortages in grains, oil, and metals. [H] Demand concerns from rising global interest rates, China's COVID-19 lockdown extensions. [I] US debt-ceiling crisis.

Standardized net supply and demand, MPRP (2023)

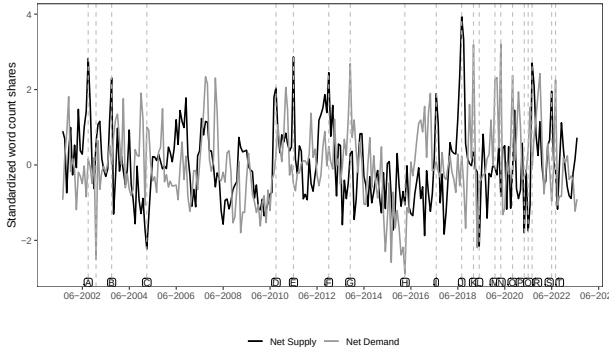
Crude Oil



[A] OPEC cuts output to lift oil prices following US 2001 recession. [B] 118th OPEC Meeting, production cut following US economic slowdown & 9/11. [C] OPEC to raise output quotas (131st E.M.). [D] OPEC pumps at 25-year highs to cater for high demand expected from China. [E] 150th & 151st OPEC E.M.: production cut (GFC). [F] Faster than expected recovery of Libyan oil production & unaffected Iraq production: perceived glut. [G] Worries about oversupplied oil market (China's slowdown); Middle East producers pump crude at record levels. [H] OPEC 171st Meeting: OPEC & non-OPEC to cut output for first time in 8 years. [I] OPEC+ extended cuts in oil output to battle global glut. [J] US record oil production: oversupply worries. [K] OPEC to raise oil production amid calls from top consumers to cool prices & support world economy. [L] OPEC production cuts & US sanctions on Iranian and Venezuelan crude. [M] COVID-19. [N] Winter storm in Texas causes US crude production drop. [O] Global economy and oil demand recover faster than expected following vaccination. [P] The US announces release of millions of barrels from strategic reserves in coordination with China, India, South Korea, Japan & Britain, to cool prices. [Q] Subsiding recession risks in major economies & reopening of China's economy boost demand. [R] Surprise decision by OPEC+ to cut output (48th JMMC).

Standardized net supply and demand, MPRP (2023)

Wheat

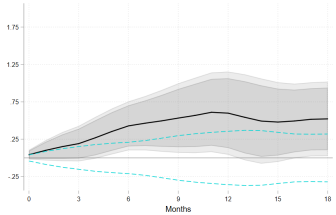


[A] Severe drought in Canada cuts wheat production by more than 25%. Worrisome dry weather in Australia & US Northern Plains. [B] Hot & dry weather trims European output & Canada's crop. [C] Ample world wheat supplies amid bumper crops. [D] Due to heatwave Russia bans exports of wheat; Ukraine imposes export quotas. [E] Dry weather stresses crops in Plains; wet weather slows wheat seedings in northern Plains. [F] Weather sparks worries about world supply. [G] Prospects of strong demand from China. [H] Sluggish demand for US supplies due to China's policy shift that favors other grains. [I] Dry weather in US northern Plains threatens crops. [J] Severe drought in Europe cuts harvests. [K] Resuming trade talks between China & the US boosts higher wheat demand. [L] Abundant world supplies due to crop-friendly weather in key areas. [M] China & the US reach phase one trade deal. [N] Covid-19 cause panic shoppers around the world to stock up on wheat-based items. [O] Strong demand from China following trade deal with the US. [P] Improved US wheat condition ratings. [Q] Above-average global yield expectations pressures wheat markets. [R] Adverse weather conditions & reduced expectations for Russia's harvest. [S] Easing fears of global recession & renewed import demand. [T] US winter crop ratings fall amid droughts; hot weather curbs India's production.

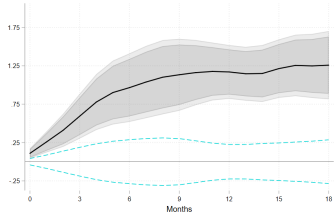
Commodity Indexes and Inflation

- Focus on **CPI** inflation (internationally comparable) and **PCE**.
- Address non-stationarity induced by COVID-19 shock: replace indices during first 3 COVID months with 2019 means; include COVID-19 dummy [Lenza & Primiceri (2022); Ng (2021)].
- Local Projections (Jorda, 2005): inflation lags and controls (log IP change, GSCI log rets, SP 500 log rets, FFRs, 10-year minus 2-year US treasury yield, VIX, trade-weighted USD log rets...); supply and demand indexes added jointly.

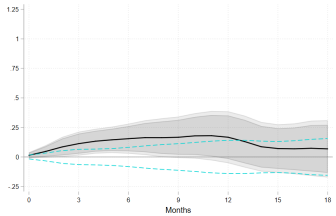
CPI inflation response to composite developments (headline & core)



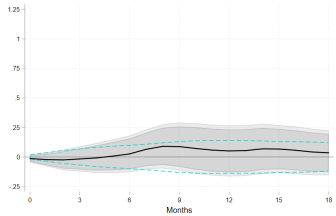
(a) Headline - Supply



(b) Headline - Demand

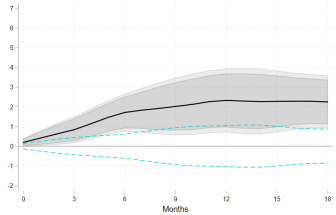


(c) Core - Supply

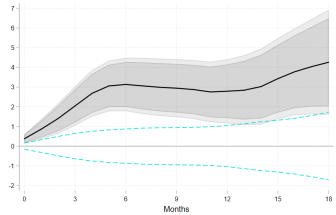


(d) Core - Demand

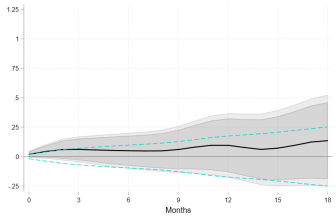
CPI inflation response to composite developments (goods & services)



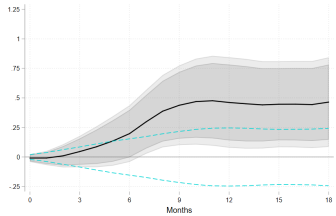
(e) Goods - Supply



(f) Goods - Demand



(g) Services - Supply



(h) Services - Demand

Information already incorporated into agents' forecasts?

Panel A - CPI					
	Baseline	SPF	F12 SPF	Clev	F12 Clev
NetDemand	0.885***	-0.0334	0.150**	0.0493	0.147
	(4.40)	(-0.68)	(3.18)	(0.65)	(1.96)
NetSupply	0.378	0.0115	0.0340	0.00310	0.0644
	(1.51)	(0.33)	(0.85)	(0.06)	(0.66)
N	257	266	259	266	259
Panel B - PCE and Consumers					
	Baseline	SPF	F12 SPF	Michigan	F12 MICH
NetDemand	0.314***	-0.0539	0.124**	-0.0598	0.0711
	(4.23)	(-0.94)	(3.29)	(-0.50)	(1.03)
NetSupply	0.162*	0.00796	0.0361	-0.00314	0.0563
	(2.04)	(0.19)	(0.96)	(-0.03)	(0.86)
N	257	197	202	266	257

Coefficients from a s.d. increase in contemporaneous composite supply & demand developments. Dependent variable in baseline: annual log growth rate of CPI or PCE, 12 months ahead. In Columns 2 and 4: 12 months expected inflation at t+12 months. In Columns 3 and 5: 12 months expected inflation at t+24, as of t+12. SPF=Survey of Professional Forecasters; Clev=market-implied expectations published by Cleveland Fed; MICH=Michigan consumer survey.

Using **text measures** in forecasts

- Examine whether indexes improve **out-of-sample prediction**.
- Two broad sets of exercises:
  - Adding indices to a baseline model **without** tradable **commodity prices**.
  - Adding indices to a baseline model **with** tradable **commodity prices**.
- Simple, **linear** parsimonious model.
- Focus on **composite** index for simplicity.
- Assessment of different index **combinations**.

Using text measures in forecasts (II)

Baseline model [Gospodinov & Ng (2013); Stock & Watson (2003); Garratt & Petrella (2022)]:

$$\pi_{t+h}^{h} = \alpha_0 + \beta_0(L)\pi_t + \beta_1(L)index_t + \beta_2 x_t + \epsilon_{t+h}. \quad (1)$$

$\Delta^h(\pi_{t+h})$: inflation of h-months horizon from time t; π_t one-month annualized rate of inflation at time t; $\beta_0(L)$ lag polynomials order 1, $\beta_1(L)$ order 1 or 2.

- **Rolling window** forecasts; windows of 120 months.
- Models with net supply and net demand, supply increase and decrease, demand increase and decrease, and supply and demand increase and decrease.
- Assess models with **moving average terms** for improved inflation prediction.

Headline CPI - Until 2019, without commodities

	horizon	baseline	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: without commodities								
Autoregressive								
	h=12	0.978	0.682**	0.991	0.687**	0.769**	0.928	0.731**
	h=6	1.373	0.836*	1.022	0.838*	0.863	1.012	0.929
	h=3	1.791	1.015	1.085	0.971	1.011	1.127	1.112
Controls, Autoregressive								
	h=12	0.935	0.764**	1.027	0.733**	0.847**	1.012	0.862
	h=6	1.331	0.969	1.013	0.965	0.991	0.996	1.051
	h=3	1.879	1.063	1.033	1.030	1.077	1.058	1.157
IMA								
	h=12	0.996	0.649**	0.971	0.665**	0.682**	0.897	0.643**
	h=6	1.438	0.745**	0.987	0.765**	0.789*	0.952	0.823
	h=3	1.872	0.876	1.047	0.858*	0.885	1.056	0.941
Controls, IMA								
	h=12	0.866	0.722**	1.011	0.740**	0.767**	0.995	0.755**
	h=6	1.294	0.920	1.016	0.936	0.942	1.033	1.007
	h=3	1.843	0.970	1.046	0.934	0.961	1.070	1.007
Composite Indices								
Net Supply			X	X				
Net Demand			X		X			
Supply Increase/Decrease							X	X
Demand Increase/Decrease						X		X

Headline CPI - Until 2019, with commodities

	horizon	baseline	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: with commodities								
Autoregressive								
	h=12	0.940	0.710**	0.999	0.708**	0.802**	0.950	0.771**
	h=6	1.338	0.858*	1.029	0.852**	0.872*	1.014	0.942
	h=3	1.699	1.017	1.088	0.962	0.993	1.117	1.108
Controls, Autoregressive								
	h=12	0.930	0.773**	1.027	0.743**	0.867*	1.015	0.879
	h=6	1.356	0.965	1.012	0.963	0.990	0.992	1.040
	h=3	1.896	1.071	1.039	1.033	1.081	1.066	1.163
IMA								
	h=12	0.977	0.669**	0.970	0.679**	0.700**	0.895	0.659*
	h=6	1.413	0.752**	0.983	0.779**	0.797	0.948	0.846
	h=3	1.850	0.887	1.040	0.857	0.910	1.042	0.949
Controls, IMA								
	h=12	0.859	0.718**	1.010	0.728**	0.775**	1.011	0.765**
	h=6	1.293	0.924	1.008	0.940	0.951	1.034	1.016
	h=3	1.843	0.969	1.039	0.942	0.961	1.068	1.008
Composite Indices								
Net Supply			X	X				
Net Demand			X		X			
Supply Increase/Decrease							X	X
Demand Increase/Decrease						X		X

Headline CPI - Until 2023, without commodities

	horizon	baseline	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: without commodities								
Autoregressive								
	h=12	1.229	0.770**	0.999	0.768**	0.804**	0.988	0.793**
	h=6	1.657	0.882**	1.012	0.882**	0.899*	1.002	0.937
	h=3	2.279	1.005	1.039	0.986	1.014	1.057	1.065
Controls, Autoregressive								
	h=12	1.251	0.806**	1.007	0.797**	0.848**	1.009	0.853**
	h=6	1.628	0.936	0.998	0.942	0.955	0.981	0.987
	h=3	2.355	1.020	1.012	1.006	1.040	1.022	1.090
IMA								
	h=12	2.077	0.765	0.920	0.809	0.770	0.843	0.654
	h=6	2.373	0.767	0.929	0.819	0.820	0.901	0.762
	h=3	2.827	0.851	0.954	0.895	0.894	0.947	0.867
Controls, IMA								
	h=12	1.692	0.765	0.956	0.808	0.791	0.926	0.719
	h=6	2.125	0.842	0.951	0.886	0.869	0.953	0.827
	h=3	2.662	0.887	0.959	0.900	0.899	0.963	0.895
Composite Indices								
Net Supply			X	X				
Net Demand			X		X			
Supply Increase/Decrease							X	X
Demand Increase/Decrease						X		X

Headline CPI - Until 2023, with commodities

	horizon	baseline	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: with commodities								
Autoregressive								
	h=12	1.172	0.798**	1.005	0.789**	0.831**	0.999	0.828**
	h=6	1.596	0.902**	1.017	0.896**	0.910*	1.000	0.951
	h=3	2.101	1.014	1.046	0.986	1.004	1.052	1.067
Controls, Autoregressive								
	h=12	1.241	0.821**	1.009	0.811**	0.866**	1.012	0.872*
	h=6	1.649	0.938	0.998	0.944	0.958	0.980	0.985
	h=3	2.355	1.034	1.018	1.016	1.050	1.027	1.104
IMA								
	h=12	2.032	0.782	0.925	0.817	0.789	0.847	0.670
	h=6	2.306	0.788	0.935	0.843	0.842	0.909	0.781
	h=3	2.788	0.866	0.963	0.903	0.899	0.947	0.878
Controls, IMA								
	h=12	1.663	0.780	0.975	0.819	0.812	0.942	0.743
	h=6	2.134	0.838	0.947	0.897	0.876	0.956	0.821
	h=3	2.674	0.881	0.954	0.899	0.897	0.965	0.892
Composite Indices								
Net Supply			X	X				
Net Demand			X		X			
Supply Increase/Decrease							X	X
Demand Increase/Decrease						X		X

Assessment

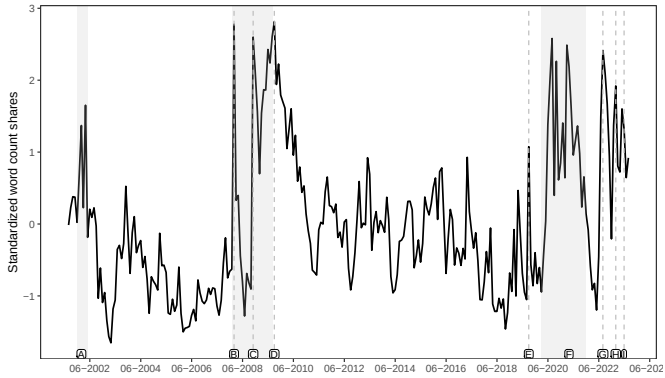
- Our indexes provide **sizeable forecasting gains** for **headline** CPI inflation (similar results for PCE).
- **Demand** indexes provide stronger forecasting gains for **headline** inflation.
- **Supply** indexes provide gains for **core** inflation.
- Framework provides substantial improvements **regardless of inflation regime**.
- Proposed framework can improve forecasts of **energy** inflation up to 20%, and **food** inflation (up to 15%), with the help of supply indexes.

Characterizing supply and demand

- Different **drivers** of supply and demand have **different implications** for **inflation**.
- Four main drivers of commodities extracted from IMF commodity reports of past decades: **business cycle, geopolitical risk, natural disasters, and climate change**.
- Semi-supervised approach; **driver-specific authoritative texts**.
- Refinement of the employed narrative toolkit: construction of **thematic indexes** that could be **driving** the supply and demand of commodities.
- **Focus** on the **interaction** of a **recessionary component of business cycle** and **natural disasters regime** with **supply** and **demand** indices.

Decomposition of commodity developments, MPRP (2023)

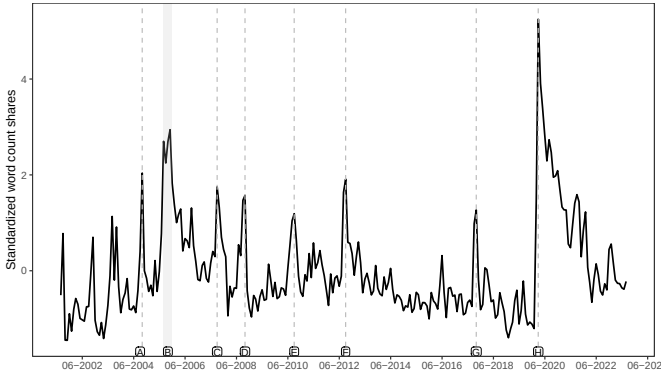
Business cycle



Note: This figure plots the Business Cycle Theme for the period between 2001 and 2023. [A] 2001 recession. [B] Global Financial Crisis (U.S. stocks had the worst January since 2000). [C] Global Financial Crisis (Many of the world's stock exchanges experienced the worst declines in their history). [D] Signs of optimism after Europe's biggest economies, Germany and France, end their recessions. [E] Fears of recession amid U.S.-China trade war. [F] Covid-19 crisis. [G] U.S. economy shrinks for second straight quarter. [H] Worries about looming U.S. economic slump amid rising interest rates. [I] 2023 U.S. debt-ceiling crisis.

Decomposition of commodity developments, MPRP (2023)

Natural Disasters



Note: This figure plots the Natural Disasters Theme for the period between 2001 and 2023. [A] 2004 Atlantic hurricane season (Ivan). [B] 2005 Atlantic hurricane season (Katrina, Emily). [C] 2007 Atlantic hurricane seasons and severe droughts across Europe and US. [D] 2008 Atlantic hurricane seasons. [E] Severe droughts in the Black Sea Region. [F] US Summer 2012 Drought. [G] 2017 Atlantic hurricane season (Irma, Harvey). [H] Covid-19.

Building different regimes

- Aggregate monthly signals from Mouabbi, Passari, and Rousset Planat (2023).
- Convert to dummy variables defined by median value of original driver series.
- Define **four distinct regimes**:
  - **Highly recessionary regime**: high unemployment, low consumer confidence, low investment.
  - **Low-recession regime**: opposite.
  - **Severe natural-disaster regime**: High levels of destruction/disruption, high levels of economic losses.
  - **Absence of severe natural disasters regime**: opposite.

Drivers of commodity fluctuations and inflation

	Business Cycle				Natural Disaster			
	h=3	h=6	h=12	h=18	h=3	h=6	h=12	h=18
Driver	-0.148	-0.101	0.060	0.191	0.311	0.699**	0.680	-0.290
	(-0.54)	(-0.30)	(0.17)	(0.40)	(1.08)	(2.37)	(1.13)	(-0.75)
DI	1.535***	1.729***	0.019	-1.250***	0.581	0.182	-0.577	-0.334
	(5.08)	(4.08)	(0.04)	(-2.96)	(1.41)	(0.53)	(-1.01)	(-0.73)
DD	-1.088***	-1.604***	-1.932***	-0.410	-1.168***	-1.312***	-1.062***	-0.543*
	(-4.16)	(-4.25)	(-4.87)	(-1.02)	(-6.96)	(-5.79)	(-2.67)	(-1.77)
SI	-0.231	-0.360	0.266	0.114	0.311	0.200	0.159	0.218
	(-1.30)	(-1.34)	(0.70)	(0.27)	(1.43)	(0.83)	(0.41)	(0.68)
SD	-0.314	-0.206	-0.188	0.003	-0.299*	-0.143	-0.025	-0.243
	(-1.48)	(-0.72)	(-0.52)	(0.01)	(-1.84)	(-0.69)	(-0.07)	(-0.90)
DI	-0.878**	-0.682	0.951	2.012***	0.384	1.447***	1.907***	0.832
× Driver	(-2.11)	(-1.39)	(1.56)	(3.31)	(0.73)	(2.91)	(3.27)	(1.63)
DD	0.327	0.510	1.698***	0.071	0.330	-0.137	-0.066	0.219
× Driver	(0.80)	(1.23)	(3.46)	(0.13)	(1.00)	(-0.40)	(-0.13)	(0.38)
SI	-0.076	0.070	-0.859*	-0.378	-0.781**	-0.544	-1.016**	-1.419***
× Driver	(-0.24)	(0.17)	(-1.68)	(-0.52)	(-2.49)	(-1.53)	(-2.10)	(-3.02)
SD	0.894**	0.711*	0.592	0.082	0.659*	0.121	-0.056	0.787*
× Driver	(2.34)	(1.67)	(1.20)	(0.12)	(1.91)	(0.36)	(-0.15)	(1.86)
N	243	243	239	233	243	243	239	233

Commodity Fluctuations

- **Interactions** with main indices:
  - **Decrease** in **demand**: deflationary, more muted in recession.
  - **Increase** in **demand**: less inflationary in short run, more in long run.
  - **Increase** in **supply**: not deflationary unless coincides with natural disaster.
  - **Decrease** in **supply**: not inflationary unless coincides with recession or natural disaster.

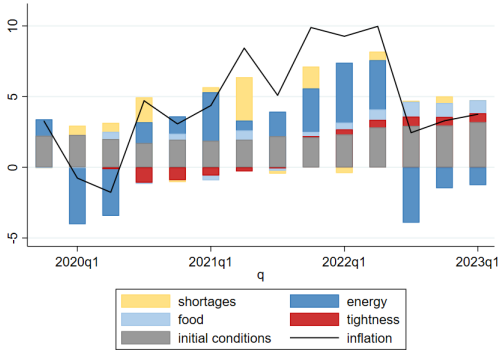
Decomposing the 2021-2023 inflation shock

- Framework of **Blanchard and Bernanke (2023)** to decompose sources of inflationary pressures into most important possible sources: **energy**, **food**, **labor market tightness**, and **supply shortages**.
- Sharp increase of energy and food prices after the first months of COVID-19 (rising **demand** and continued **supply constraints**; Russian **invasion** of Ukraine).
- **Tight labor markets**: **large fiscal expansion** and accommodating monetary policy.
- **Supply shortages** account for various shocks to global supply chains affecting various types of commodities and processed goods.
- Added value of indexes: **structured measure of shortages / supply constraint**. (Google Trends: perceived, not actual shortages, cannot disentangle supply from demand).

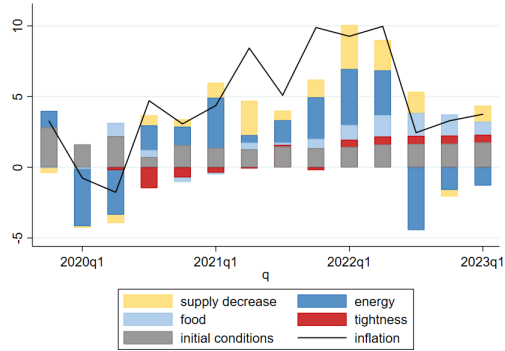
Decomposing the 2021-2023 inflation shock

- Setup akin to **structural vector autoregression framework with exogenous variables**: **tightness** (vacancies to unemployment), **labor productivity** (eight-quarter moving average of value added over employment), **food and energy inflation**, and **supply decrease index**.
- Price measure: log CPI index; wage measure: nominal employment cost index; short- and long-run inflation expectations: 1- and 10-year expectation measures of Cleveland Fed.
- Use estimated coefficients to estimate historical decomposition of each of the exogenous variables between 2020Q1 and 2023Q1, taking as a given previous values.

Decomposing the 2021-2023 inflation shock



(i) Google shortage measure



(j) Supply decrease index

Note: Decomposition of quarterly annualized CPI inflation using the framework of Blanchard and Bernanke (2023). The continuous black lines show actual inflation, and the stacked bars the contribution of each external variable, without including residuals. Initial conditions show the contribution of pre-pandemic data and the productivity variable.

Conclusion

- Application of novel **narrative measures** of **commodity** price drivers that use state-of-the-art **computer linguistics** for **inflation prediction**.
- Ability to identify **common** and **idiosyncratic** drivers of **demand** and **supply across commodities**.
- Supply and demand commodity indexes have **differential impact** across different inflation measures.
- Forecasting exercise confirms importance of different commodity price drivers through **improved forecasting gains** of indexes over commodity returns, macro controls and expectations.
- **Real-time** nature of indexes means they can be **readily embedded** in forecasting frameworks.