# Economic Uncertainty from Business Tendency Surveys: The Peruvian case

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# Motivation

- Periods of uncertainty are often associated with macroeconomic downturns.
- Episodes of allegedly high uncertainty in Peru:
  - Global Financial Crisis of 2008–2009, COVID-19 pandemic.
  - Recurrent domestic disturbances, ranging from political instability to climate shocks.
- Begging the question, how does uncertainty affects the Peruvian economy?

## What does the paper do?

1. Constructs and analyzes novel firm-level uncertainty measures derived from the Central Bank's Survey of Macroeconomic Expectations.

2. Estimates their aggregate effects using vector autoregressions (VARs).

# What does the paper find?

1. The uncertainty measures are countercyclical and spike during periods of economic and political distress.

2. Structural shocks to uncertainty ressemble demand-side shocks: they generate a persistent decline in economic activity, prices and interest rates, and induce a depreciation of the domestic currency.

# Related literature

1. Developed markets: Bloom (2009); Bachmann et al. (2013); Jurado et al. (2015); Alessandri and Mumtaz (2019); Bush and López Noria (2021); Bachmann et al. (2023); Bloom et al. (2024).
   - Our survey-based measures follow Bachmann et al. (2013)

2. Emerging markets: Carrière-Swallow and Céspedes (2013); Bhattarai et al. (2020); Miescu (2023); Llosa et al. (2022); Giraldo et al. (2023); Alvarado and Rodríguez (2025).
   - Uncertainty shocks are contractionary.
   - Employment responds with a lag.
   - Favor the view that uncertainty shocks are primarily demand-driven.

# Outline

1. Data
   - Survey of Macroeconomic Expectations.
   - Uncertainty measures.
2. Results
   - Uncertainty measures and historical events.
   - Uncertainty and economic activity.
3. Final remarks

# Survey of Macroeconomic Expectations

- We focus on two questions about firm-level production performance.
  1. Backward-looking: Has your production increased, remained the same, or decreased relative to the previous month?
  2. Forward-looking: Do you expect your production level to increase, remain the same, or decrease over the next three months?
- Numerical scale: +1 (increase), 0 (no change), and -1 (decrease).

# Uncertainty Measures

- Following Bachmann et al. (2013), we construct two measures of uncertainty.
- The first is based in ex-ante forecast dispersion:

$$FDISP_t = \sqrt{Frac_t^+ + Frac_t^- - (Frac_t^+ - Frac_t^-)^2} \tag{3.1}$$

where $Frac_t^+$ and $Frac_t^-$ are the sales-weighted fraction of firms reporting expected increases or decreases in production, respectively.

- Standard deviation of a random variable $\in \{-1, 0, +1\}$, with the fractions as probabilities.

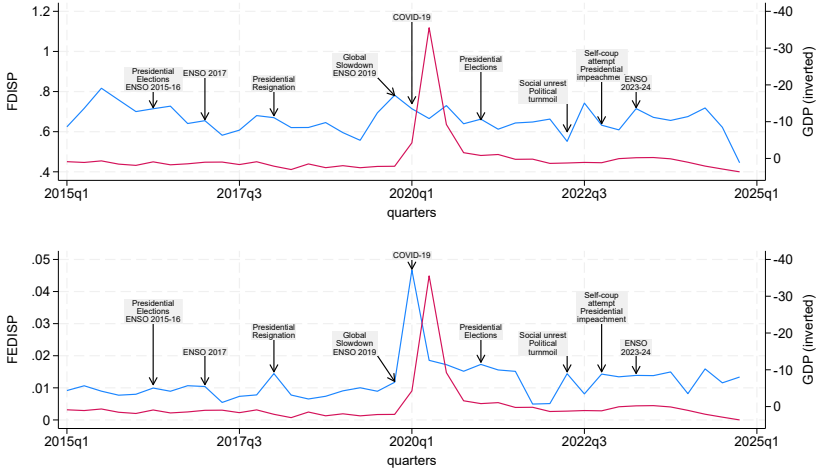
## Uncertainty Measures

- The second measure is based on ex-post forecast error: $e_{i,t+3}$.
  - This error is the difference between firm $i$ realized production in months $t+1$ to $t+3$ and its $t$-period forecast production for those months.
  - Realized production is approximated by the sum of responses to the backward-looking question in months $t+1$ to $t+3$.
- As a measure of uncertainty, we consider the sales-weighted cross-sectional standard deviation of forecast errors:

$$FEDISP_t = stdw\left(e_{i,t+3}\right) \tag{3.2}$$

## Results: Uncertainty and Historical Events

Result 1: Spikes in the uncertainty measures coincide with important historical events.

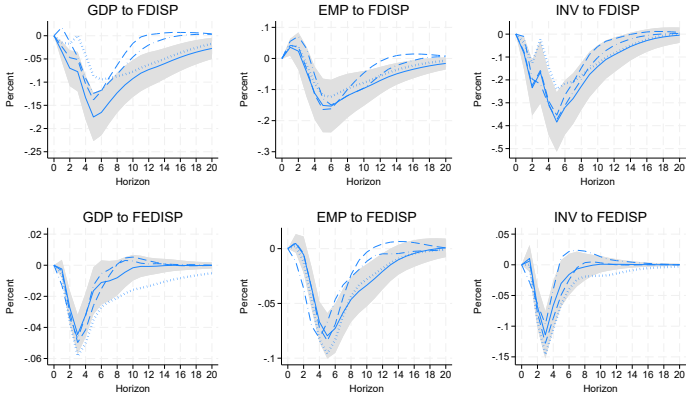



*Note.* Quarterly average of uncertainty in blue. Quarterly seasonally adjusted log GDP (linear-quadratic detrended) in red.

## Results: Uncertainty Shocks and Economic Activity

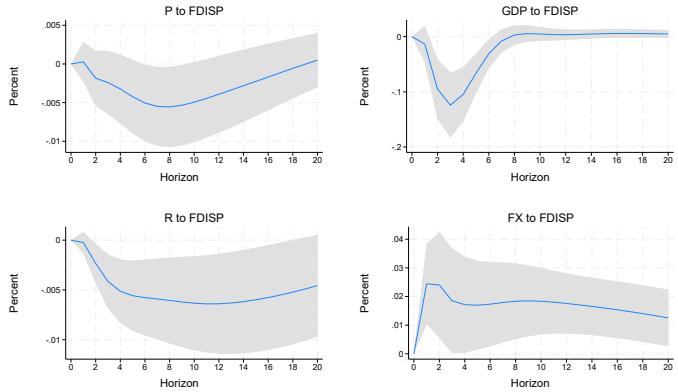
Result 2: Structural uncertainty shocks are contractionary. Investment shows the sharpest contraction, while employment decreases with a delay. These shocks also induce an FX depreciation and lower inflation and domestic interest rates.

# Bivariate VARs




*Note.* Solid = log-data , dashed = HP-filtered, dotted = linear-quadratic. Dotted-dashed = 12-month log-difference. Bootstrapped 68% confidence bands from the log-data model.

# Multivariate VARs (w/detrended macro-data)




*Note.* 12-month log-difference macro-data. VARs with 2 lags. Bootstrapped 68% confidence bands.

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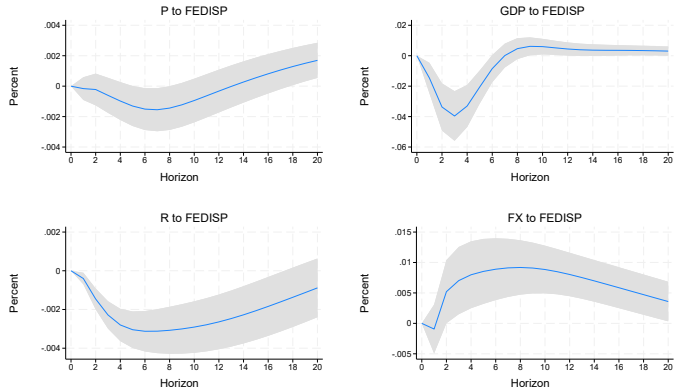


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# Final remarks

- Provides new evidence on the macroeconomic effects of uncertainty in Peru.
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  1. coincide with major historical events;
  2. share key statistical properties with conventional uncertainty indicators;
  3. and lead to economic downturns, FX depreciation, and lower interest rates.
- Future research: address endogeneity issues (Baker et al., 2020).

Thanks.

# Survey of Macroeconomic Expectations

- Conducted monthly by the Central Reserve Bank of Peru.
- Qualitative and quantitative forecasts from a sample of non-financial private firms.
- Expectations about both macroeconomic conditions and firm-level performance.
- Targets 10k largest firms, but the number of respondents hovers around 290.
- Optimized sampling method to ensure representativeness of the target universe: bigger firms are included with higher probability.

# Sample Structure

Table: Distribution of sales by industry (2022)

| Sector | SME | (a) | (b) |
|---|---|---|---|
| Construction | 1.4 | 4.0 | 2.2 |
| Services | 10.6 | 21.6 | 18.0 |
| Wholesale trade (incl. retail) | 26.5 | 36.8 | 35.1 |
| Utilities | 2.7 | 3.1 | 3.1 |
| Agriculture & fishing | 3.6 | 3.7 | 4.6 |
| Manufacturing | 29.5 | 19.9 | 19.4 |
| Mining (incl. oil & gas) | 25.7 | 12.8 | 17.6 |
| Total | 100.0 | 100.0 | 100.0 |
| SEM total gross output as % of : | 100.0 | 12.7 | 20.5 |

*Note*: The distribution of nominal gross output by sector in the SME was constructed from the sample of December 2022. Columns (a) presents the distribution of nominal gross output in the official tax records of 2022. Column (b) presents the distribution nominal gross output in the top 10k firms in 2022.

## Results: Statistical Properties of Uncertainty Measures

The uncertainty measures share some key statistical properties with uncertainty measures based on volatility of asset prices, news about economic policy, and unpredictability of macro-data. - in the paper

Table: Quarterly Summary Statistics

| A. Moments | *FDISP* | *FEDISP* | *VIX* | *EPU* | *MU* |
|---|---|---|---|---|---|
| Standard deviation | 10.24 | 56.09 | 30.52 | 55.40 | 11.74 |
| Skewness | -0.43 | 3.50 | 0.96 | 2.77 | 1.08 |
| Kurtosis | 4.42 | 18.98 | 3.44 | 11.96 | 3.69 |
| First order autocorrelation | 0.32 | 0.27 | 0.68 | 0.69 | 0.73 |
| B. Cross-correlations | *FDISP* | *FEDISP* | *VIX* | *EPU* | *MU* |
| *FDISP* | 1.00 | | | | |
| *FEDISP* | 0.08 | 1.00 | | | |
| *VIX* | 0.05 | 0.52 | 1.00 | | |
| *EPU* | -0.07 | 0.45 | 0.73 | 1.00 | |
| *MU* | 0.27 | 0.36 | 0.48 | 0.48 | 1.00 |

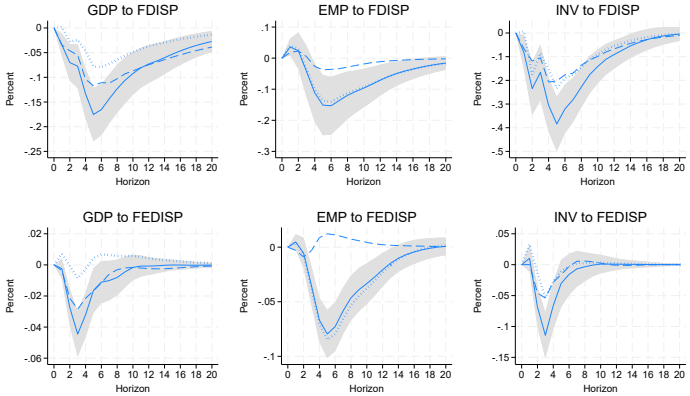
*Notes.* All statistics are computed using the common sample from 2015 to 2024. VIX is the implied volatility of S&P 500, EPU is the US Economic Policy Uncertainty Index (Baker et al., 2016), and MU is a macroeconomic uncertainty index of Peru (Llosa et al., 2022). To normalize the scales, all series are percent changes from their sample means.

Table: Dynamic cross-correlations with GDP

| Lag/lead: $j =$ | -4 | -3 | -2 | -1 | 0 | +1 | +2 | +3 | +4 |
|---|---|---|---|---|---|---|---|---|---|
| *FDISP* | 0.27 | -0.16 | -0.39 | -0.24 | -0.12 | -0.23 | 0.04 | 0.02 | 0.12 |
| *FEDISP* | -0.01 | -0.03 | -0.27 | -0.91 | -0.34 | -0.17 | -0.10 | -0.10 | -0.06 |
| *VIX* | 0.03 | 0.02 | -0.03 | -0.50 | -0.59 | -0.35 | -0.26 | -0.15 | -0.01 |
| *EPU* | -0.02 | -0.06 | -0.08 | -0.41 | -0.89 | -0.58 | -0.35 | -0.10 | 0.09 |
| *MU* | 0.07 | -0.06 | -0.20 | -0.40 | -0.54 | -0.28 | -0.35 | -0.50 | -0.34 |

*Notes*. Pairwise correlations are computed using the common sample from 2015 to 2024. Each column reports the correlation between the logarithm of GDP - detrended using the linear-quadratic method - and the uncertainty indicators - in percentage deviations from their sample means - at various lags and leads $j$.

# Bivariate VARs and COVID controls




*Note.* Solid = log-data without exogenous variables, dashed = Stringency Index, dotted = Dummy (March 2020). Bootstrapped 68% confidence bands from the log-data model.

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