

Uncertainty and Firms

Nicholas Bloom (Stanford University)

NY Fed, November 14th 2025

Thanks to **Hites Ahir** (IMF) and **Adithya Mohan** (Stanford) for help and advice



John and I are Celebrating our 25 Year **Uncertainty Anniversary**

John and I are Celebrating our 25 Year **Uncertainty Anniversary**



The Eighth World Congress of the Econometric Society was held at the [University of Washington in Seattle](#) from [August 11–16, 2000](#). The event featured over 300 contributed papers organized into 79 sessions, and the invited papers were later compiled into a three-volume set titled "Advances in Economics and Econometrics". The congress attracted more than 1,000 delegates and was co-chaired by Mathias Dewatripont, Lars Peter Hansen, and Stephen J. Turnovsky. [↗](#)

- **Dates:** August 11–16, 2000
- **Location:** University of Washington, Seattle, WA
- **Organizers:** Co-Chaired by Mathias Dewatripont, Lars Peter Hansen, and Stephen J. Turnovsky
- **Content:** Featured approximately 300 contributed papers and invited symposium papers covering various topics in economics and econometrics
- **Publications:** The invited papers were published as a three-volume set, "Advances in Economics and Econometrics" [↗](#)

The Performance of Forecast-Based Monetary Policy Rules under Model Uncertainty

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Author

- Listed:
- Andrew Levin
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- Andrew Theo Levin 
 - John C. Williams

Abstract

In this paper, we consider whether monetary policymakers should adjust short-term nominal interest rates in response to inflation and output forecasts rather than to recent outcomes of these variables. The use of forecast-based rules has been advocated on the basis of transmission lags and other considerations, and such rules also provide a reasonably good description of the policy strategies of several inflation-targeting central banks. We address these issues using four different macro-econometric models of the U.S. economy (the Fuhrer-Moore model, the MSR model of Orphanides and Wieland, Taylor's Multi-Country Model, and the FRB/US staff model); all four models incorporate rational expectations and nominal inertia, but differ in many other respects. We begin by evaluating the performance of various forecast-based rules that have been proposed in the literature. We find that some of these rules yield relatively poor performance, and that a number of such rules fail to yield determinacy (that is, a unique rational expectations equilibrium) in at least one of the four models. Next, we determine the optimal set of forecast-based rules for each model (that is, the rules that trace out the inflation-output volatility frontier subject to an upper-bound on interest rate volatility). We find that even optimized forecast-based rules yield very small benefits compared with optimized outcome-based rules that respond to current inflation, the current output gap, and the lagged interest rate. In the case of rules that respond directly to inflation forecasts but not to the output gap, we find a substantial deterioration in performance, even as measured by a policymaker whose sole objective is to minimize inflation variability. Finally, rules that involve relatively short forecast horizons (less than one year ahead) are reasonably robust to model uncertainty; that is, when such a rule is optimized for one model, the rule also performs reasonably well in the other three models. However, rules that respond to longer-horizon forecasts are not robust to model uncertainty (and in some cases yield indeterminacy), mainly because of the sharp differences in output and inflation persistence across the four models considered here.

Suggested Citation

 Andrew Levin & John C. Williams, 2000. "[The Performance of Forecast-Based Monetary Policy Rules under Model Uncertainty](#)," [Econometric Society World Congress 2000 Contributed Papers 1781](#), Econometric Society.

A Generalised Model of Investment under Uncertainty: Aggregation and Estimation

[Author & abstract](#)[Download](#)[26 References](#)[Most related](#)[Related works & more](#)[Corrections](#)

Author

- Listed:
- Nicholas Bloom
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- Nicholas Bloom

Abstract

We propose a structural model of investment which is based on the aggregation of (S,s) investment projects within firms. This encompasses the findings that whilst firm level investment is smooth, plant level investment is lumpy and frequently zero. We undertake stochastic aggregation and derive a structural firm level investment estimator. The empirical performance and fit of this estimator on a panel of manufacturing firms is encouraging and provides an avenue for general policy simulation. This model also explains the rich non-linear dynamics of firm level investment data and the frequent simultaneity of firm level investment and disinvestment. This approach provides an alternative structural estimator to the standard convex adjustment cost models, such as Tobin's Q and the Euler equation. The is important because these estimators, which assume quadratic adjustment costs, appear to be misspecified and subject to a fallacy of composition between smooth firm level investment and lumpy plant level investment. For completeness we also consider time aggregation as an alternative source of smoothing but statistically reject this as being insufficient to smooth investment alone. This test also rejects most plant level data, such as the US\ LRD and UK\ ARD, as being generated from a single (S,s) process.

Suggested Citation

 Nicholas Bloom, 2000. "[A Generalised Model of Investment under Uncertainty: Aggregation and Estimation](#)," [Econometric Society World Congress 2000 Contributed Papers 1505](#), Econometric Society.

- Measuring Uncertainty



- Impact of Uncertainty on Firms



Uncertainty is hard to measure.....

.....so I'll show three **Real Time Monthly approaches**



Approach 1: Text

...for or a
...of the parties with
...the work described
...and understandings with
...harmless the contractor against loss or
...entire agreement of the parties with respect
...shall act to complete the work described within
...prior negotiations, agreements and understandings with
...prior negotiations, agreements and understandings with
...of the liability or potential liability of the contractor a
...Agreement contain the entire agree
...ment. All parties shall act to
...prior negotiations,
...indemnify and
...liability

One Text Measure from Newspapers: Economic Policy Uncertainty

THE
QUARTERLY JOURNAL
OF ECONOMICS

Vol. 131 November 2016 Issue 4

MEASURING ECONOMIC POLICY UNCERTAINTY*

SCOTT R. BAKER
NICHOLAS BLOOM
STEVEN J. DAVIS

We develop a new index of economic policy uncertainty (EPU) based on newspaper coverage frequency. Several types of evidence—including human readings of 12,000 newspaper articles—indicate that our index proxies for movements in policy-related economic uncertainty. Our U.S. index spikes near tight presidential elections, Gulf Wars I and II, the 9/11 attacks, the failure of Lehman Brothers, the 2011 debt ceiling dispute, and other major battles over fiscal policy. Using firm-level data, we find that policy uncertainty is associated with greater stock price volatility and reduced investment and employment in policy-sensitive sectors like defense, health care, finance, and infrastructure construction. At the macro level, innovations in policy uncertainty foreshadow declines in investment, output, and employment in the United States and, in a panel vector autoregressive setting, for 12 major economies. Extending our U.S. index back to 1900, EPU rose dramatically in the 1930s (from late 1931) and has drifted upward since the 1960s. *JEL Codes:* D80, E22, E66, G18, L50.

*We thank Adam Jorring, Kyle Kost, Abdulla Al-Kuwari, Sophie Biffar, Jörn Boehnke, Vladimir Dashkeyev, Olga Deriy, Eddie Dinh, Yuto Ezure, Robin Gong, Sonam Jindal, Ruben Kim, Sylvia Klosin, Jessica Koh, Peter Lajewski, David Nebiyu, Rebecca Sachs, Ipei Shibata, Corinne Stephenson, Naoko Takeda, Melissa Tan, Sophie Wang, and Peter Xu for research assistance and the National Science Foundation, MacArthur Foundation, Sloan Foundation, Becker Friedman Institute, Initiative on Global Markets, and Stigler Center at the University of Chicago for financial support. We thank Ruedi Bachmann, Sanjai Bhagat, Vincent Bignon, Yongsung Chang, Vladimir Dashkeyev, Jesus Fernandez-Villaverde, Laurent Ferrara, Luis Garicano, Matt Gentzkow, Yuri Gorodnichenko, Kevin Hassett, Takeo Hoshi, Greg Ip, Anil Kashyap, Patrick Kehoe, John Makin, Johannes Pfeifer, Meijun Qian, Itay Saporta, John Shoven, Sam Schulhofer-Wohl, Jesse Shapiro, Erik Sims, Stephen Terry, Cynthia Wu, and many seminar and conference audiences for comments. We also thank the referees and editors, Robert Barro and Larry Katz, for comments and suggestions.

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1593

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EPU Indices

All Country-Level Data

Global

USA

Australia

Belgium

Brazil

Canada

Chile

China

Colombia

Croatia

Denmark

France

Germany

Greece

Hong Kong

India

Ireland

Italy

Japan

South Korea

Mexico

Netherlands

New Zealand

Nigeria

Pakistan

Poland

Russia

Singapore

Spain

Sweden

Turkiye New

UK

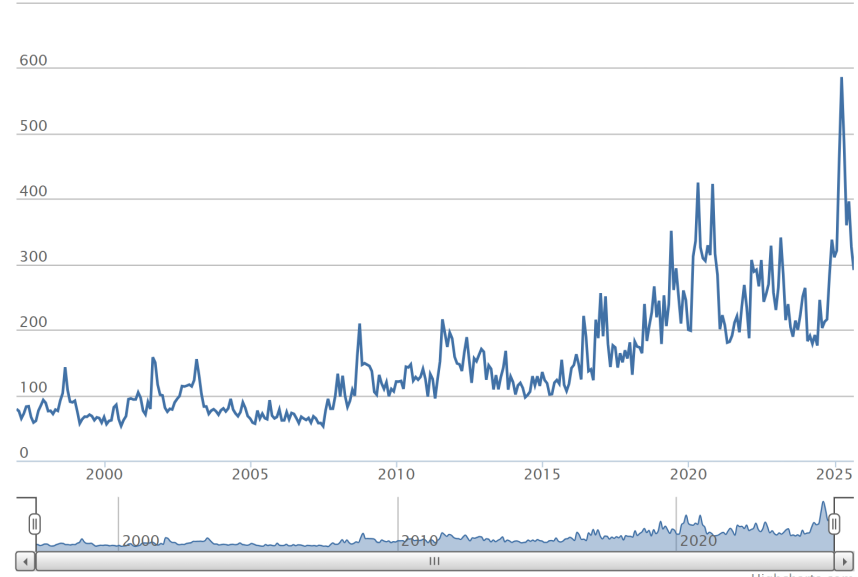
US State-Level EPU

Economic Policy Uncertainty Index

We develop indices of economic policy uncertainty for countries around the world.

Monthly Global Economic Policy Uncertainty Index

Zoom 1m 3m 6m 1y 7y All



Highcharts.com

www.policyuncertainty.com

The Economic Policy Uncertainty (EPU) index comes from computer searches of newspapers

- US index: 10 major papers get monthly counts of articles with:
 - E** {economic or economy}, and
 - P** {regulation or deficit or federal reserve or congress or legislation or white house}, and
 - U** {uncertain or uncertainty}
- Normalize by the count of all articles, sum to get Monthly US index
- Similar process on ≈ 2000 newspapers for Daily US Index



Another Text Measure is The World Uncertainty Index - Covers 143 Countries Monthly

NBER WORKING PAPER SERIES

THE WORLD UNCERTAINTY INDEX

Hites Ahir
Nicholas Bloom
Davide Furceri

Working Paper 29763
<http://www.nber.org/papers/w29763>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 2022

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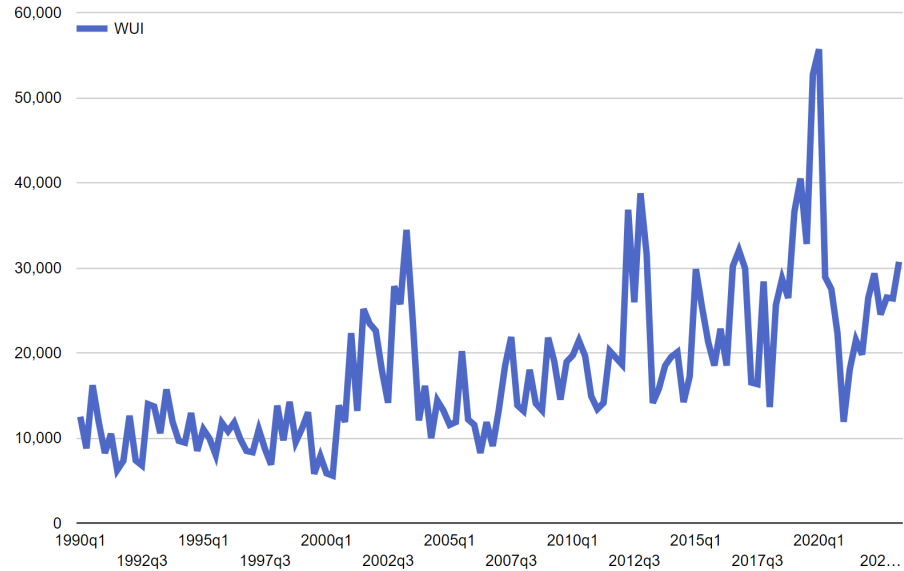
World Uncertainty Index

[Home](#) [Data](#) [Research](#) [Applications](#) [Media](#) [About us](#)

World Uncertainty Index (WUI): Global

Index. GDP weighted average. 1990Q1 to 2023Q2

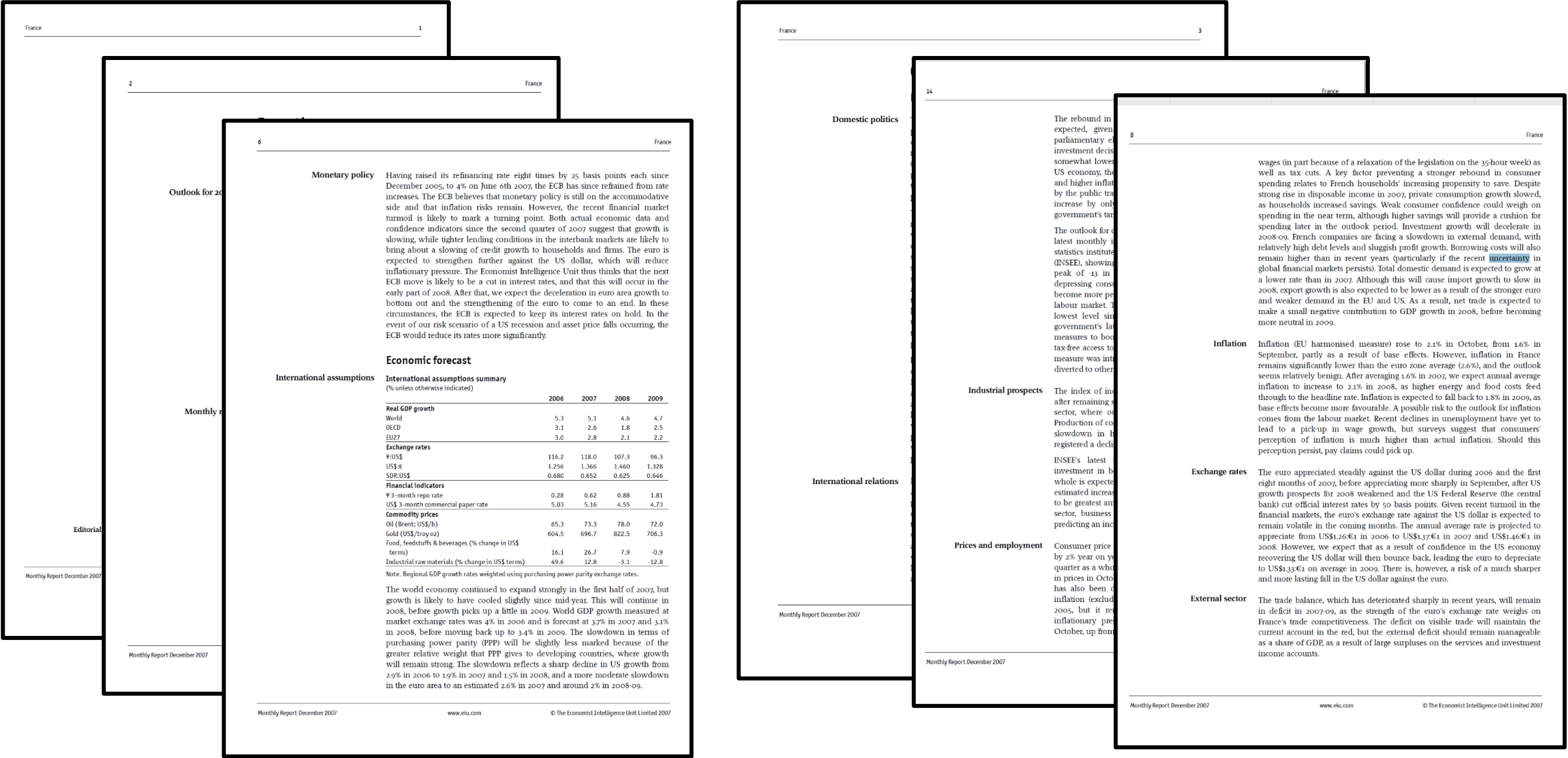
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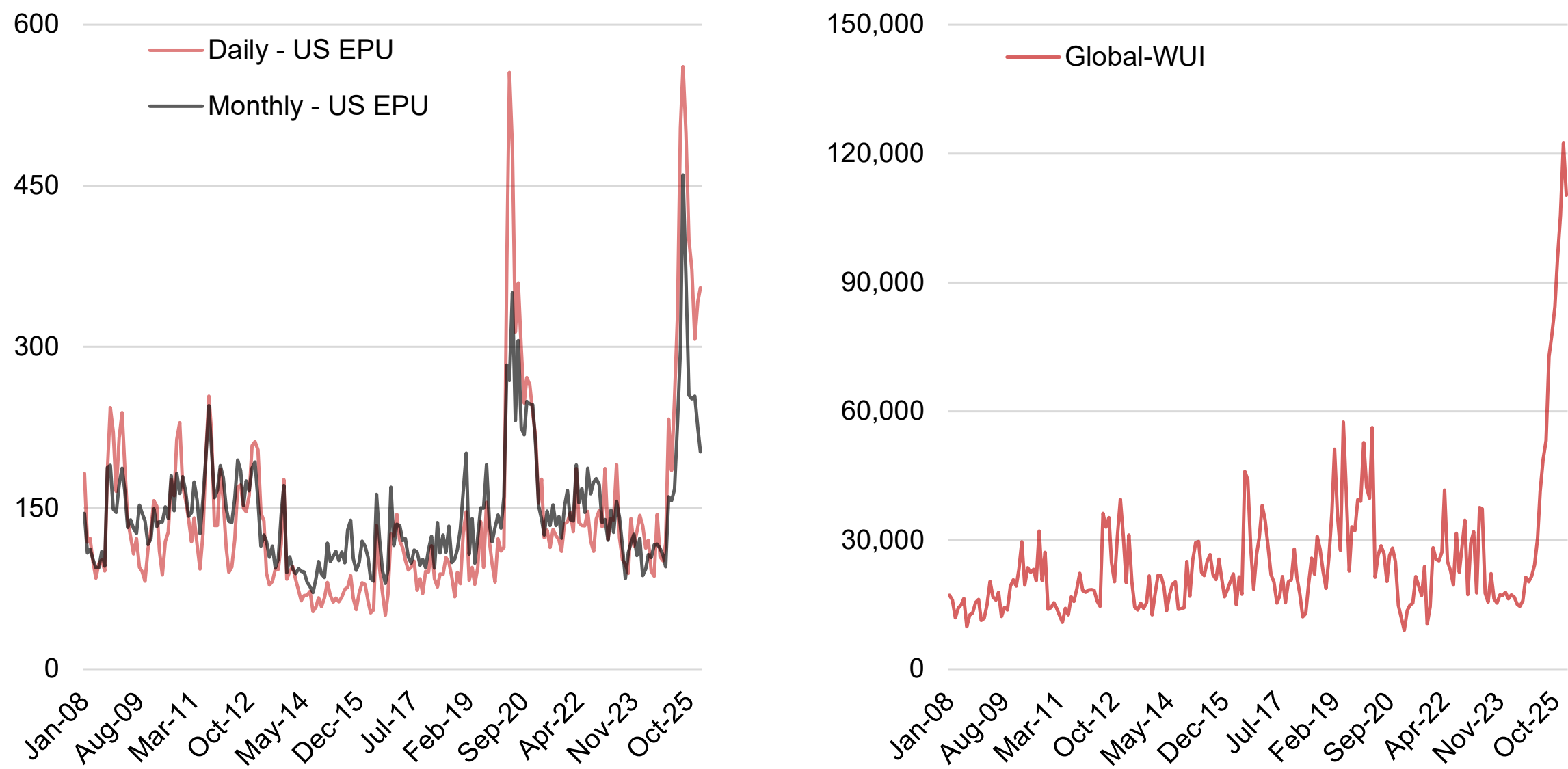
Note: The WUI is computed by counting the percent of word "uncertain" (or its variant) in the Economist Intelligence Unit country reports. The WUI is then rescaled by multiplying by 1,000,000. A higher number means higher uncertainty and vice versa. For example, an index of 200 corresponds to the word uncertainty accounting for 0.02 percent of all words, which—given the EIU reports are on average about 10,000 words long—means about 2 words per report.

Uses Economist Intelligence Unit monthly country reports

EUI quarterly reports standard format, mean of 29 pages.

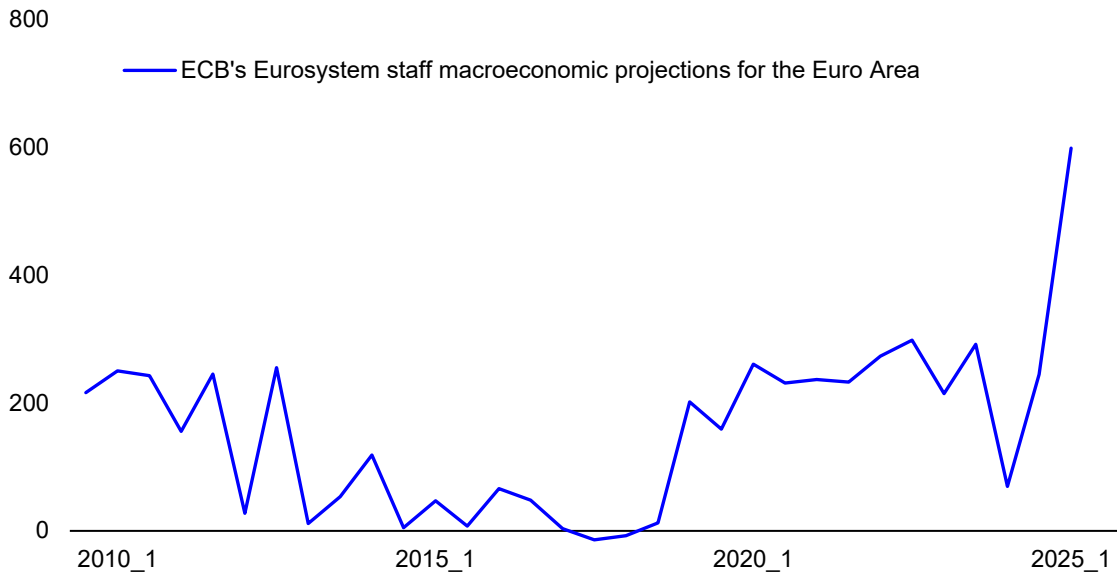
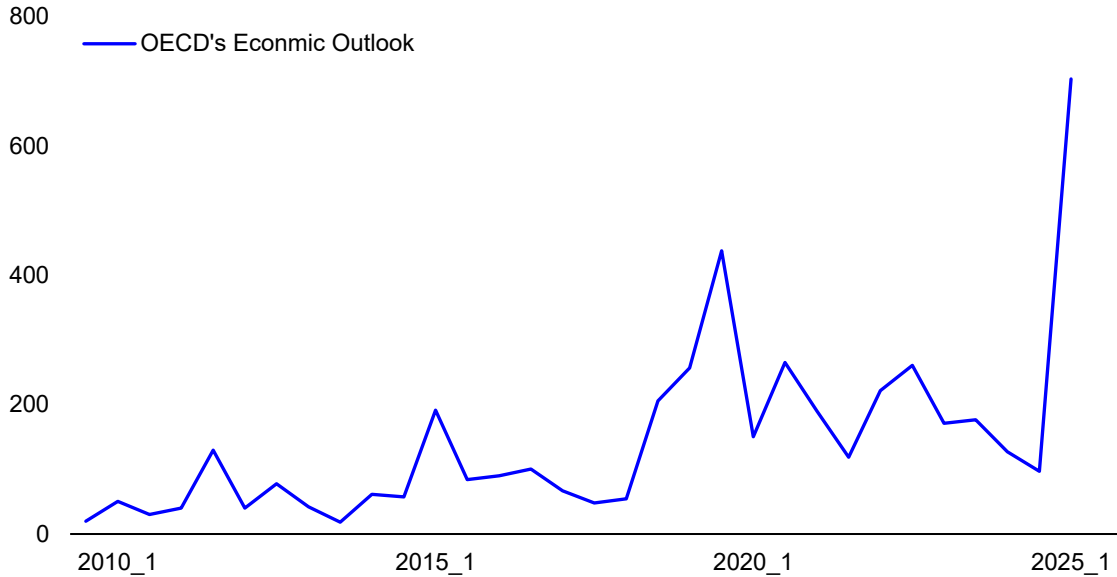
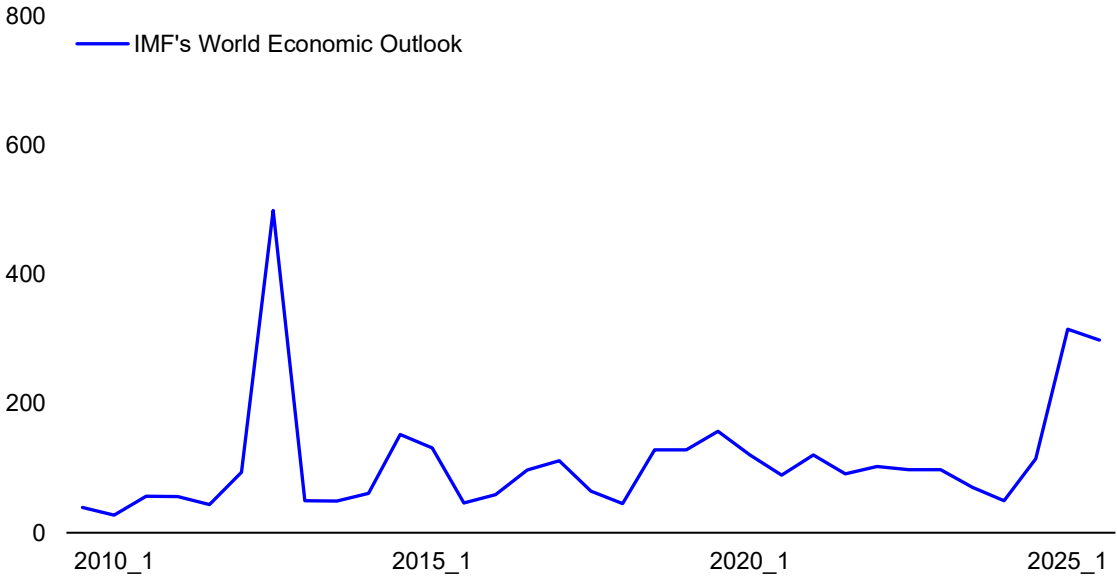


The Economic Policy Uncertainty US index and the World Uncertainty Global index both spiked in 2025



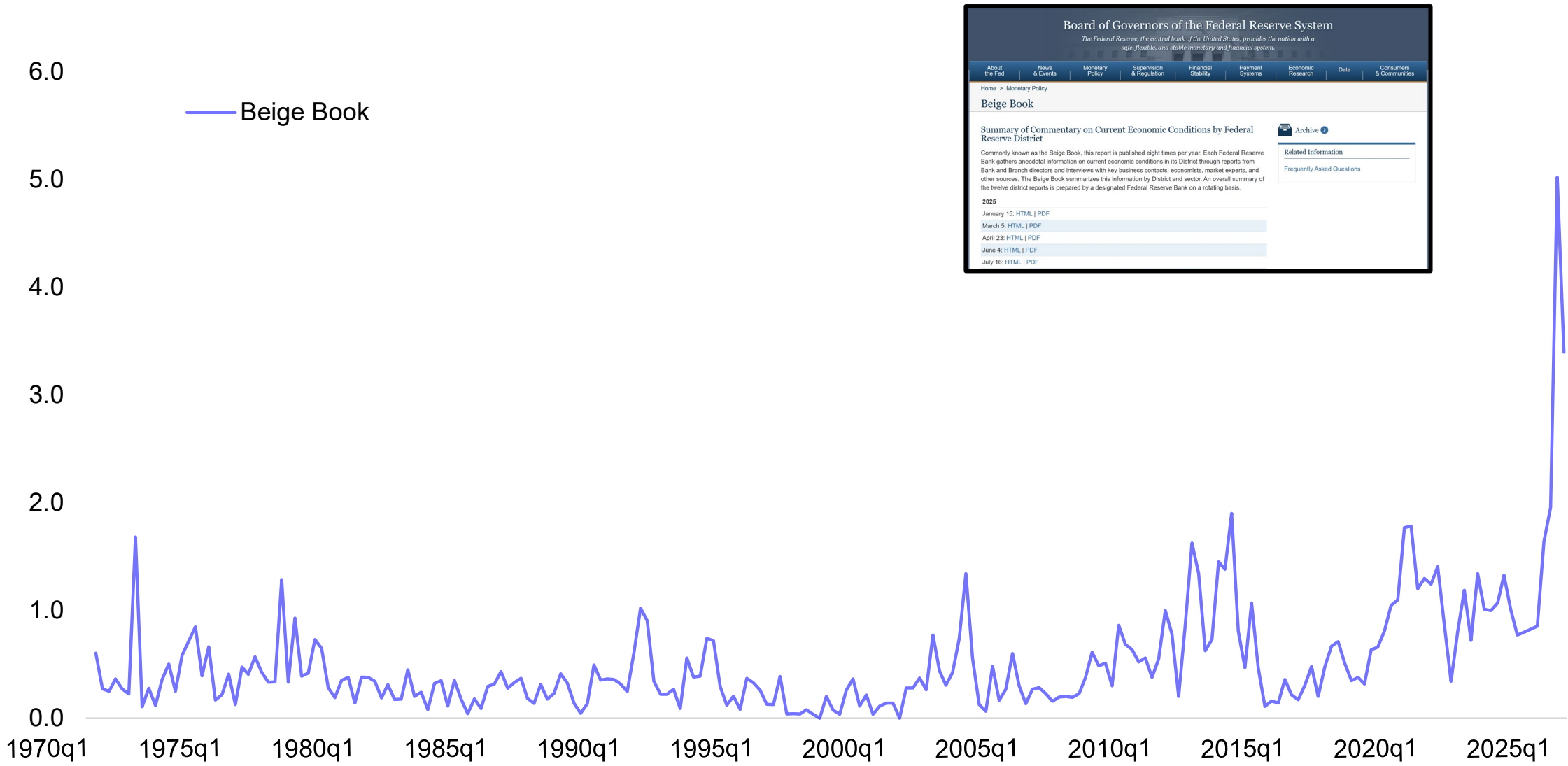
Source: "Uncertain about Uncertainty", IMF F&D Magazine, <https://www.imf.org/en/Publications/fandd/issues/2025/09/uncertainty-about-uncertainty-nicholas-bloom>

Text Mentions of “uncertainty” in IMF, OECD, World Bank and ECB Reports also Spiked in 2025



Source: “Uncertain about Uncertainty”, IMF F&D Magazine, <https://www.imf.org/en/Publications/fandd/issues/2025/09/uncertainty-about-uncertainty-nicholas-bloom>

Even Text Mentions of “uncert*” in the Beige Book Spiked in 2025

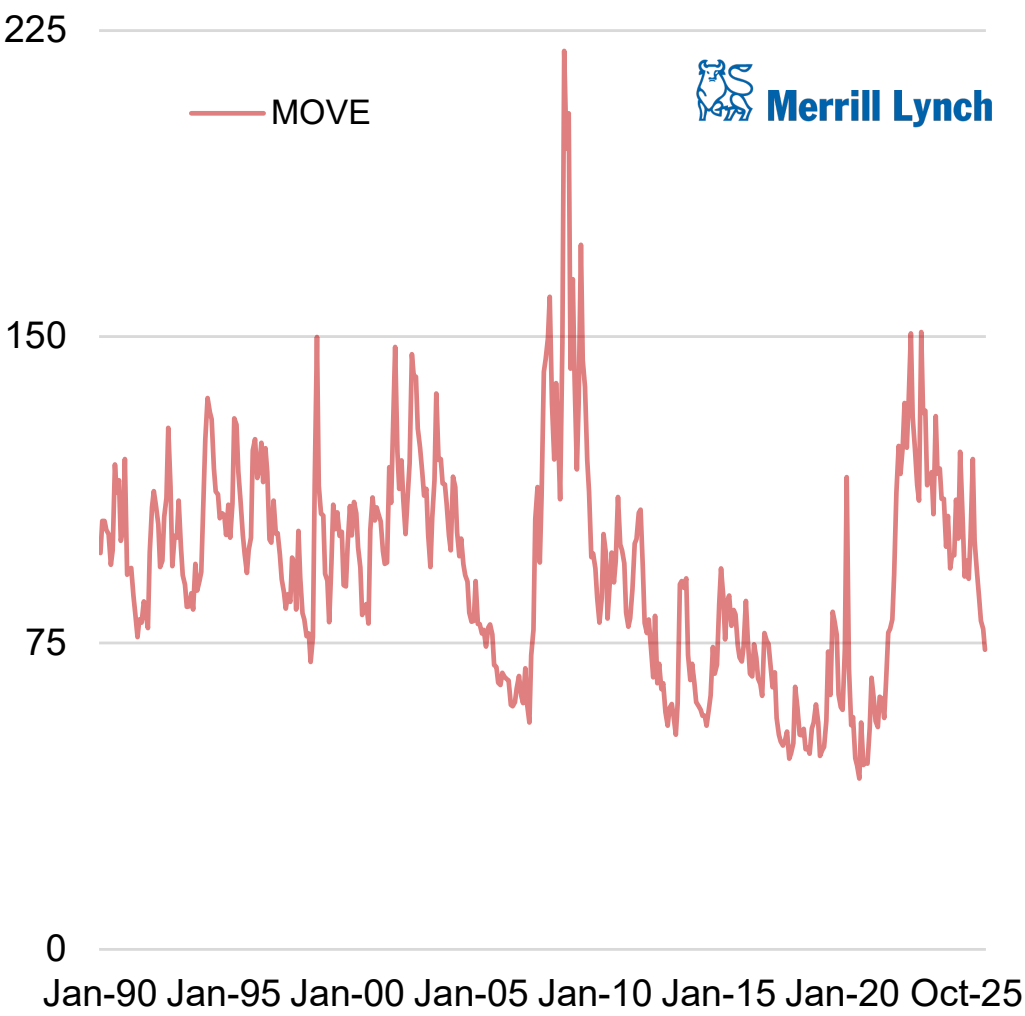
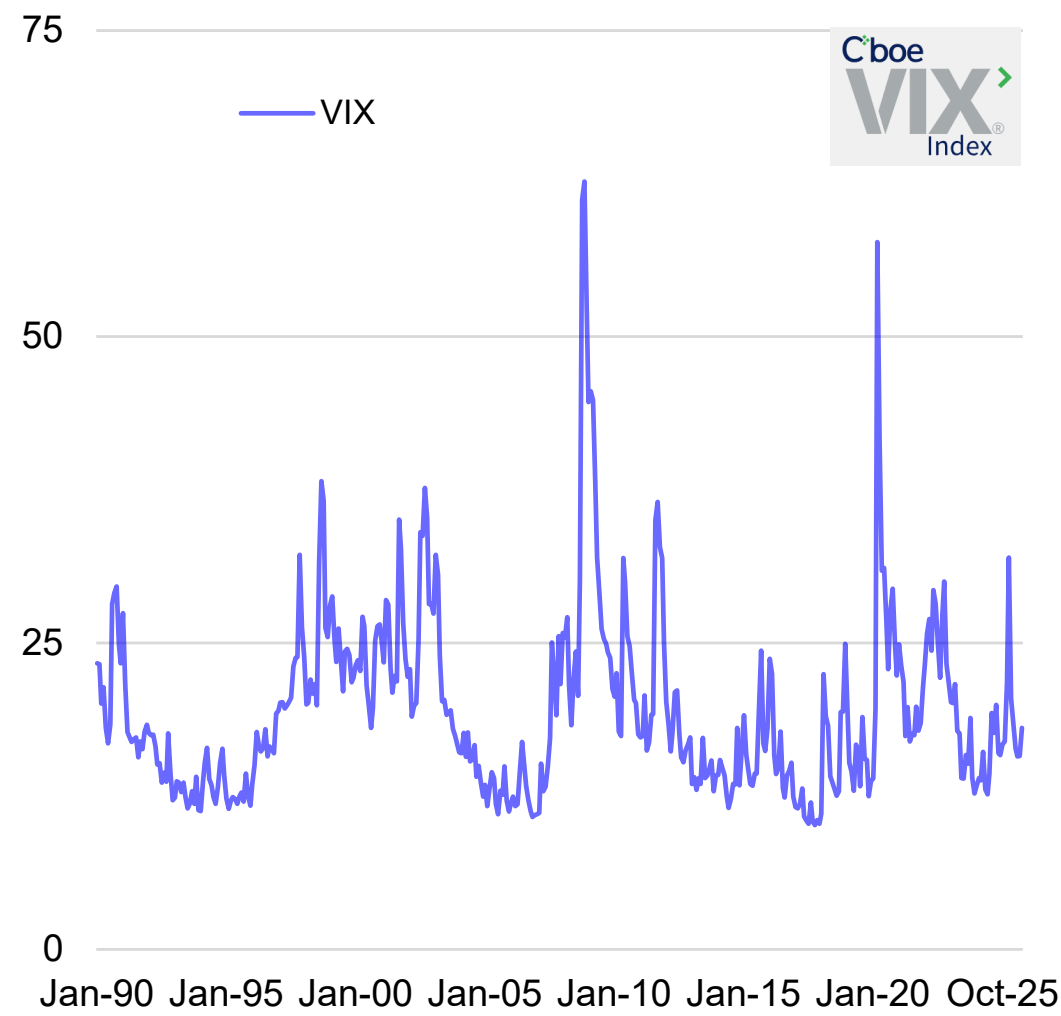


Source: Analysis of the Beige Book by Hites Ahir. Scale is “uncert*”/total words scaled by 1000. Months allocated to quarters.

Approach 2: Markets



S&P500 equity implied volatility (VIX) and bond implied volatility (MOVE) rose during 2025, but also dropped by Oct 2025

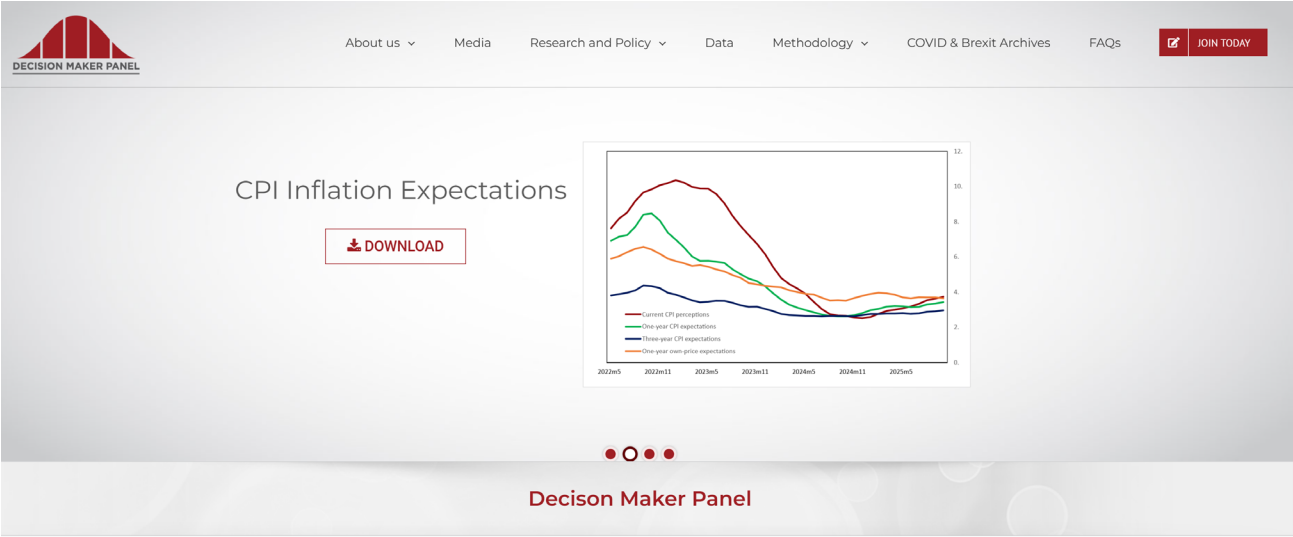


Source: "Uncertain about Uncertainty", IMF F&D Magazine, <https://www.imf.org/en/Publications/fandd/issues/2025/09/uncertainty-about-uncertainty-nicholas-bloom>

Approach 3: Surveys



Two Large Monthly Firm Surveys in the UK and US



Next month's Decision Maker Panel data will be published Thursday 4th December 2025

DECISION MAKER PANEL

LATEST DATA – OCTOBER 2025

SIGN UP FOR NOTIFICATIONS

The DMP was set up in August 2016. It provides direct insight into business expectations and uncertainty, for example Covid-19, Brexit and Inflation. Our panel draws information from Financial Officers in UK companies operating in a broad range of industries and is designed to be representative of the population of UK businesses.

BANK OF ENGLAND GOVERNOR'S LETTER TO DMP MEMBERS



Survey of Business Uncertainty



The Survey of Business Uncertainty (SBU) is an innovative panel survey that measures one-year-ahead expectations and uncertainties that firms have over their own employment and sales. The sample covers all regions of the U.S. economy, every industry sector except agriculture and government, and a broad range of firm sizes. The SBU was created in consultation with [Steven Davis](#) of the Hoover Institution and [Nicholas Bloom](#) of Stanford University.

External researchers can now request SBU microdata that have had identifying characteristics removed. To initiate a request, please [complete this form](#).

Latest Data & News

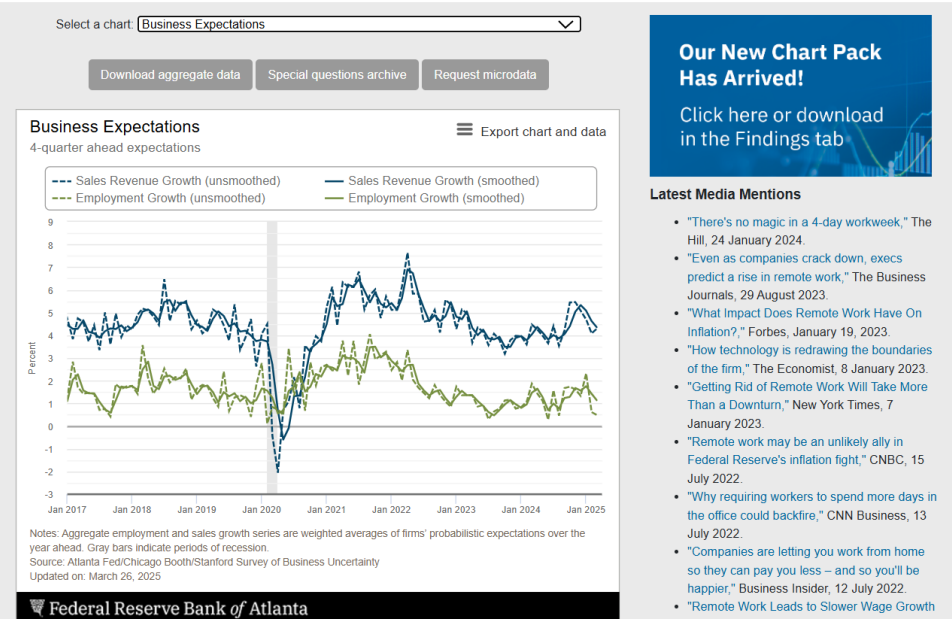
Findings & Results

Researcher Biographies

About the Survey

About the Panel

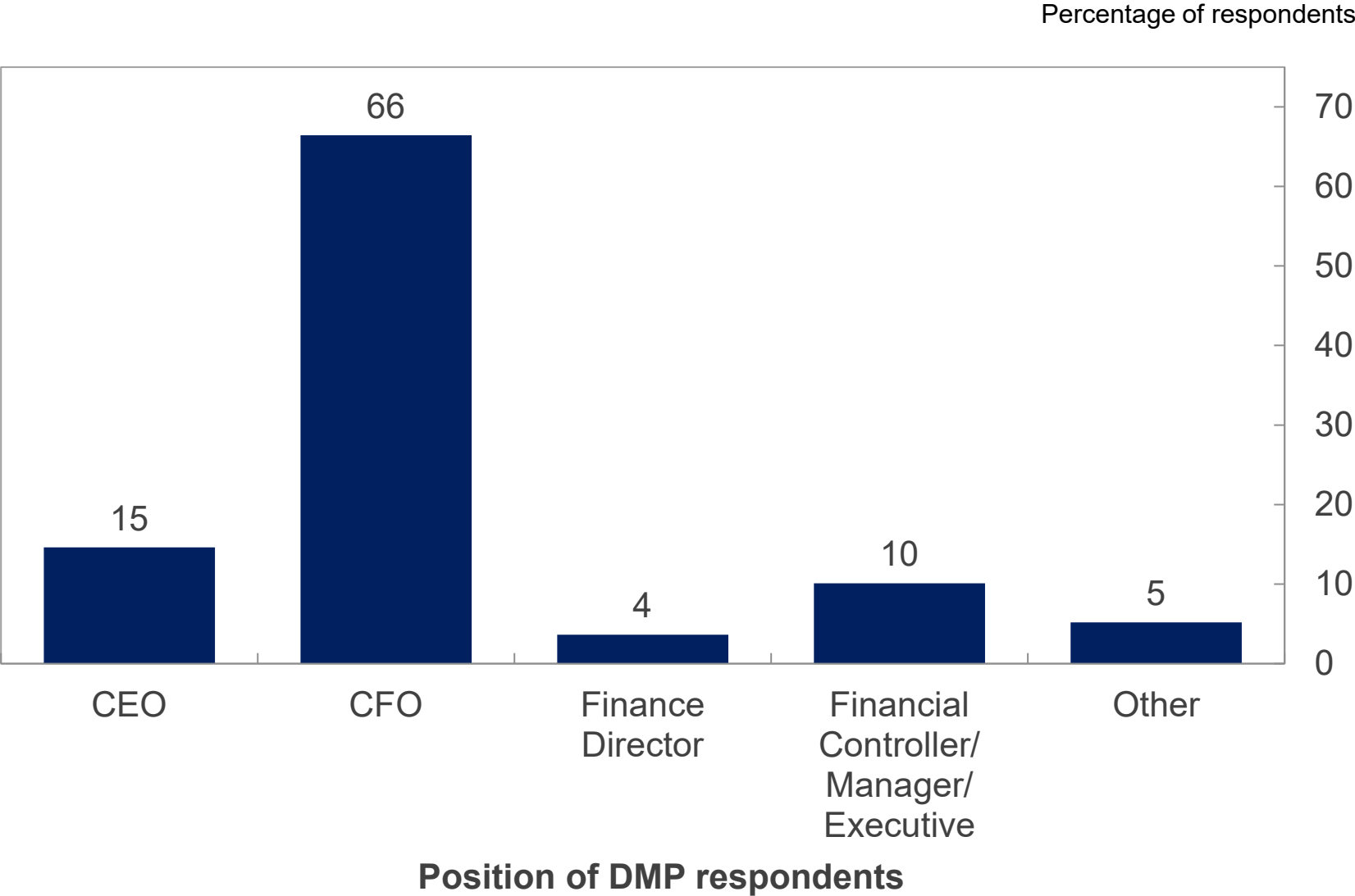
SBU in the Media



Folks are Recruited by Phone and then moved into an Online Panel



85% respondents are CFOs, CEOs or FDs



Surveys Ask About Forecast Distributions – e.g Sales

Decision Maker Panel



Looking a year ahead from the first quarter of 2021 to the first quarter of 2022, by what % amount do you expect your SALES REVENUE to have changed in each of the following scenarios?

Notes:
(a) Please include sales of UK-based businesses only and not from any overseas part of the group.
(b) Sales growth scenarios should be ordered from the lowest to the highest.

The LOWEST % change in sales revenue would be about:	-5	%
A LOW % change in sales revenue would be about:	0	%
A MIDDLE % change in sales revenue would be about:	5	%
A HIGH % change in sales revenue would be about:	10	%
The HIGHEST % change in sales revenue would be about:	15	%

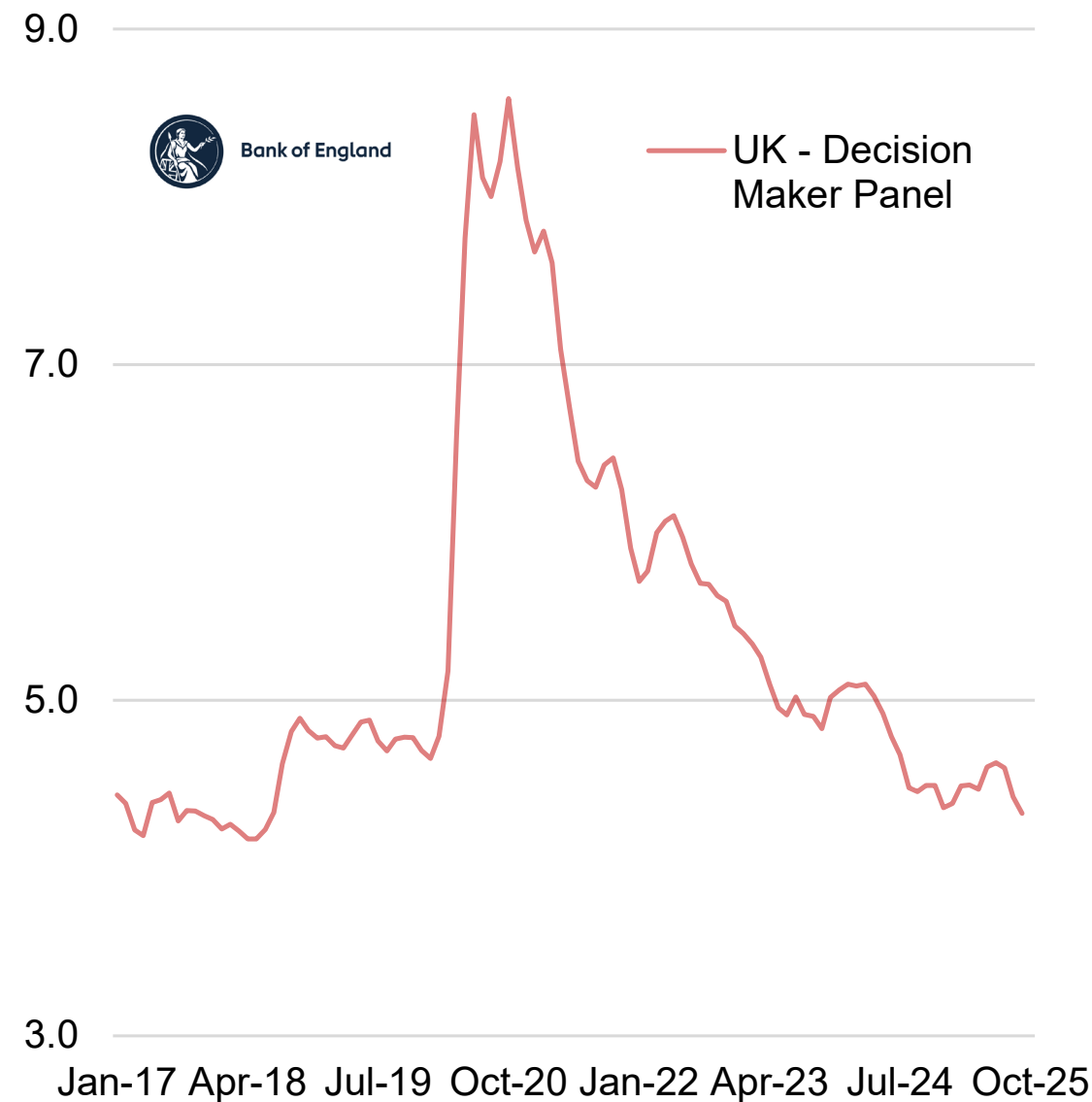
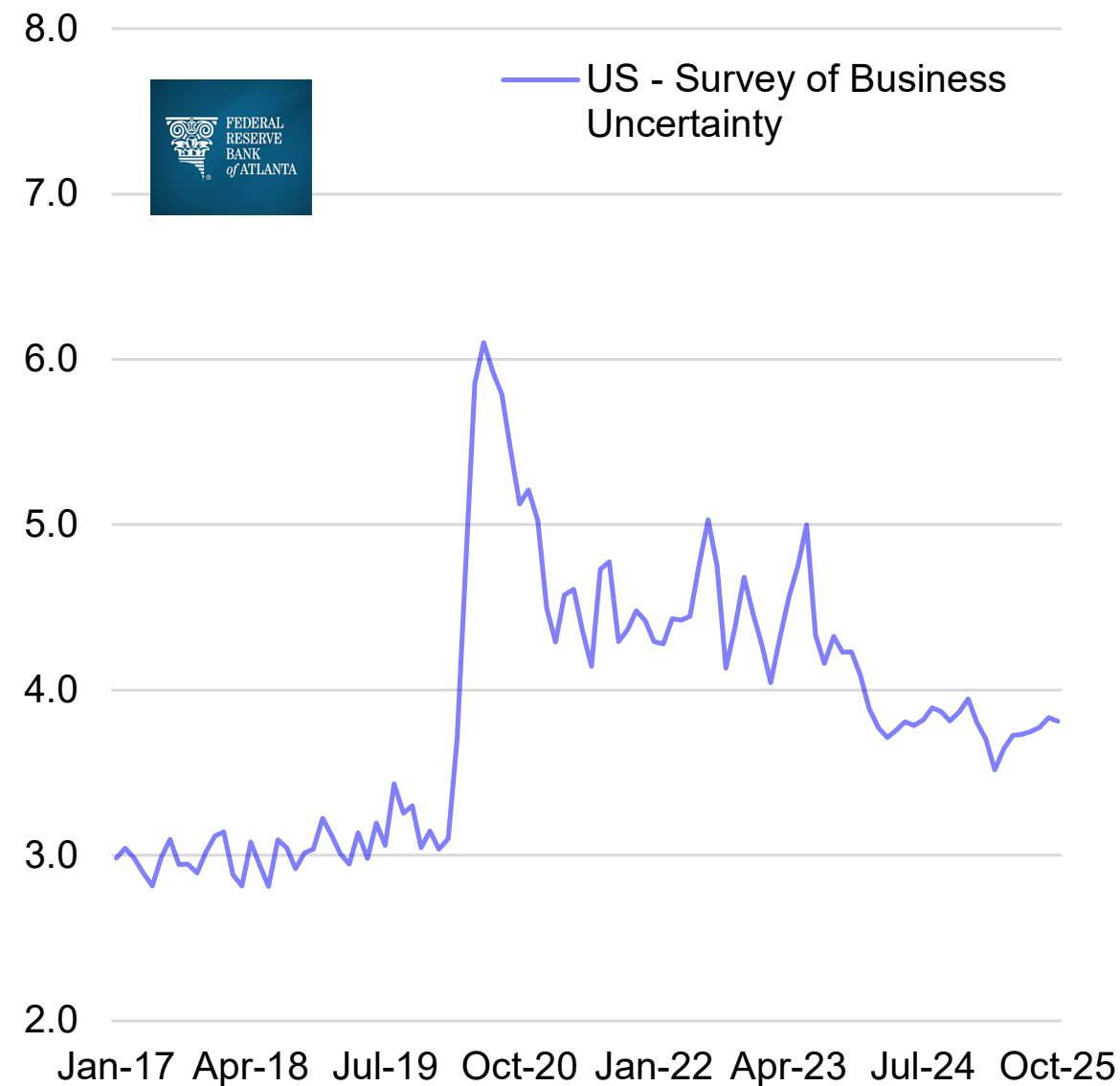
Decision Maker Panel



Please assign a percentage likelihood (probability) to the % changes in SALES REVENUE you entered (values should sum to 100%)

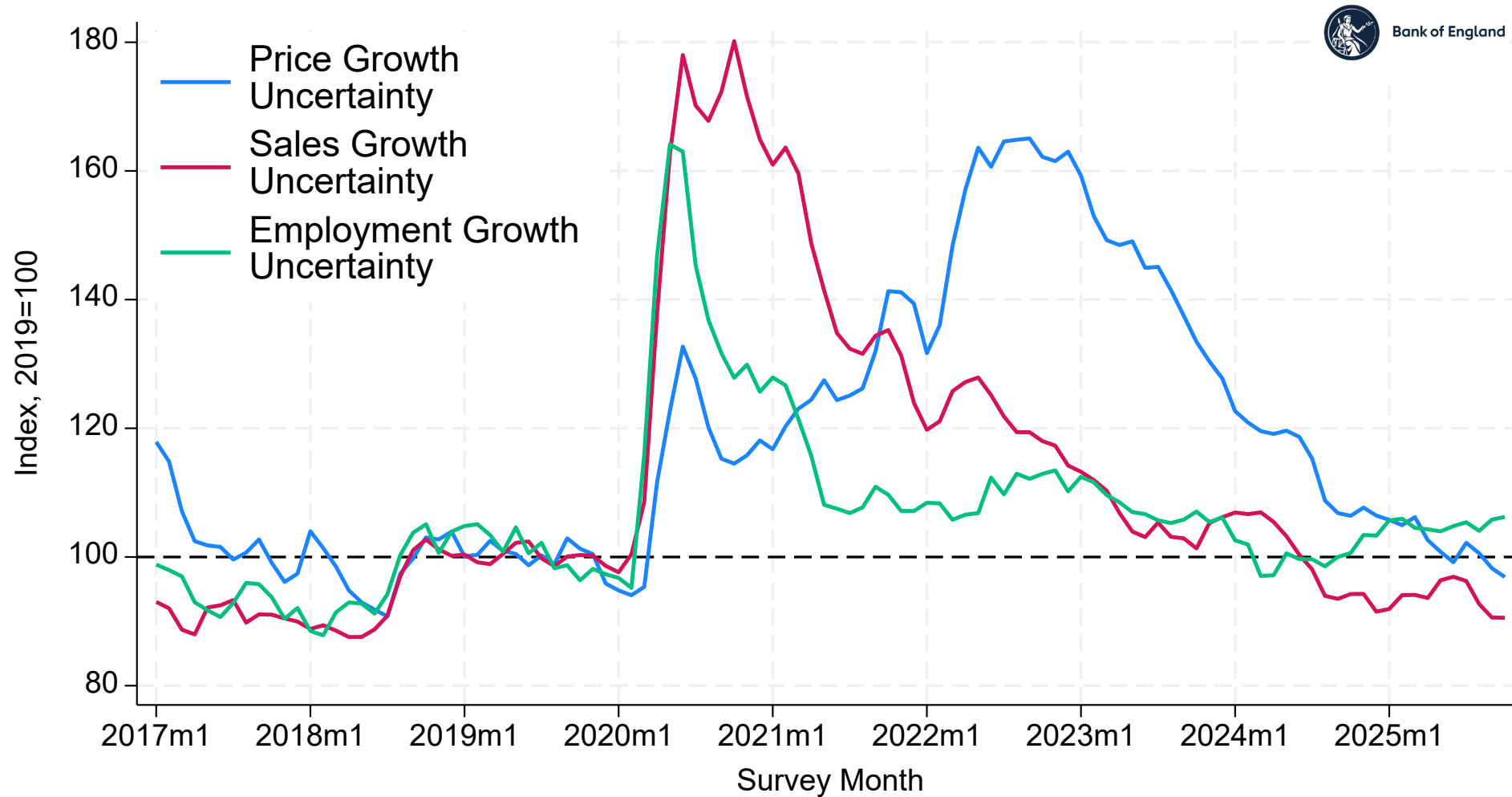
LOWEST: The likelihood of realising about -5% would be:	10	%
LOW: The likelihood of realising about 0% would be:	20	%
MIDDLE: The likelihood of realising about 5% would be:	40	%
HIGH: The likelihood of realising about 10% would be:	20	%
HIGHEST: The likelihood of realising about 15% would be:	10	%
Total	100	%

UK and US Sales Uncertainty Jumped in 2020 Then Dropped Back



Source: "Uncertain about Uncertainty", IMF F&D Magazine, <https://www.imf.org/en/Publications/fandd/issues/2025/09/uncertainty-about-uncertainty-nicholas-bloom>

Can Also Examine Different Types of Uncertainty – Sales and Hiring Uncertainty Spiked Early, Price Uncertainty Spiked Later



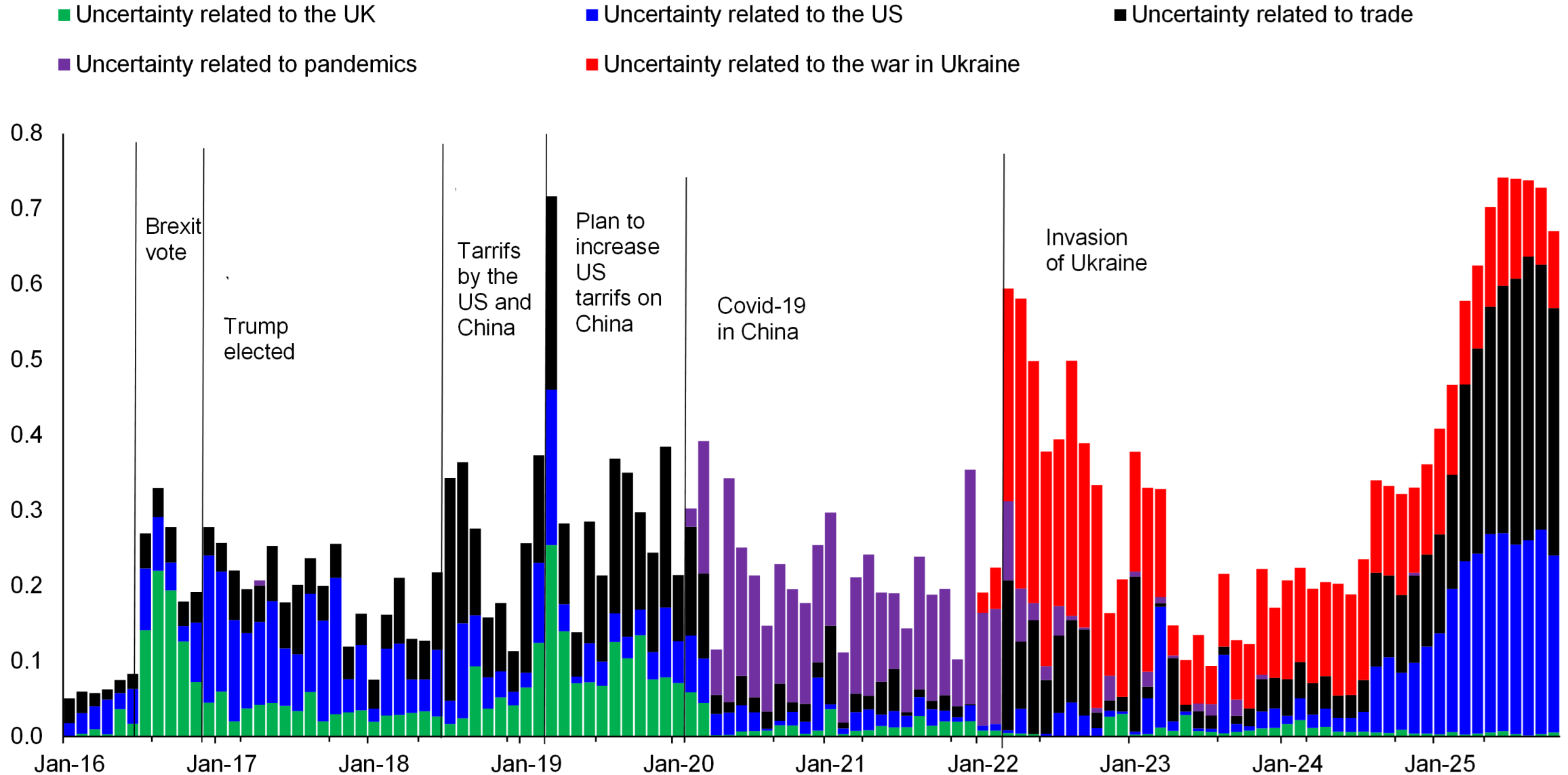
Note: The series are three-month moving averages

What to conclude.....

No measure is perfect, and they all track different types of uncertainties

Overall, I would say uncertainty is elevated (7/10), but not at epic levels

One thing is certain - the sources of uncertainty changed over time



Measuring Uncertainty



Impact of Uncertainty on Firms



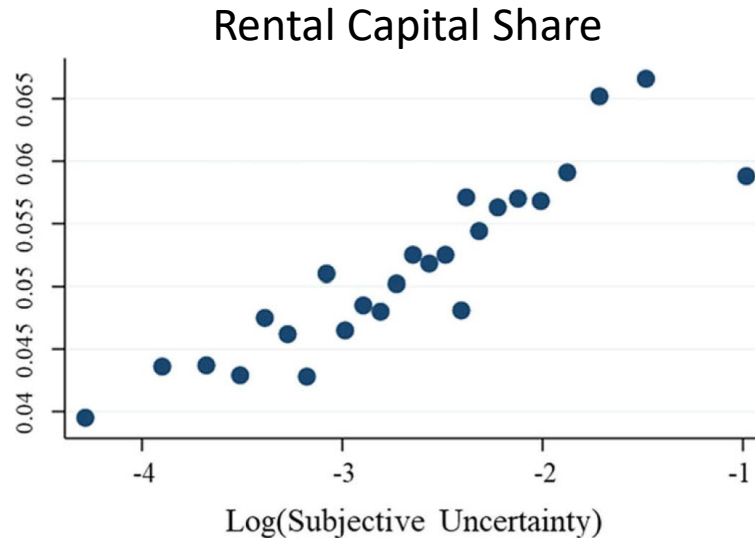
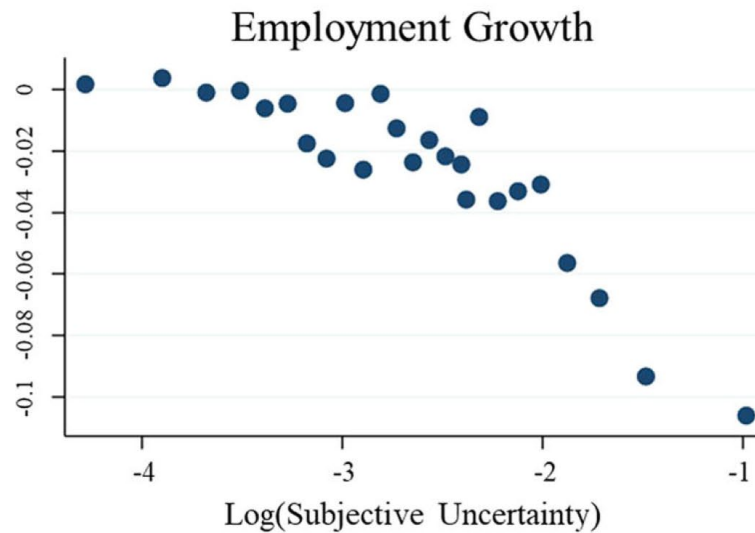
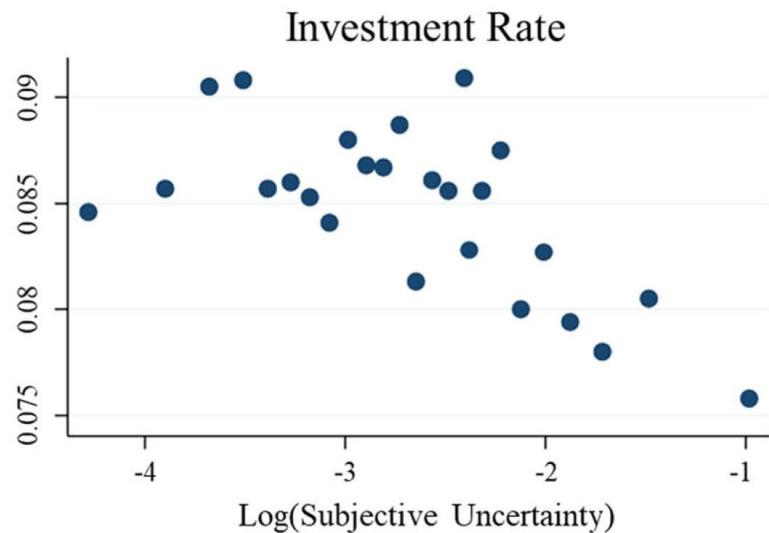
Theory: two main mechanisms for uncertainty to impact firms

Risk: uncertainty increases hurdle rates
(e.g. Keynes 1936 or Tobin 1958)

Real options: uncertainty makes firms delay with adjustment costs
(e.g. Bernanke 1983 or Dixit and Pindyck 1994)

- (I) Uncertainty lowers investment “*levels effect*”
- (II) Uncertainty lowers reallocation “*caution effect*”

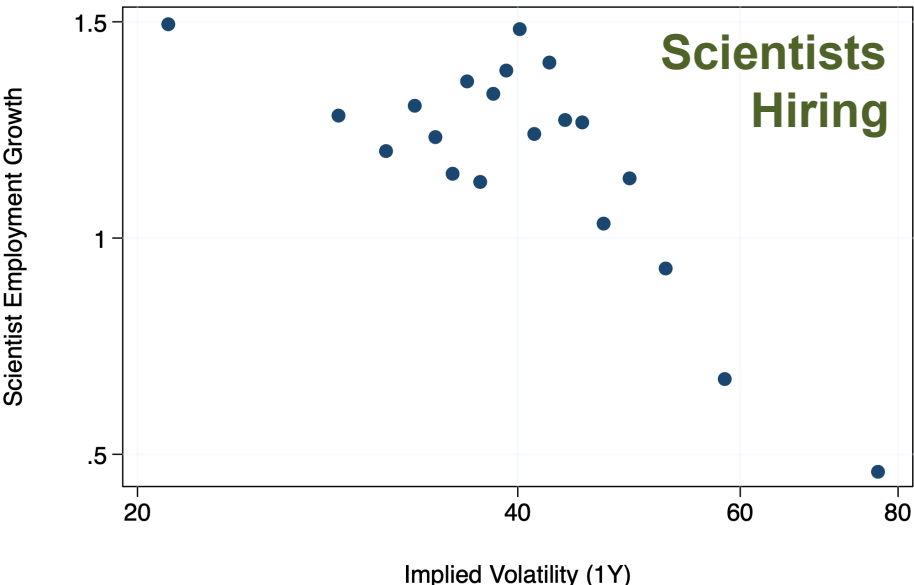
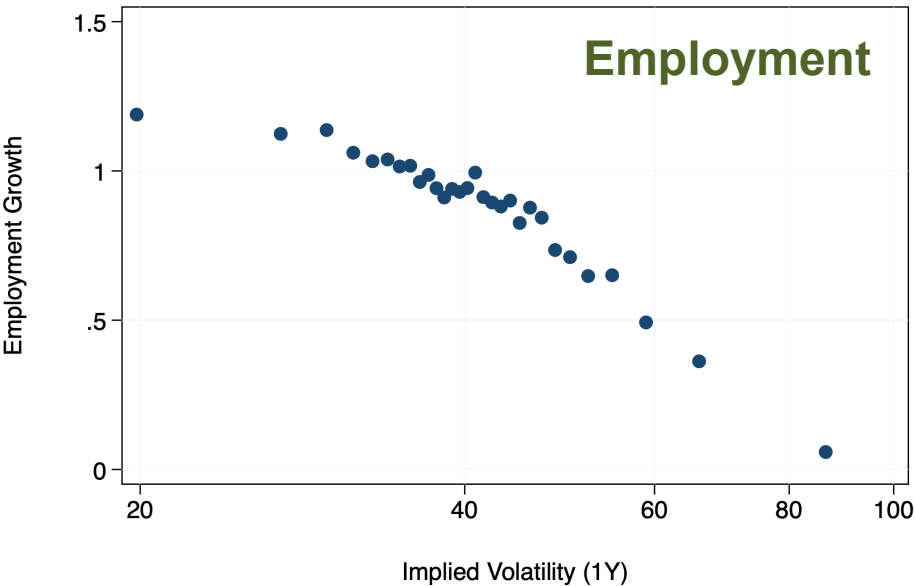
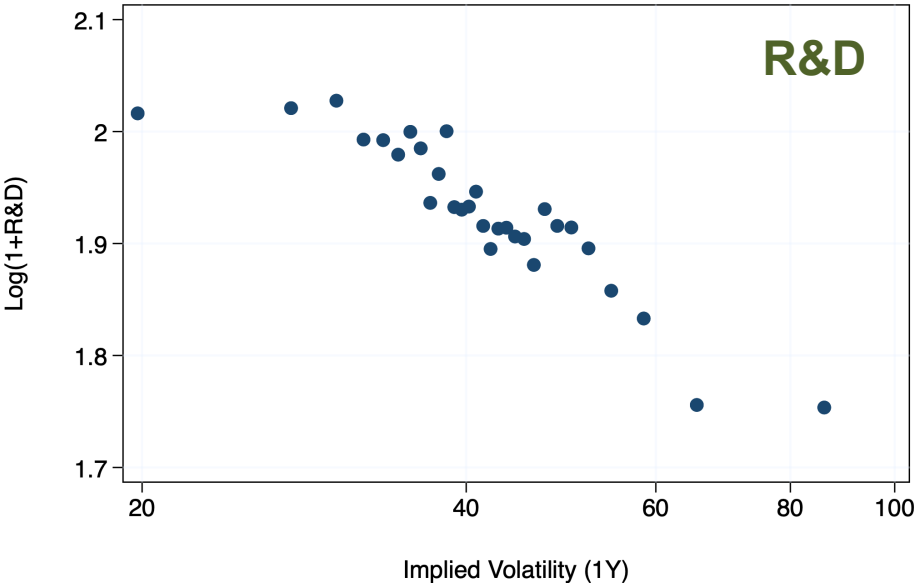
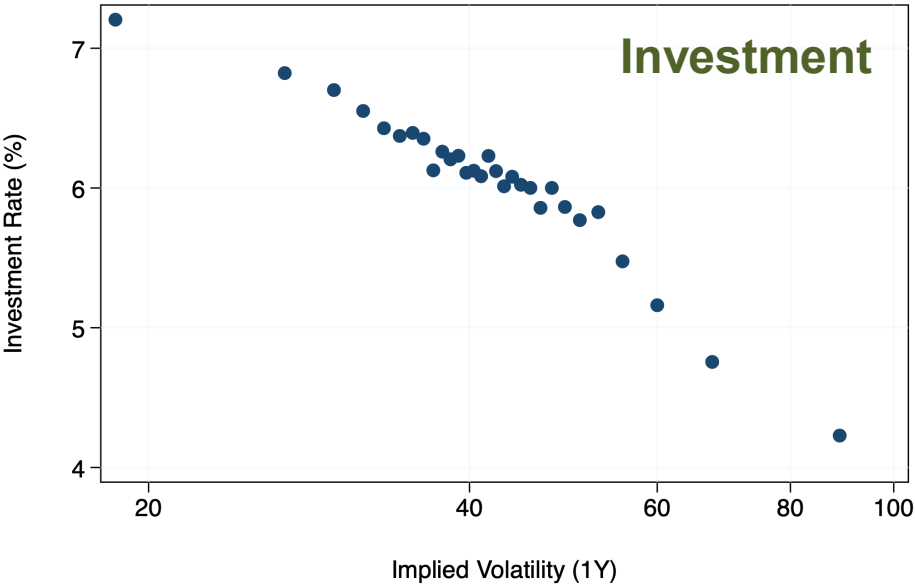
Empirics “levels effects”: Higher uncertainty *correlated with* lower investment, employment growth and sales growth (Census data)



Source: “Investment and Subjective Uncertainty”, International Economic Review, November 2024, Nick Bloom, Steve Davis, Lucia Foster, Scott Ohlmacher and Itay Saporta-Eksten

Data from 25,000 US Manufacturing Plants surveyed in 2015

Empirics “levels effects”: Uncertainty *Correlated With* Less Investment, R&D, Hiring and Scientist Hiring (Compustat and Revelio)



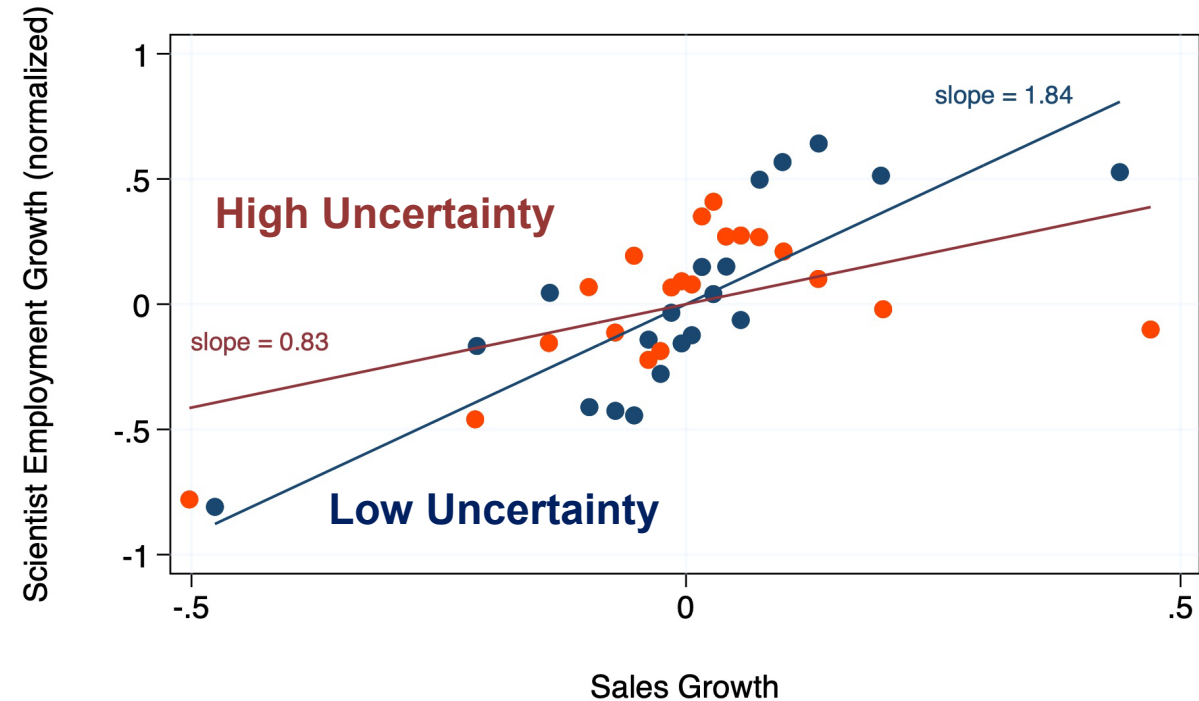
Source: “Short and Long Run Uncertainty”, Jose Barrero, Nick Bloom, Adithya Mohan and Ian Wright, 2025. Data sources: **Compustat** Quarterly Investment Rate, 2004-2023, 114,000 obs, 3000 firms; Compustat Quarterly R&D. 2004-2023, 78,000 obs, 2000 firms; **Revelio** Quarterly Employment DHS Growth, 2008-2023, 69,000 obs, 1600 firms. OptionMetrics data on implied volatility

Empirics “caution effects”: Uncertainty also reduces reallocation – firms respond about 50% less to market signals at high uncertainty

Investment Response to Sales



Scientist Hiring Response to Sales



Source: “Short and Long Run Uncertainty”, Jose Barrero, Nick Bloom, Adithya Mohan and Ian Wright, 2025. Data sources: Compustat Quarterly Investment Rate, 2004-2023, 114,000 obs, 3000 firms; Revelio Quarterly Employment DHS Growth, 2008-2023, 69,000 obs, 1600 firms. OptionMetrics data on implied volatility. Volatility split by low=bottom 25%, high=top 25%.

Uncertainty effects amplified if financial constraints are tight

The Finance Uncertainty Multiplier

Iván Alfaro

BI Norwegian Business School

Nicholas Bloom

Stanford University

Xiaoji Lin

University of Minnesota

We show how real and financial frictions amplify, prolong, and propagate the negative impact of uncertainty shocks. We use a novel instrumentation strategy to address endogeneity in estimating the impact of uncertainty by exploiting differential firm exposure to exchange rate, policy, and energy price volatility. We show that financially constrained firms cut investment more than unconstrained firms following an uncertainty shock. We then build a general equilibrium heterogeneous firms model with real and financial frictions, finding that financial frictions (i) amplify uncertainty shocks by doubling their impact on output; (ii) increase persistence by doubling the duration of the drop; and (iii) propagate uncertainty shocks by spreading their impact onto financial variables.

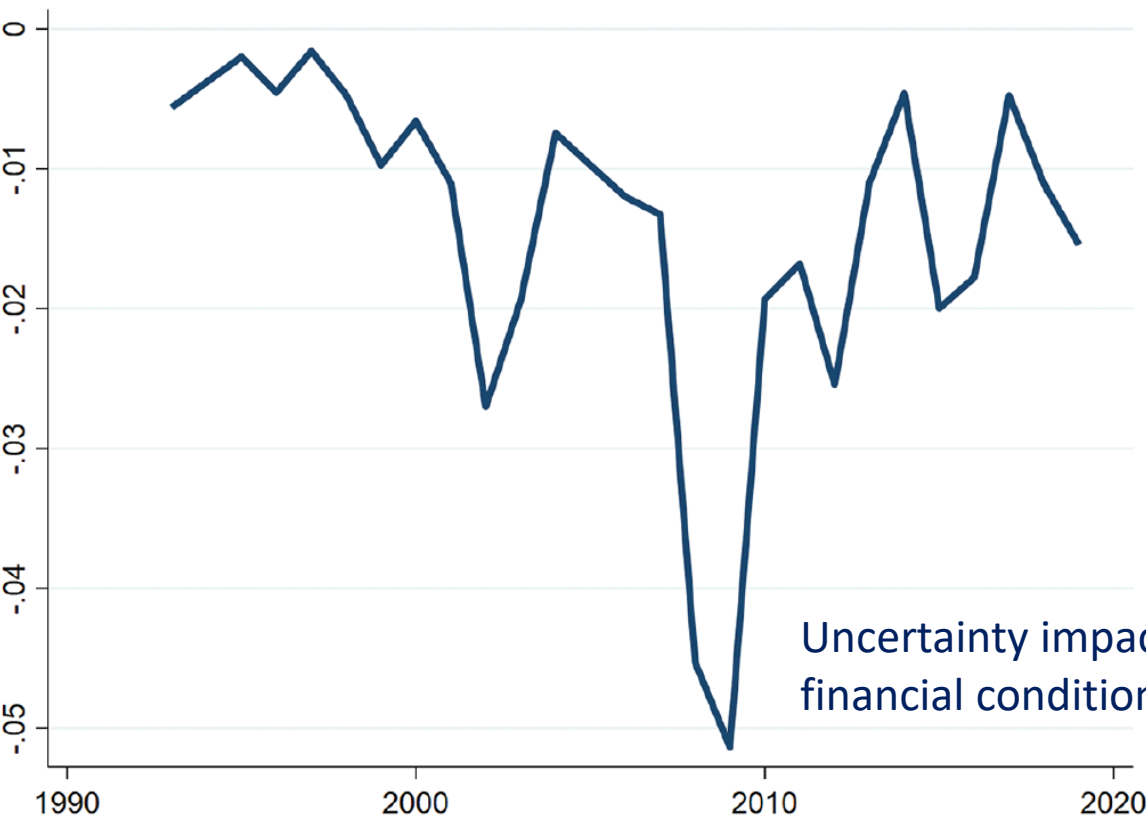
Author Iván Alfaro also publishes under the name Luis Iván Alfaro-Dardón. We thank the editor, Harald Uhlig; three thoughtful referees; our formal discussants, Zhanhui Chen, Nicolas Crouzet, Ian Dew-Becker, Jan Eberly, Simon Gilchrist, Po-Hsuan Hsu, Hyunseob Kim, Howard Kung, Ye Li, Gill Segal, and Toni Whited; and seminar audiences at the Adam Smith Conference, American Economic Association, American Finance Association, Beijing University, BI Norwegian Business School, Cambridge University, China Europe International Business School, University of Chicago, Econometric Society, European Finance Association, Georgetown University, London Business School, Macro Finance Society

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<https://doi.org/10.1086/726230>

Real and financial frictions multiply – uncertainty cuts investment from both “real options” and “cash options”

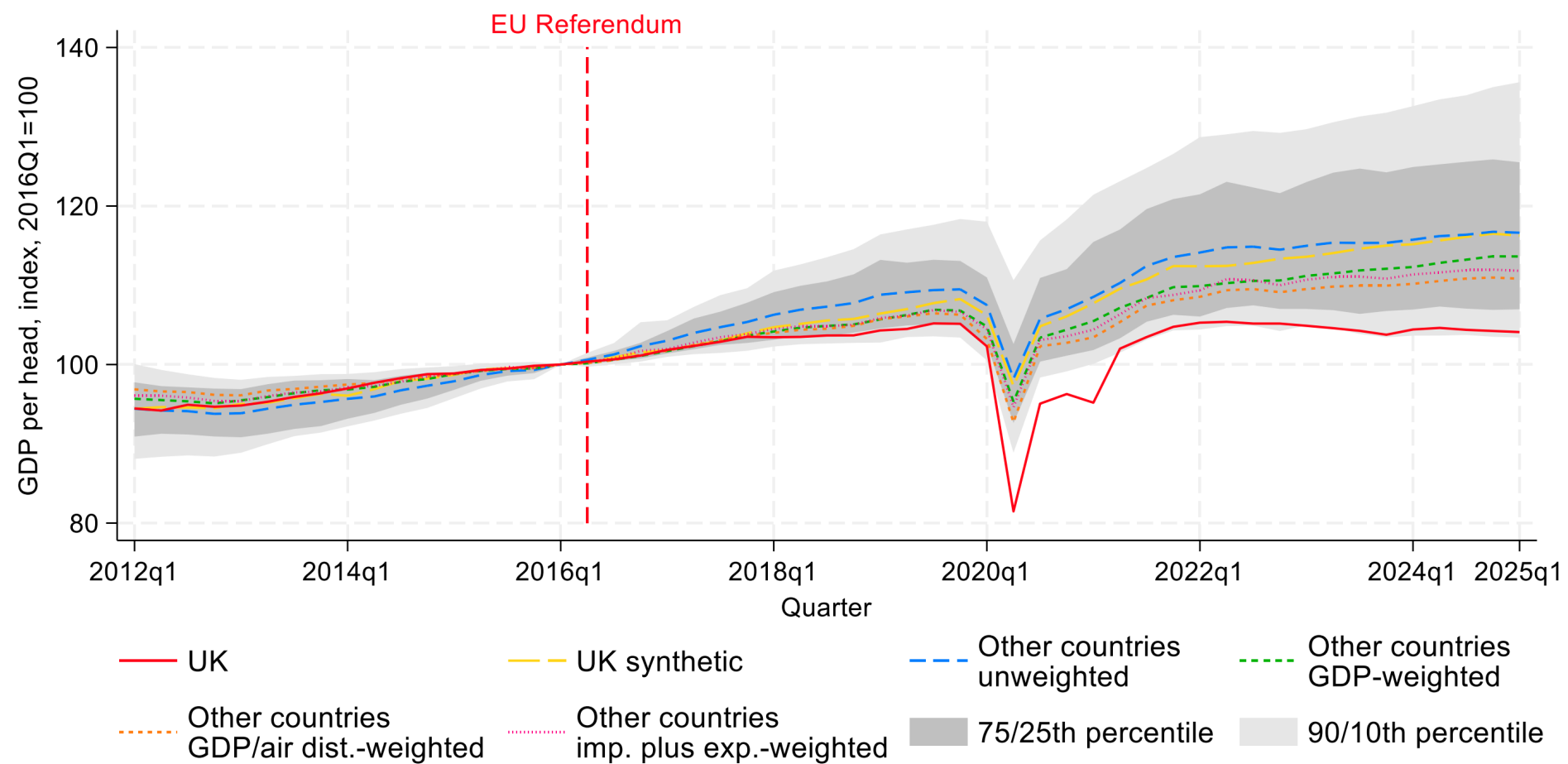
Figure 2: Marginal Impact of Uncertainty on Investment



Example of Persistently Damaging Uncertainty: Brexit



Figure 1: GDP per capita cross-country comparison



Notes: The figure uses data on real gross domestic product per person in the population. Comparator countries are US, Canada, EU-27 countries, Iceland, Norway, Switzerland, and Japan. All series used in the calculations have been seasonally adjusted. The synthetic control method estimates the effect of the EU referendum on the UK's economy by comparing the evolution of GDP per capita for the UK to the evolution of GDP per capita for a synthetic control group. We use data starting from 2006Q1 up to the EU referendum (2016Q2, 41 periods) to obtain optimal weights that minimize the prediction error in the pre-referendum period. To predict UK GDP per capita in the pre-referendum period we used GDP per capita, trade openness, investment ratio, educational attainment, and industry share in value added. Due to highly volatile time series we excluded Cyprus and Malta. For Ireland we use a measure of modified domestic demand rather than GDP because of distortions in the headline GDP data. The country weights are: US: 0.614, EST: 0.109, GRE: 0.095, ITA: 0.067, IRE: 0.044, LAT: 0.034, ICE: 0.03, HUN: 0.007. Percentiles were estimated using the bootstrapping method. Sources: OECD, Irish Central Statistics Office and World Bank.

Conclusion

- > Uncertainty has risen in some, but not all, measures in 2025**
- > Uncertainty rapidly reduces employment and investment**
- > Longer-run reduces growth from reallocation and innovation effects**