Online Appendix to "Global Confidence, Uncertainty, and Business Cycles"

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A.1 Literature Review: Global Confidence and Business Cycle

The literature has shown that economic confidence is an important channel of business and financial cycle fluctuations. Economic theory has long claimed that waves of optimism and pessimism could be important drivers of business cycles (e.g., Pigou 1927; Akerlof and Shiller 2010). Survey data on consumer sentiment might provide information about such optimistic or pessimistic views regarding future economic developments, including uncertainty that may have substantial implications for real economic activity. Over the recent decades—in particular, since the global financial crisis—these studies have reformulated macroeconomic models with business and consumer confidence as a channel of business cycle fluctuations (Bansal and Shaliastovich 2010; Barsky and Sims 2012; Farmer 2012; Angeletos and La'O 2013; Ilut and Schneider 2014; Benhabib, Wang, and Wen 2015; Lagerborg, Pappa, and Ravn 2020).

Empirical results have presented evidence on the role of confidence as a source of business and financial cycles (Eickmeier 2007; Beaudry, Dupaigne, and Portier 2011; Fei 2011; Bachmann and Sims 2012; Jones and Olson 2013; Møller, Nørholm, and Rangvid 2014; Karnizova and Khan 2015; Leduc and Liu 2016; Dées and Zimic 2019; Levchenko and Pandalai-Nayar 2020; Nowzohour and Stracca 2020). A group of studies augmented their empirical models with survey-based confidence to investigate the effects of the confidence

on domestic business cycles. Other studies proposed novel identification schemes that sort out the shocks in economic sentiment orthogonally to other macroeconomic shocks, and investigated the causal impact of the shocks on macroeconomic developments. In this appendix, we review extensively the large literature on the confidence and business cycle.

A.1.1 Confidence and Economic Activity

A wide range of studies have tested empirically the role of confidence in the business cycle fluctuations. The studies have mainly focused on the large economies, including the United States and the euro area. Leduc (2010) used professional economic forecasts for the United States to measure confidence, and correlated the results with future economic activity. The analysis suggested that changes in the expectations on future economic performance acted as an important driver for economic fluctuations, and that the periods of heightened optimism were likely followed by monetary policy tightening. Using regime-switching models with the data of U.S. business cycle expansion and contraction, Ahmed and Cassou (2016) showed the impact of confidence shocks on economic activity conditional on potential states. They showed that the connection between consumer confidence and certain types of consumer purchases is important during good economic times, while it becomes less critical during bad economic times. Shapiro, Sudhof, and Wilson (2020) developed new time-series measures of economic sentiment by applying computational text analysis on economic and financial newspaper articles from January 1980 to April 2015. They found that the news sentiment indices correlate strongly with contemporaneous business cycle indicators and that innovations to news sentiment predict future economic activity.

Using VAR models of economic activity, sentiment, and uncertainty in four sectors—industry, retail, services, and construction—of the euro area, van Aarle and Moons (2017) investigated the roles played by economic sentiment and uncertainty in explaining economic adjustments during the financial crisis and the Great Recession. They found that sentiment and uncertainty had non-negligible effects on economic activity. Berry and Davey (2004) suggested some possible interpretations of the consumer confidence data by assessing

its embedded information in predicting consumption. Taylor and McNabb (2007) examined whether indicators of consumer and business confidence could predict movements of GDP over the business cycle in four European economies. The results indicated that both consumer and business confidence indicators are procyclical and generally convey useful information for predicting downturns. Using the survey data on inflation and growth expectations in Italy, Cesaroni and Iezzi (2017) showed the indicators were able to early detect turning points of the business cycle. Batchelor and Dua (1998) tested whether the consumer confidence index improved the economic forecasts and found that consumer confidence would have been helpful in predicting the recession in 1991.

A.1.2 Confidence Cycle in a Global Dimension

The literature documents that, due to fast-developing technologies and strengthening of cross-border linkages, economic sentiments have been increasingly synchronized across countries (Nowzohour and Stracca 2020). Advances in information technology make economic agents exposed more to the conditions in other jurisdictions (Daas and Puts 2014; Gorodnichenko, Pham, and Talavera 2021). Under the circumstances, the shifts in pessimism or optimism in a country can swiftly spread to the other countries' psychological waves, making economic sentiments likely co-vary across countries. In addition, since the economies are tightly interconnected via global supply chains, news on a country's future productivity will influence sentiments not only in the origin country but also in neighboring countries (Lee 2006, Venturini 2015, Audrino and Tetereva 2019).

That said, while a sizable body of literature documents the roles played by confidence in driving business cycles, the research on the global confidence cycle and its consequences on a global level is still in its early stages. The studies on the global confidence cycle are important because they can contribute to unraveling the sources of global business and financial cycles. Although the literature has empirically characterized business and financial cycles among countries, there is not yet a concrete consensus on the main driving forces of the global cycles.[1]

[1]For instance, with the help of a dynamic factor model, Stock and Watson (2005) and Kose, Otrok, and Whiteman (2003, 2008) explain the roles of global

Among a few exceptions, Nowzohour and Stracca (2020) documented stylized facts of economic sentiments by investigating a variety of confidence and uncertainty measures. Based on the findings on the highly positively correlated economic sentiments in a global dimension, they concluded that a global factor of confidence indeed exists. Dées and Güntner (2017) used survey data on consumer sentiment in order to identify the causal effects of confidence shocks on real economic activity in a selection of advanced economies. They found that, after controlling for the international confidence cycles through a FAVAR model, the domestic and cross-border impacts of country-specific confidence shocks (and their contribution to business cycle fluctuations) were smaller, confirming the existence of the global dimension of confidence shocks and their effects.[2]

A.1.3 Confidence and Uncertainty

While confidence has a close relationship with uncertainty, it also has subtly distinct natures from uncertainty. Conceptually, the literature suggests that confidence is a strong belief in future economic conditions which can be a consequence of news and/or animal spirits, while uncertainty is either the lack of information on the distribution of probability for future economic developments, so-called unknown unknowns, or the range of possible future economic outcomes (Nowzohour and Stracca 2020). Hence, given their natures, the interactions and differences between confidence and uncertainty can be considered in the following ways.

First, confidence reflects future economic uncertainty. As argued by Akerlof and Shiller (2010), confidence reflects sentiments (animal spirits), which can be important sources of economic fluctuations. An increase in aggregate uncertainty signals riskier (or more

factors in business cycles. Miranda-Agrippino and Rey (2015) document a common factor which contributes a considerable portion in variations of financial asset prices including equity prices, commodity prices, and bond indices. Ha et al. (2020) investigate the two-way interplays between the business and financial cycles using a dynamic factor model.

[2]Dees and Brinca (2013) also assessed the link between consumer sentiment and consumption expenditures for the United States and the euro area. The study provided some evidence of a "confidence channel" in the international transmission of shocks, as U.S. confidence indices helped predict consumer sentiment in the euro area.

volatile) economic conditions to economic agents, which lowers confidence and confidence-induced spending, leading to falling aggregate demand and an economic contraction. Second, the confidence channel can also play a role, as elevated uncertainty increases risk and ambiguity. The increased ambiguity makes it difficult for economic agents to form a probability distribution of economic fundamentals. With pessimistic beliefs, people expect the worst outcome might occur, which is worsened with the increased uncertainty, leading to further contractions in investment, spending, and hiring (Ilut and Schneider 2014). In addition, movements in measured confidence also reflect changes in perceptions about future economic fundamentals. As discussed in Barsky and Sims (2012), confidence conveys information about future productivity growth and output changes at lower frequencies. An increase in uncertainty raises the real option value for economic agents to delay their spending and investment activities (Bloom 2009), making them less sensitive to changes in economic conditions and policies. This, in turn, leads to misallocation of resources among firms, lowered productivity, and lower output overall. In reality, however, it is highly likely that a change in uncertainty occurs simultaneously instead of coming alone and having repercussions on economic agents' confidence.

A.1.4 Information Contents in Confidence Measures

The theoretical developments often focused on how to empirically quantify confidence shocks and on what information contents are included in the shocks. There are two contrasting approaches to the role of confidence in macroeconomics: the "information" or "news" view, which suggests that confidence indicators contain information about future economic developments (e.g., Beaudry and Portier 2006; Jaimovich and Rebelo 2009; Barsky and Sims 2012), and the "animal spirits" view, which claims that changes in beliefs unrelated to economic fundamentals have a causal effect on the business cycle (Angeletos and La'O 2013).

Barsky and Sims (2012) proposed and implemented a novel structural VAR approach to the identification of news shocks about future technology. The news shock was identified as the shock orthogonal to the innovation in current utilization-adjusted TFP that best explains variation in future TFP. The study concluded that while news,

animal spirits, and pure noise all contributed to confidence innovations, the relationship between confidence and subsequent activity was almost entirely reflective of the news component. Using monthly U.S. data and a structural vector autoregression, Starr (2012) investigated the influence of economic news on consumer sentiment and examined whether news shocks—changes in coverage that would not be expected from incoming data on economic fundamentals—have aggregate effects. The author found that sentiment is affected by news shocks and that shocks to sentiment have positive effects on consumer spending. By using high-frequency micro data on spending and consumer confidence in the United States, Lachowska (2016) studied whether changes in confidence represent autonomous fluctuations in optimism, independent of information on economic fundamentals, or whether they reflected economic news. The study found that consumer confidence contained information relevant to predicting spending, independent of other indicators.

Angeletos and La'O (2013) enriched workhorse macroeconomic models with a mechanism that manifests itself as waves of optimism and pessimism about the short-term economic outlook. They interpreted this mechanism as variation in confidence and showed that it helps account for many salient features of the data. Building on Barsky and Sims (2012), Levchenko and Pandalai-Nayar (2020) proposed a novel identification scheme for a non-technology business cycle shock which they labeled as "sentiment." This is a shock orthogonal to the identified surprise and news TFP shocks that maximizes the short-run forecast error variance of an expectational variable, alternatively a GDP forecast or a consumer confidence index. The U.S. sentiment shock produced a business cycle in the United States, with rises of output, hours, and consumption following a positive shock, and accounted for the bulk of U.S. short-run business cycle fluctuations.

A.2 Measures of Global Confidence, Uncertainty, and Business Cycle

In addition to global confidence cycles presented in Section 3.1, we present the measures of global business, financial, and inflation cycles. The global indicators are proxied by common components across countries using dynamic factor models. Also, a variety of global uncertainty indices in the literature are compared.

A.2.1 Global Business, Financial, and Inflation Cycles

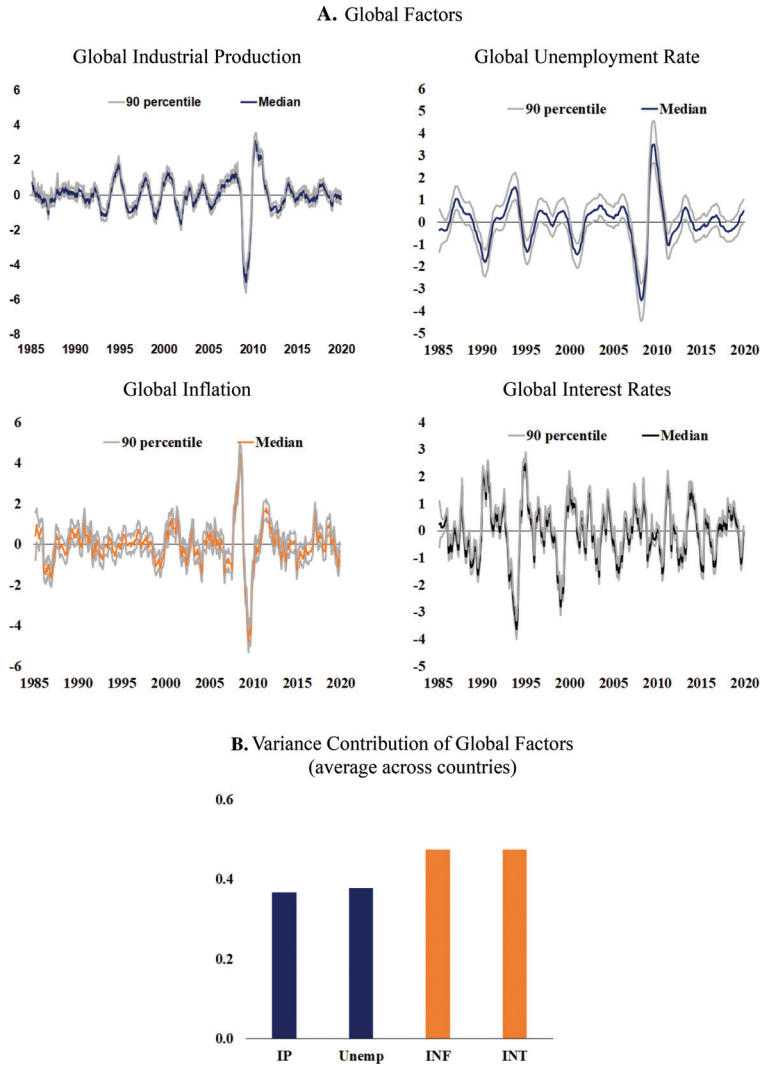
Figure A.1 presents the global factors for cross-country industrial production, unemployment rates, headline CPI inflation, and long-term interest rates. The global industrial production exhibits very similar temporal patterns as that for business confidence (as shown in Figure 1) and is also consistent with the findings in many other studies that employed GDP growth in a quarterly frequency. In particular, it fell sharply during the global financial crisis period. Global factors for the other variables were also all statistically significant and identified the global recessions and slowdowns. Panel B of the figure presents the variance contributions of the global macroeconomic, financial, and inflation factors. Over 1985–2019, the global factors, on average across countries, explained a sizable proportion: about two-fifths of total variations in industrial output and unemployment rates. This finding is consistent with previous studies that document the existence of a global business cycle (e.g., Kose, Otrok, and Prasad 2012). Nominal variables—headline CPI inflation and interest rates—showed an even greater degree of co-movement; the global factors explained around three-fifths of total variations in the variables.

Quantitatively, the variance contributions of the global factors to real variables (about 40 percent), and to nominal variables (60 percent), are in the range of the corresponding variance shares of the global business and consumer confidence factors (38–58 percent), as explained in Section 3. The results thus indicate commonalities among the cross-country dynamics of confidence, real activity, inflation, and interest rates. Alternatively, the results may suggest that global business and consumer confidence cycles have played an important role in the cross-border transmission of macroeconomic shocks into financial and macroeconomic variables.

A.2.2 Measures of Global Uncertainty

We summarize a variety of global uncertainty measures in the literature and group them into specific categories according to the nature of the shocks: financial uncertainty, macroeconomic and economic policy uncertainty, geopolitical uncertainty, and uncertainty caused by pandemic disease, including the COVID-19 pandemic.

Figure A.1. Global Macroeconomic and Financial Factors



Note: Global factors are extracted from detrended industrial production (year-on-year growth rates), unemployment rate, headline CPI inflation (year-on-year growth rates), and long-term interest rates (panel A) in 25 countries, using a dynamic factor model. Depending on the variables, some countries are excluded from the database due to data availability. Solid black, blue, or orange lines are median draws based on 3,000 posterior Bayesian draws. Gray lines indicate 5th–95th percentiles confidence bands. Variance contributions of global factors (panel B) are based on simple averages across countries.

Figure A.2. Measure of Global Uncertainty

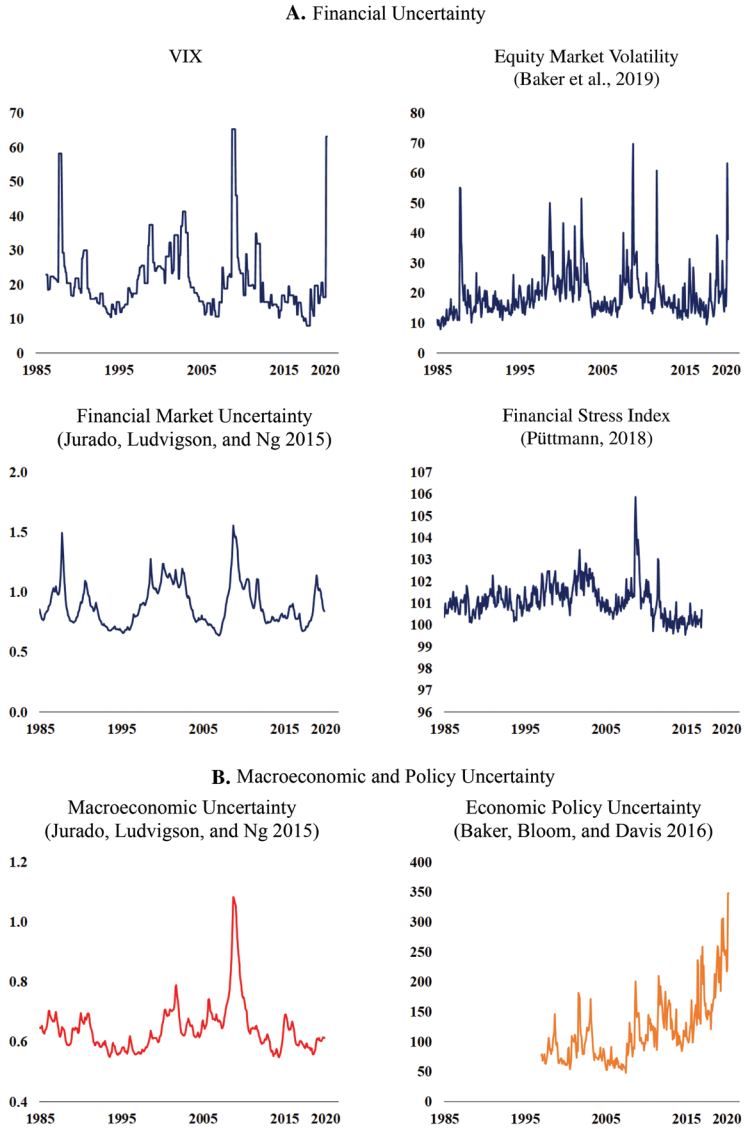


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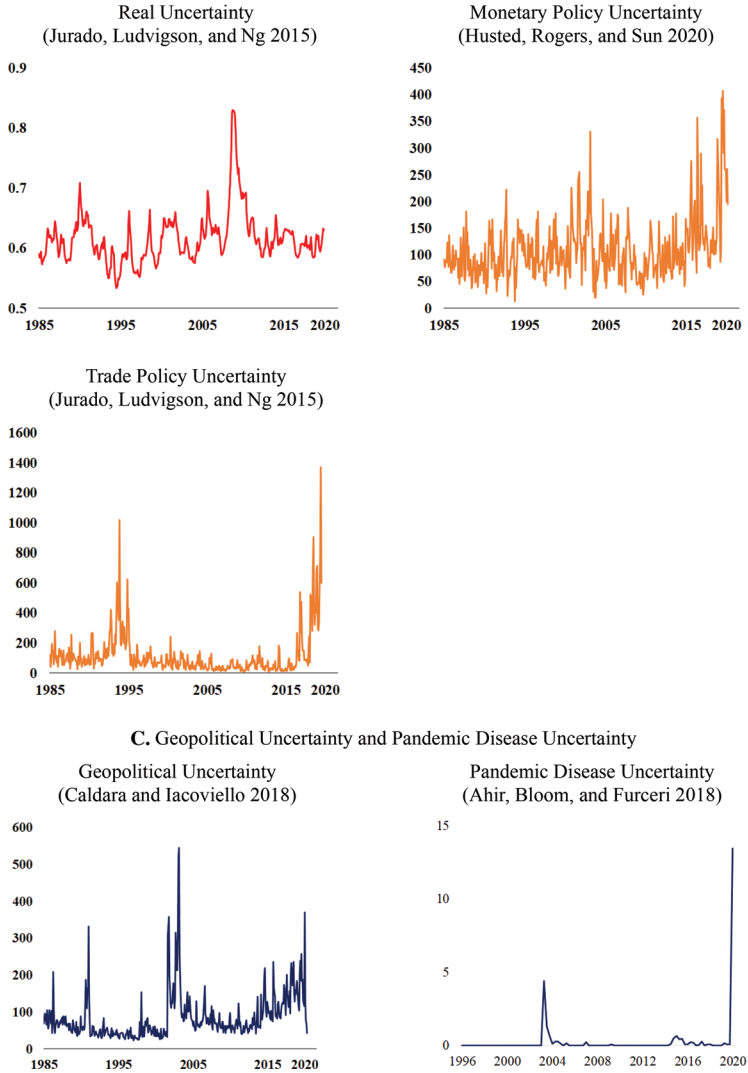
Figure A.2 plots the evolution of some uncertainty measures. Along with the CBOE volatility index (VIX), other measures of financial market uncertainty are also widely used (panel A),

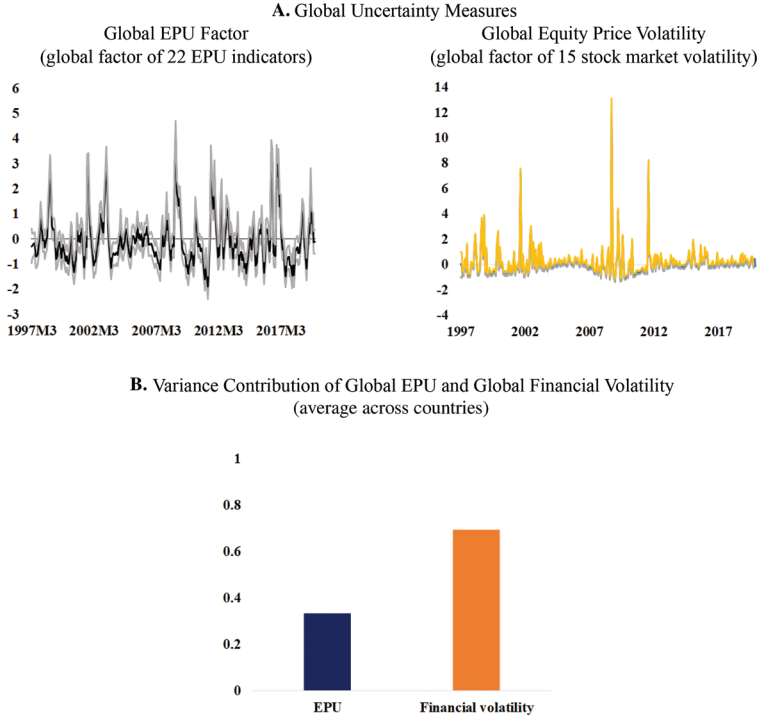
Figure A.2. (Continued)



Note: The figures are global uncertainty index produced by the authors.

including financial market uncertainty as in Jurado, Ludvigson, and Ng (2015) and the Financial Stress Index, as in Püttmann (2018). Similar to macroeconomic uncertainty, real uncertainty is estimated by Jurado, Ludvigson, and Ng (2015), as shown in panel B. Policy

Figure A.3. Global Synchronization of Uncertainty Measures

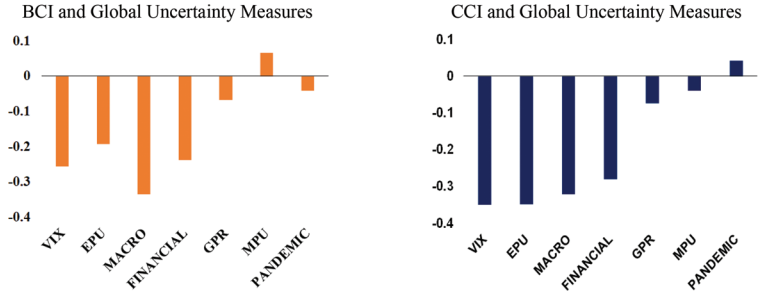


Note: Global factors (panel A) are extracted from detrended economic policy uncertainty or financial market volatility (square of monthly equity returns) in 22 and 15 countries, respectively, using a dynamic factor model. Depending on the variables. Solid black and yellow lines are median draws based on 3,000 posterior Bayesian draws. Gray lines indicate 5th–95th percentiles confidence bands. Variance contributions of global factors (panel B) are based on simple averages across countries.

uncertainty measures include monetary policy uncertainty and trade policy uncertainty by Husted, Rogers, and Sun (2020). A geopolitical uncertainty index was compiled by Caldara and Iacoviello (2018) and uncertainty due to pandemic disease was proposed by Ahir, Bloom, and Furceri (2018) (panel C).

We also examine cross-country synchronization by estimating a latent common factor and quantifying the importance of the global factor. Figure A.3 summarizes the global factor for the EPU index

Figure A.4. Correlation between Global Confidence and Uncertainty Measures

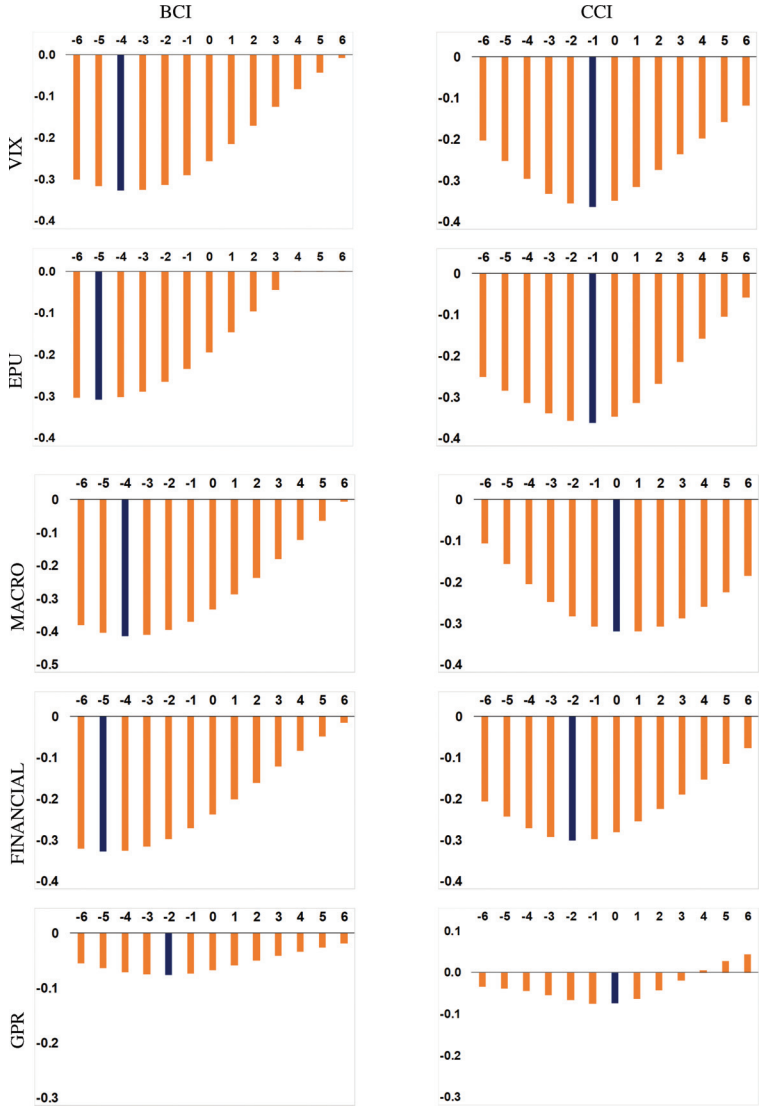


Note: Contemporaneous correlation coefficients of business (or consumer) confidence with global macroeconomic and financial variables. VIX, EPU, MACRO, FINANCIAL, GPR, MPU, and PANDEMIC indicate global uncertainty measures in the literature on U.S. stock market volatility, economic policy uncertainty, macroeconomic uncertainty, financial uncertainty, geopolitical uncertainty, and pandemic disease uncertainty, respectively.

(panel A) and financial market volatility (panel B). A global factor for the EPU index is estimated from the individual indices for 22 countries, while that for market volatility is computed from equity price volatility (measured by squares of monthly equity prices) in 15 countries. The global factors are in line with the global index compiled by the original authors, although the factors are stationary, being estimated after detrending the slow-moving components. The synchronization of the uncertainty measures is sizable: global factors explain around a third of total variation in the cross-country EPU index and three-quarters of financial volatility measures, based on average across countries. Again, this degree of co-movement is comparable with that of cross-country business and consumer confidence indicators.

That said, the movements in global uncertainty factors also seem to be heterogeneous across different measures, which suggests that the uncertainty measures share less common information and may be less endogenous to business and financial cycles than confidence indicators.

Figure A.5. Lead-Lag Correlations between Confidence Indicators and Other Uncertainty Measures



Note: Contemporaneous correlation coefficients of business (or consumer) confidence with global macroeconomic and financial variables. VIX, EPU, MACRO, FINANCIAL, and GPR indicate global uncertainty measures in the literature on U.S. stock market volatility, economic policy uncertainty, macroeconomic uncertainty, financial uncertainty, and geopolitical uncertainty, respectively.

Table A.1. Contribution of Other Uncertainty Shocks (percent)

Shocks	Related Studies	Industrial Production	Unemployment Rate	Inflation	Interest Rate
Financial Uncertainty	Jurado, Ludvigson, and Ng (2015)	6.7	13.9	8.0	4.3
Macro Uncertainty	Jurado, Ludvigson, and Ng (2015)	26.5	33.3	40.1	14.7
Economic Policy Uncertainty	Baker, Bloom, and Davis (2016)	1.7	1.6	1.0	1.2
Monetary Policy Uncertainty	Husted, Rogers, and Sun (2020)	0.8	0.9	1.2	1.5
Geopolitical Uncertainty	Caldara and Iacoviello (2018)	1.4	1.6	1.4	1.0
World Pandemic Uncertainty	Ahir, Bloom, and Furceri (2018)	2.0	2.2	3.6	1.4

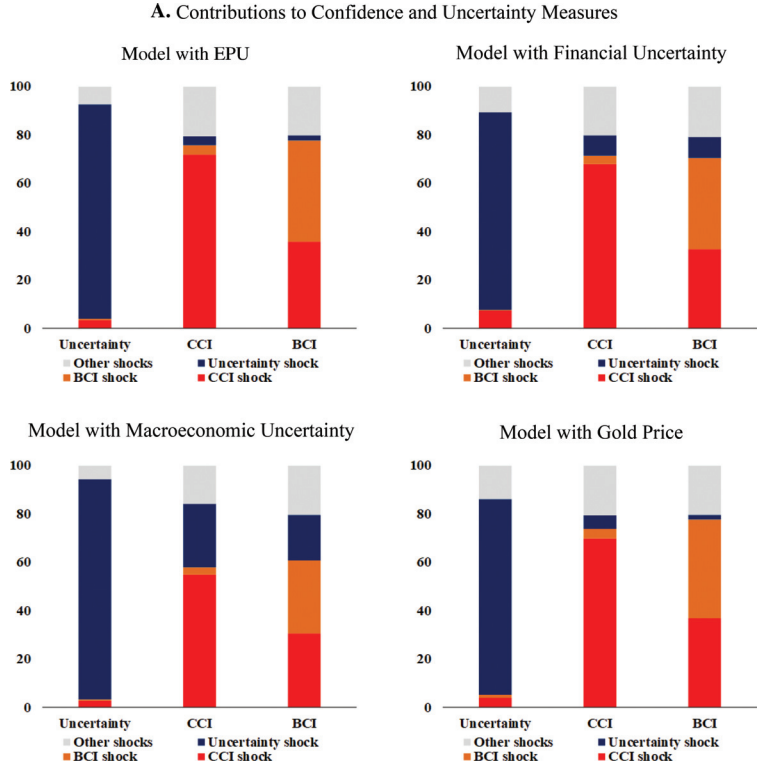
Note: This table reports forecasting error variance contributions of the uncertainty shocks to the financial and macroeconomic variables. They are estimated from the global FAVAR model with industrial production, unemployment rate, inflation, interest rates, and the corresponding uncertainty measure. The uncertainty measures are ordered last. FEVD decomposition is based on 40 months forecasting horizon. All results are based on median among 1,000 Bayesian draws.

A.3 Additional Figures and Tables

We present additional figures that summarize the results based on alternative model specifications or identification schemes.

A.3.1 Contribution of Confidence Shocks

Figure A.6. Contribution of Global Confidence Shocks: Models with Alternative Uncertainty Measures



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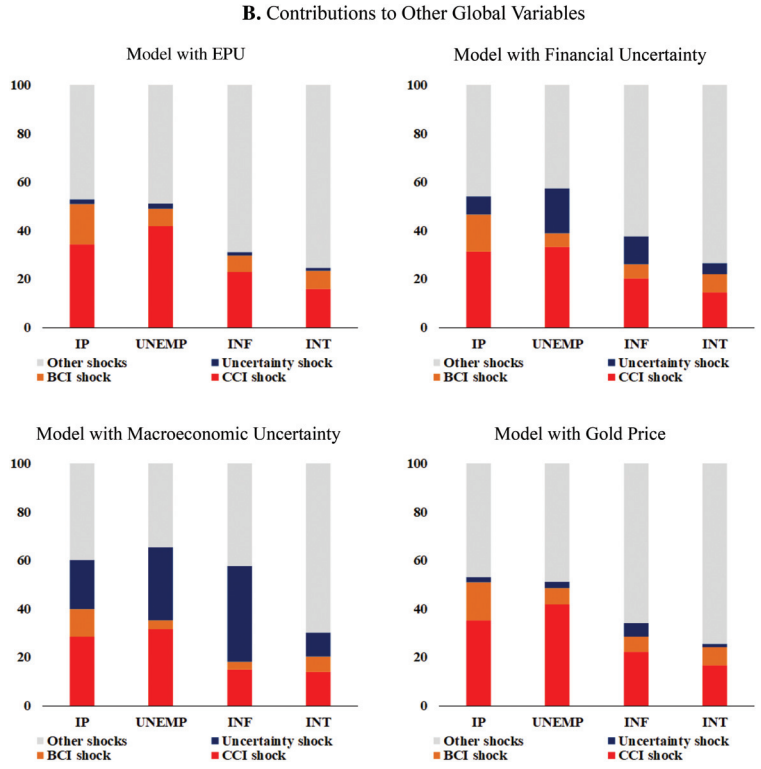
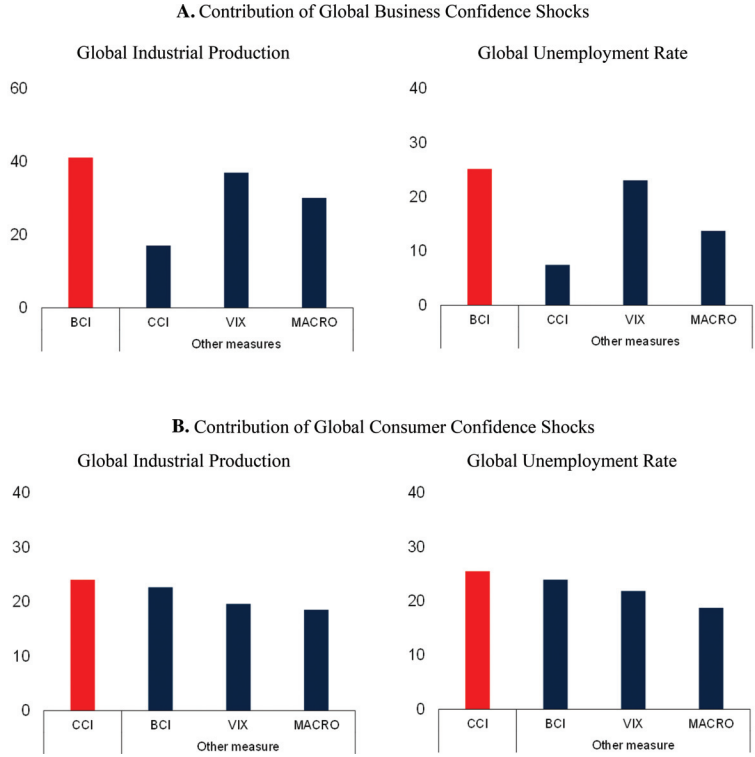


Note: Forecasting error variance contributions of uncertainty, consumer confidence (CCI), and business confidence (BCI) shocks estimated with the global FAVAR model (that consists of global industrial production, unemployment rate, inflation, interest rates, uncertainty, consumer confidence, and business confidence). Alternative measures of uncertainty are employed. FEVD decomposition is based on 40 months forecasting horizon. All results are based on median among 1,000 successful Bayesian draws. Vertical axis indicates percent.

Figure A.7. Contribution of Global Confidence Shocks: Alternative Models



Note: Forecasting error variance contributions of business confidence (BCI; red bars in panel A) and consumer confidence (CCI; red bars in panel B) shocks estimated with the five-variable FAVAR model (that consists of global industrial production, unemployment rate, inflation, interest rates, business or consumer confidence). "Other measures" (navy bars) indicate the contribution of business (panel A) or consumer confidence (panel B) based on six-variable alternative models where other measures of uncertainty or confidence indicators are also employed in the model. FEVD decomposition is based on 40 months forecasting horizon. All results are based on median among 1,000 successful Bayesian draws. Vertical axis indicates percent.

A.3.2 Model with External Instruments

Table A.2. Regression Results of Uncertainty Shocks on Other Structural Shocks[1]

Structural Shocks		Country	Related Studies	β	SE	P-value	Obs.	Sample
A. Instrumental Variable: VIX_U								
Financial	TED Spread	US	Gilchrist and Zakrajšek (2012)	0.06	0.07	0.37	360	1990:M1–2019:M12
Monetary Policy	MP1	US	Gertler and Karadi (2015)	0.18	0.12	0.13	336	1990:M1–2017:M12
	MP4	US	Gertler and Karadi (2015)	0.29	0.22	0.18	336	1990:M1–2017:M12
Fiscal Policy	Gov't. Spending	US	Romer and Romer (2010)	0.00	0.00	0.19	72	1990:Q1–2007:Q4
Inflation[2]	Inflation Expectation	Global	Kose et al. (2019)	0.01	0.01	0.37	214	2002:M3–2019:M12
Oil Price	Oil Price	Global	Ha, Kose, and Ohnsorge (2019)	0.07	0.04	0.12	88	1996:Q1–2017:Q4
B. Instrumental Variable: $Gold_U$								
Financial	TED Spread	US	Gilchrist and Zakrajšek (2012)	0.15	0.21	0.47	360	1990:M1–2019:M12
Monetary Policy	MP1	US	Gertler and Karadi (2015)	−1.03	0.85	0.23	336	1990:M1–2017:M12
	MP4	US	Gertler and Karadi (2015)	−0.66	0.46	0.15	336	1990:M1–2017:M12
Fiscal Policy	Gov't. Spending	US	Romer and Romer (2010)	0.00	0.00	0.58	72	1990:Q1–2007:Q4
Inflation[2]	Inflation Expectation	Global	Kose et al. (2019)	−0.01	0.07	0.85	214	2002:M3–2019:M12
Oil Price	Oil Price	Global	Ha, Kose, and Ohnsorge (2019)	0.09	0.20	0.64	88	1996:Q1–2017:Q4

Note: [1]This table reports the estimates ($\hat{\beta}_i$) of the regression $z_t = \alpha + \beta_{imi,t} + \theta_{i,t}$. z_t indicates a proxy for global uncertainty shock, i.e., daily uncertainty component composed by the poor man's approach (VIX_U or $Gold_U$) and $m_{i,t}$ denotes a proxy for the other structural stock i. Newey-West heteroskedasticity and autocorrelation consistent (HAC) standard errors are reported. Rejecting the null hypothesis of no correlation ($\beta_i = 0$) would suggest that the proxy for the uncertainty shock correlates with the structural shock proxied by measure i. [2]The forecast data are obtained from Consensus Economics. The monthly shifts of inflation expectation are computed based on the first principal components of country panel.

Table A.3. Regression Results of Confidence Shocks on Other Structural Shocks[1]

Structural Shocks		Country	Related Studies	β	SE	P-value	Obs.	Sample
A. Instrumental Variable: VIX_C								
Financial	TED Spread	US	Gilchrist and Zakrajšek (2012)	0.14	0.07	0.04	360	1990:M1–2019:M12
Monetary Policy	MP1	US	Gertler and Karadi (2015)	−0.11	0.13	0.37	336	1990:M1–2017:M12
	MP4	US	Gertler and Karadi (2015)	−0.21	0.13	0.12	336	1990:M1–2017:M12
Fiscal Policy	Gov't. Spending	US	Romer and Romer (2010)	0.00	0.00	0.42	72	1990:Q1–2007:Q4
Inflation[2]	Inflation Expectation	Global	Kose et al. (2019)	0.01	0.01	0.61	214	2002:M3–2019:M12
Oil Price	Oil Price	Global	Ha, Kose, and Ohnsorge (2019)	−0.09	0.07	0.19	88	1996:Q1–2017:Q4
B. Instrumental Variable: $Gold_C$								
Financial	TED Spread	US	Gilchrist and Zakrajšek (2012)	−0.31	0.21	0.13	360	1990:M1–2019:M12
Monetary Policy	MP1	US	Gertler and Karadi (2015)	−0.87	0.90	0.34	336	1990:M1–2017:M12
	MP4	US	Gertler and Karadi (2015)	−1.09	0.92	0.24	336	1990:M1–2017:M12
Fiscal Policy	Gov't. Spending	US	Romer and Romer (2010)	−0.01	0.00	0.11	72	1990:Q1–2007:Q4
Inflation[2]	Inflation Expectation	Global	Kose et al. (2019)	−0.05	0.04	0.25	214	2002:M3–2019:M12
Oil Price	Oil Price	Global	Ha, Kose, and Ohnsorge (2019)	0.16	0.30	0.59	88	1996:Q1–2017:Q4

Note: [1]This table reports the estimates ($\hat{\beta}_i$) of the regression $z_t = \alpha + \beta_{i} m_{i,t} + \theta_{i,t}$. z_t indicates a proxy for global uncertainty shock, i.e., daily confidence component composed by the poor man's approach (VIX_C or $Gold_C$) and $m_{i,t}$ denotes a proxy for the other structural stock i. Newey-West heteroskedasticity and autocorrelation consistent (HAC) standard errors are reported. Rejecting the null hypothesis of no correlation ($\beta_i = 0$) would suggest that the proxy for the uncertainty shock correlates with the structural shock proxied by measure i. [2]The forecast data are obtained from Consensus Economics. The monthly shifts of inflation expectation are computed based on the first principal components of country panel.

A.3.3 Cholesky Identification with Alternative Variable Ordering

Figure A.8. Impact of Confidence and Uncertainty Shocks: Alternative Cholesky Order

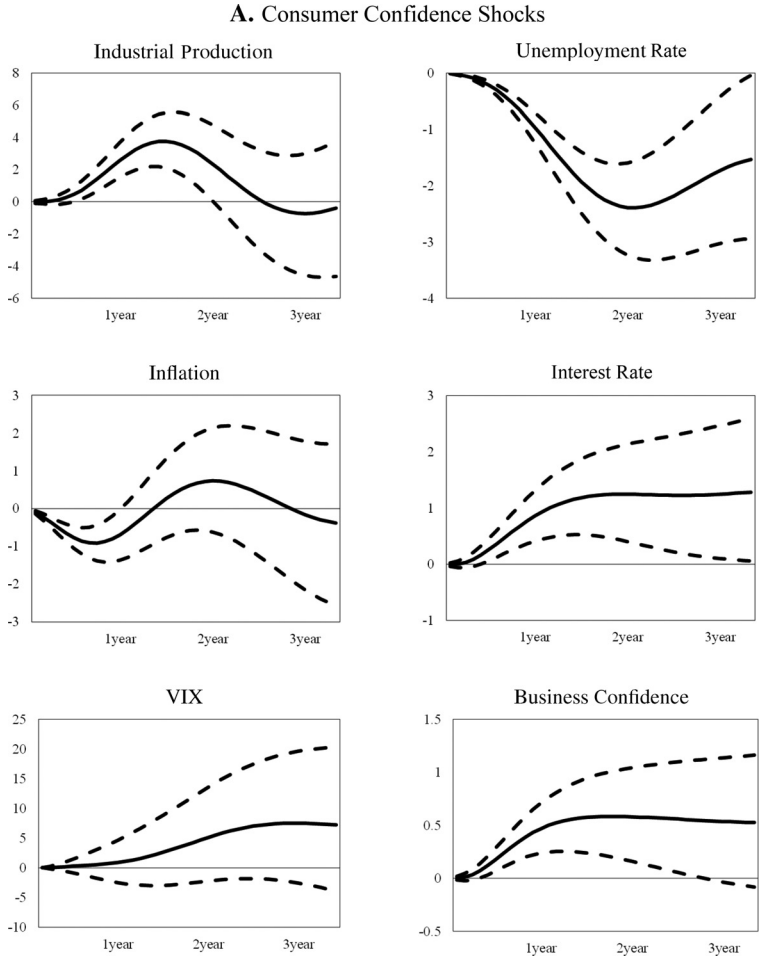


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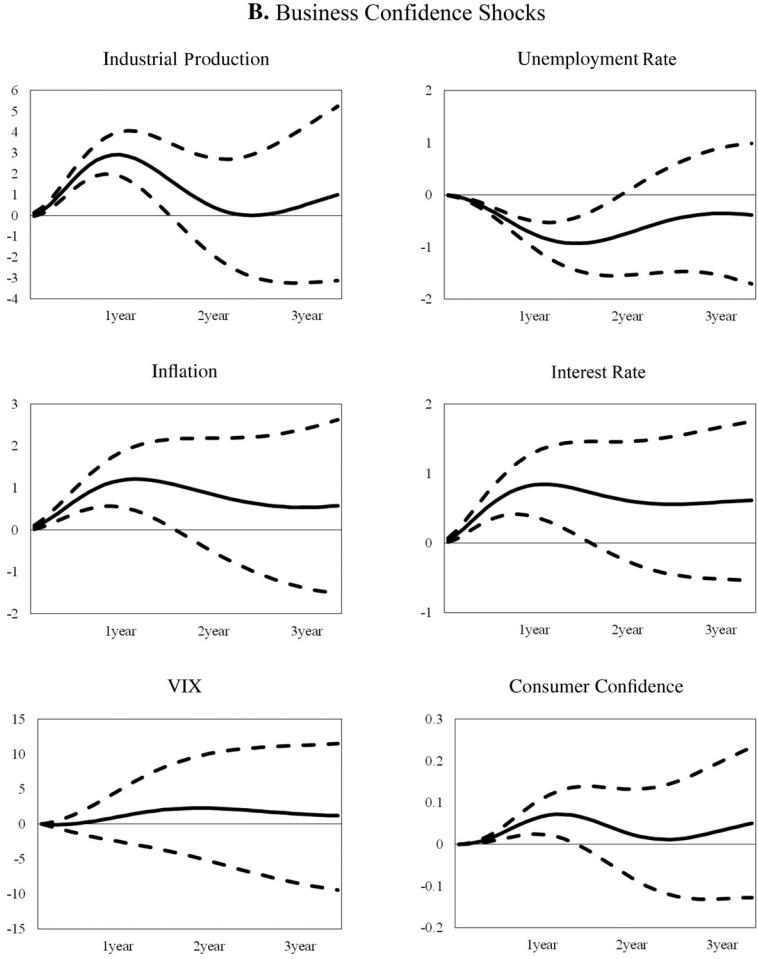
Figure A.8. (Continued)



Note: Based on seven-variable FAVAR model where the variables are ordered: uncertainty, consumer confidence, business confidence, industrial production, unemployment rate, inflation, and interest rates. Impulse response functions (IRFs) are based on a one-standard-deviation increase in consumer confidence. Broken lines indicate 90 percent confidence intervals.

A.4 Additional Sensitivity Checks

A.4.1 Proxy VAR Estimation with Alternative Instrumental Variables

We further present additional results based on the proxy VAR. First, we present the results based on five variables (global confidence and other macro and financial variables), without explicitly separating confidence shocks from uncertainty shocks. This model implicitly assumes that the instrumental variables for global sentiments conceptually convey the information on the confidence when confidence shocks instantaneously move together when uncertainty shocks occur. The monthly surprises of three types of instrumental variables (VIX, EPU, and gold price) are separately employed for the estimation of the model with global consumer confidence. F-statistics on the first-stage regression for the three types of instrumental variable are 35, 15, and 10, respectively.[3] The impulse responses are presented in panels A–C of Figure A.9.

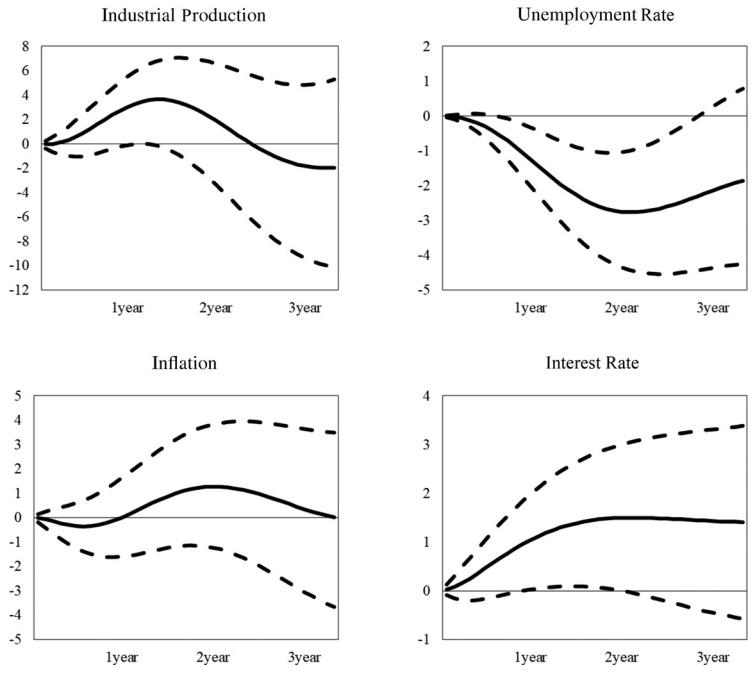
Next, we estimate the proxy VARs using cross-country narrative instruments, as proposed by Baker, Bloom, and Terry (2020): natural disasters, revolutions, political coups, and terrorist attacks. Baker, Bloom, and Terry (2020) use the four types of instrumental variables for 60 countries in a quarterly panel. Each series also takes into account the weights of each event to gauge the relative impacts (i.e., non-weighted/trade-weighted/distance-weighted series). Hence, to reduce the dimensions of instrumental variables and pay more attention to the global movements, we mainly test with the first principal component of each series and/or with those of large economies (the United States). As summarized in Figure A.10, the narrative instrumental variables yield similar patterns of the impulse responses to our baseline estimation.[4] That said, the relevancy of instrumental variables was different across confidence measures. For the global business confidence, the instruments were

[3]However, the instrumental variables were not sufficiently relevant to the business confidence shocks. This may be partly because business confidence shocks endogenously reflect the impacts of consumer confidence and uncertainty as shown in Section A.4.2, thus making it hard to isolate and identify the shocks with the instrumental variables.

[4]Since the instrumental variables are on a quarterly basis, we convert our monthly VAR model to the quarterly to match the data frequency.

Figure A.9. Impact of Consumer Confidence Shocks: Five-Variable (including only confidence) Proxy VAR Estimation

A. VIX as a Single IV (without the poor man's approach, $IV_C = [VIX]$)



(*continued*)

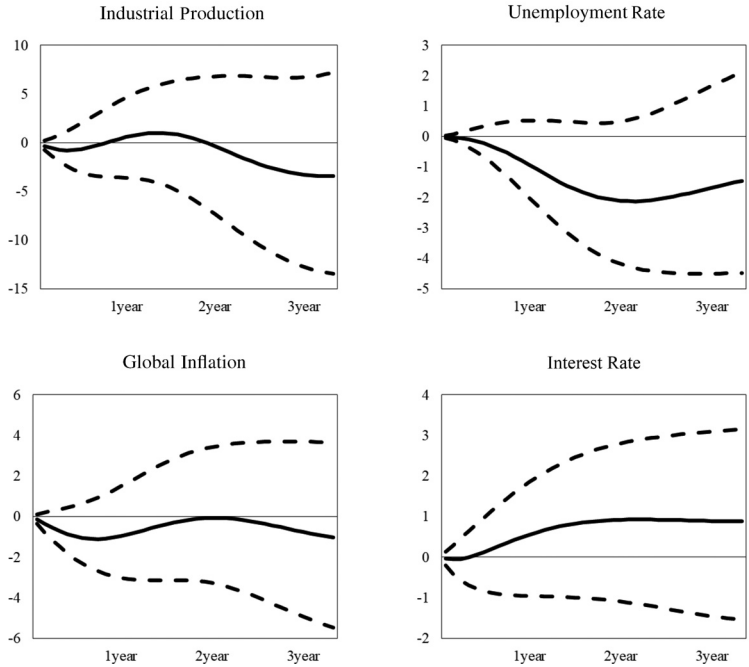
clearly relevant—in particular, the instruments based on the revolutions and terror attacks (F-statistics: 11.5). In contrast, for the consumer confidence, the relevancy was below the rule-of-thumb level of 10, which may reflect that firms react more sensitively to such narrative information than consumers.

A.4.2 Model without Global Inflation

Our baseline results imply that global confidence and uncertainty shocks—in particular, global business confidence shocks—are in nature demand shocks. Nonetheless, if the shocks mainly reflect only aggregate demand shocks, or if the shocks are highly correlated

Figure A.9. (Continued)

B. US EPU as a Single IV (without the poor man's approach, $IV_C = [EPU^{US}]$)



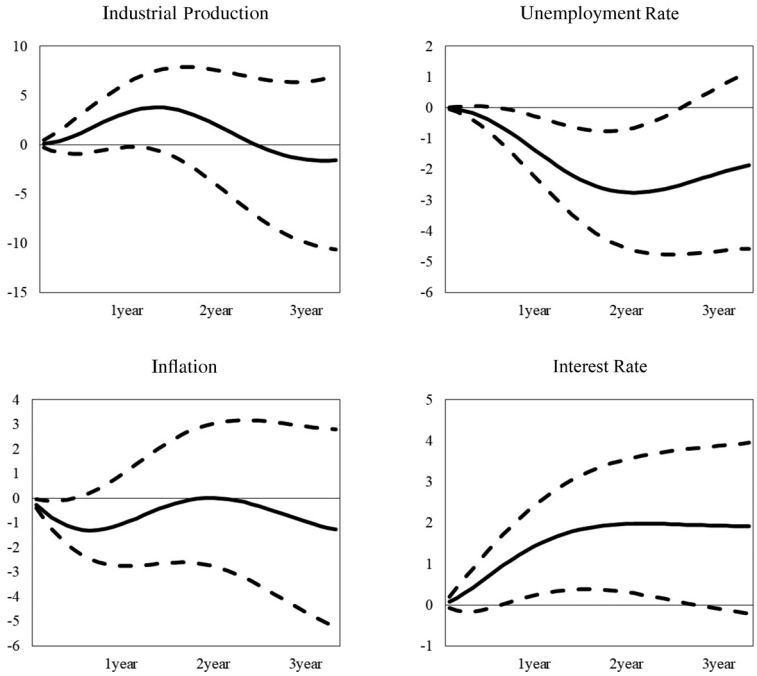
(*continued*)

with global aggregate shocks, then the uncertainty and confidence shocks will be controlled by other global variables—for instance, global inflation—that are likely to respond to the shocks contemporaneously. This can in turn under-estimate (or over-estimate if the variables are ordered reversely) the impacts of confidence and uncertainty shocks to the global business cycle fluctuations. To check this possibility, we here estimate the model that excludes the global inflation measure.

As shown in Figure A.11, the model that excludes global inflation yields consistent results with our baseline model; the global variables respond quite significantly to all types of global confidence and uncertainty shocks (panels A–C) and the shocks contribute to a sizable portion of fluctuations in global variables (panel D). Although not reported here, the exclusion of other global variables than global

Figure A.9. (Continued)

C. Gold Price as a Single IV (without the poor man's approach, $IV_C = [Gold]$)



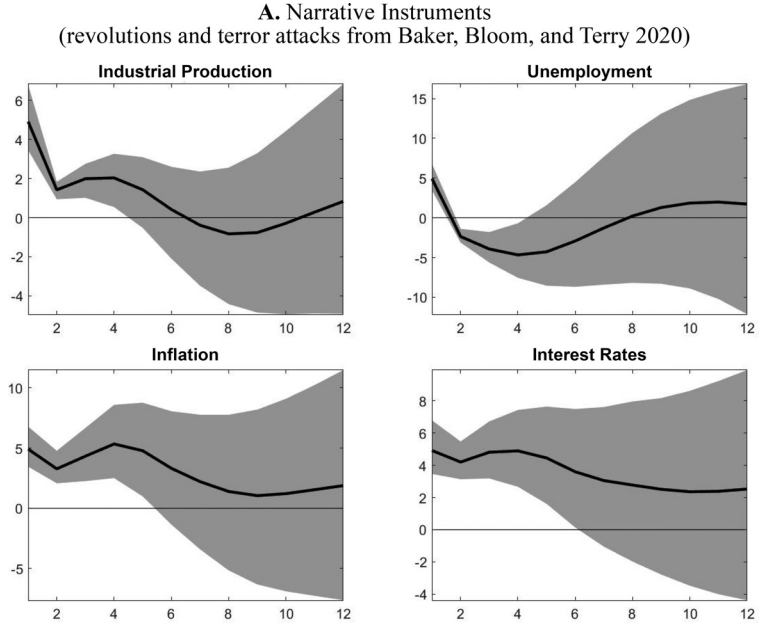
Note: The impulse responses are to a one-standard-deviation increase in consumer confidence. F-statistics of the first-stage regression are 35 (panel A), 15 (panel B), and 10 (panel C). Broken lines indicate 90 percent confidence intervals.

inflation did not substantially change the empirical results either. In essence, the results confirm the significant role of global uncertainty and confidence shocks that are differentiated from other types of global shocks.

A.4.3 Models Separately Employing Confidence and Uncertainty Measures

We also present the dynamic responses of global variables to the global uncertainty and confidence shocks based on the models which include each type of confidence and uncertainty measure exclusively. Impulse responses of global variables following the three types of

Figure A.10. Impact of Business Confidence Shocks (five-variable proxy VAR)

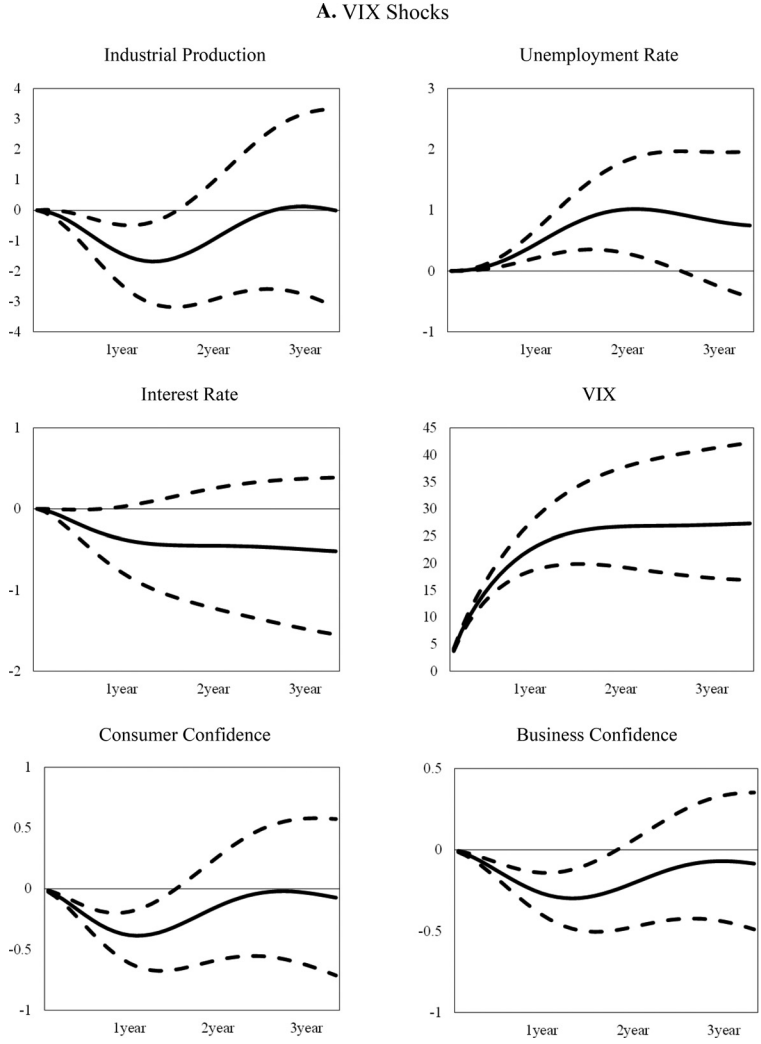


Note: The impulse responses are based on the proxy VAR model that employs [revolutions (US), terror attacks (PCA)] as a set of instrumental variables for global business confidence shocks. F-statistic of the first-stage regression is 11.5. The responses are to a positive one-standard-deviation structural shock. Solid lines (black) and shaded areas indicate point estimates and their 90 percent confidence sets computed by 1,000 draws of bootstrap. Vertical axis indicates percentage point and horizontal axis indicates quarters.

shocks were qualitatively and quantitatively similar to those based on our baseline results (Figures A.12 to A.14).

One notable exception is the impacts of global business confidence, which are clearly much greater in magnitude than those estimated when we included consumer confidence or uncertainty in the model: a one-standard-deviation increase in global business confidence was associated with an increase in global industrial production by 4.5 percentage points and with a decrease in global unemployment rates by 1.5 percentage points. This indicates that business confidence shocks endogenously reflect the (spillover) impacts

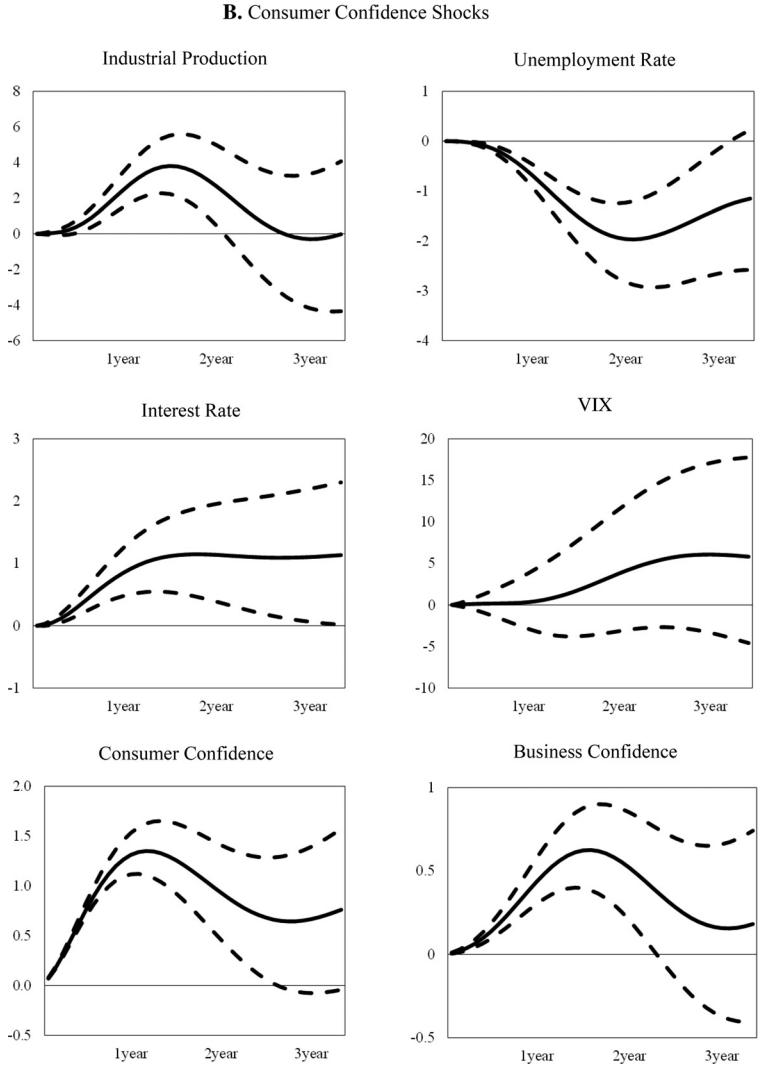
Figure A.11. Impulse Response Following Confidence and Uncertainty Shocks



(*continued*)

of consumer confidence and uncertainty, and thus, when we controlled the spillover effects, the pure impact of business confidence became reduced and less persistent although still statistically significant. Indeed, as exhibited in Section 3 (Figure 2), the responses

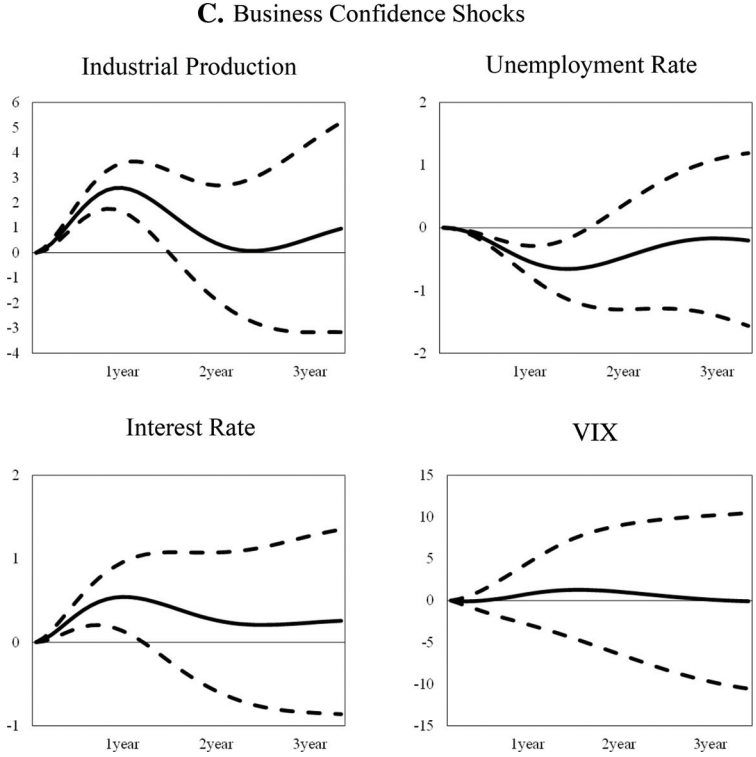
Figure A.11. (Continued)



(*continued*)

of business confidence following a consumer confidence shock or an uncertainty shock were sizable and significant. This result strengthens our baseline specification, which includes both business and consumer confidences.

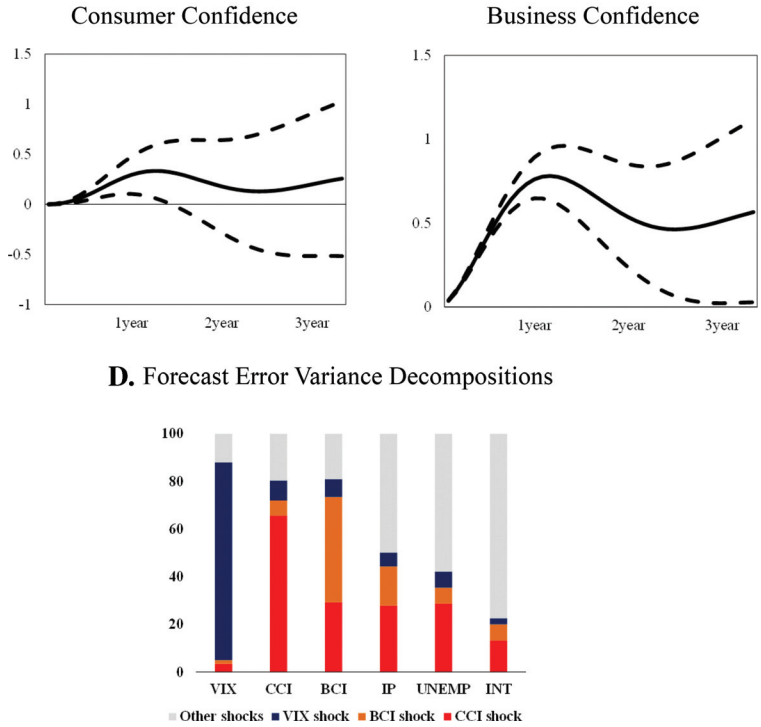
Figure A.11. (Continued)



(*continued*)

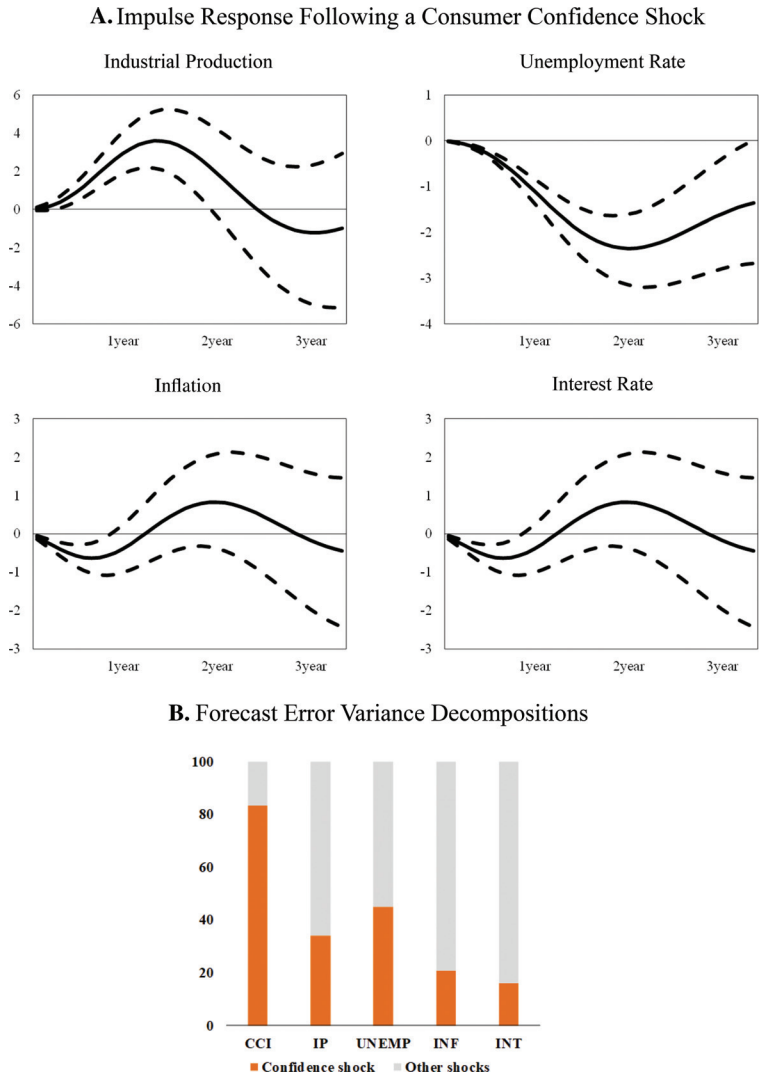
Reflecting the impulse responses, variance decomposition of the global variables suggests that the contributions of global business confidence shocks are over-estimated, by explaining over two-fifths and a quarter, respectively, of total variations in global industrial output and global unemployment rates. This is different from our baseline results that the shocks explained at most a tenth of variations in the global variables.

Figure A.11. (Continued)



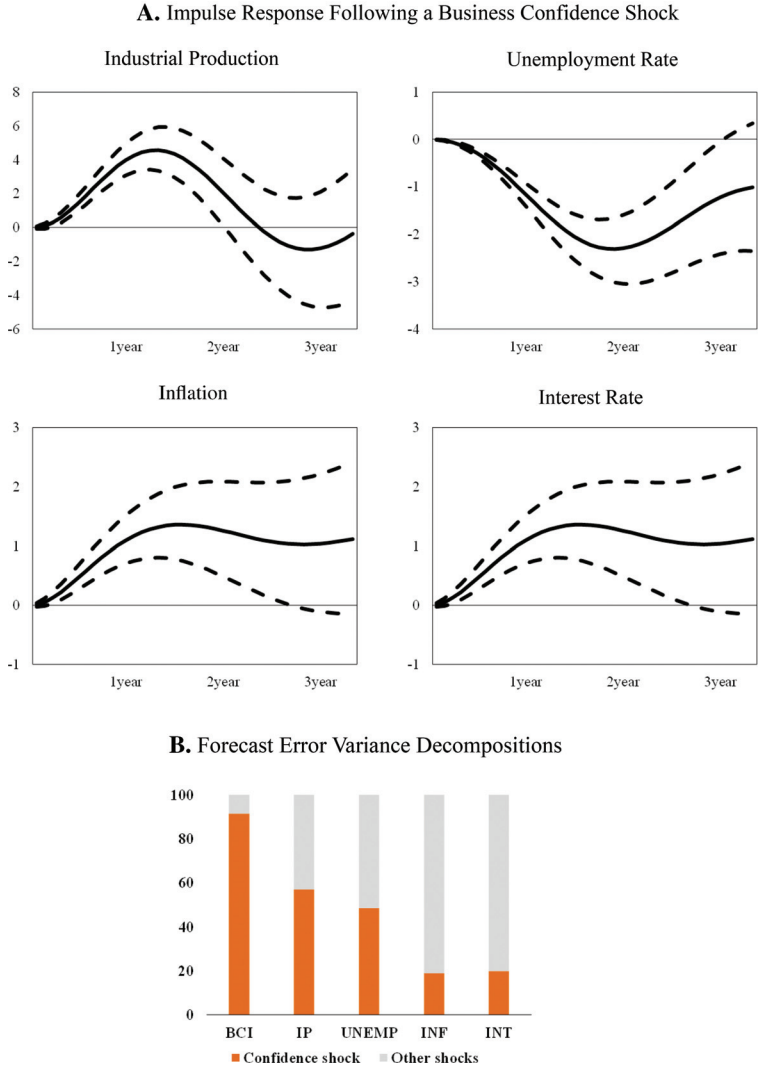
Note: The impulse responses are based on the six-variable global FAVAR model, which excludes global inflation, to a positive one-standard-deviation global uncertainty shock (panel A), consumer confidence shock (panel B), and business confidence shock (panel C). Solid lines and broken lines indicate median (50th) and 5th–95th percentiles, respectively, among 1,000 Bayesian draws. Vertical axis indicates percentage points or unit changes and horizontal axis indicates months. Forecasting error variance contributions of the shocks (panel D) is based on 40 months forecasting horizon. Vertical axis indicates percent.

Figure A.12. Estimation Results: Model with Consumer Confidence



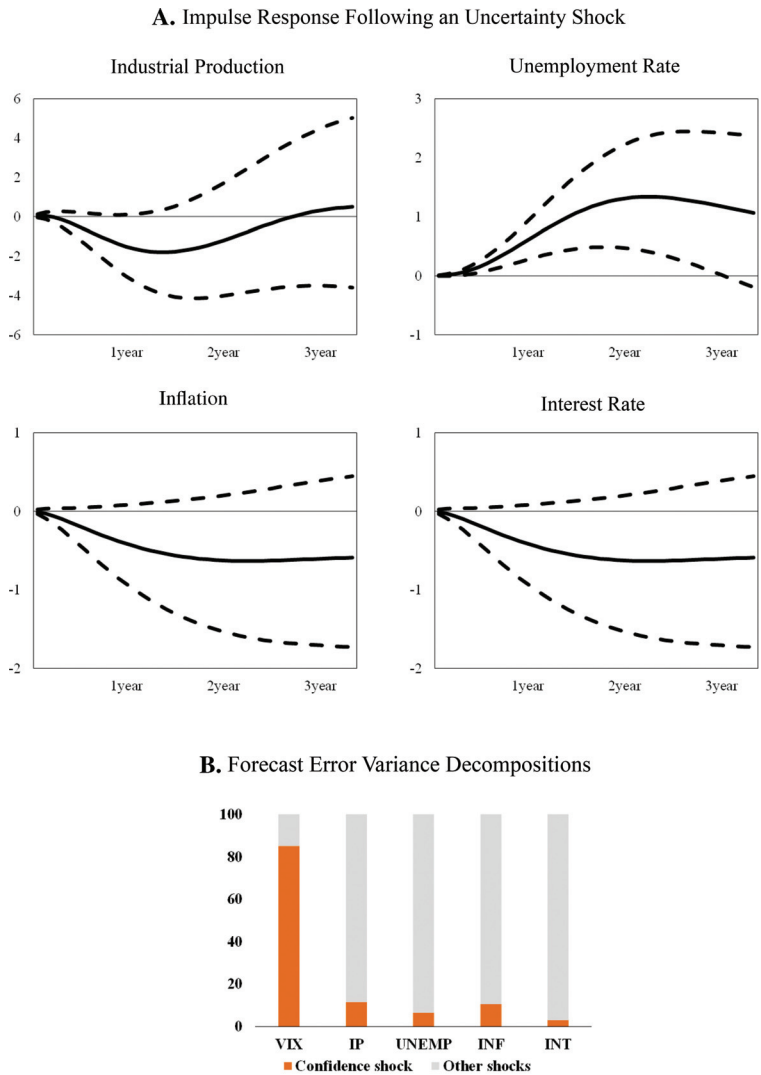
Note: The impulse responses (panel A) are based on the five-variable global FAVAR model, which separately employs confidence and uncertainty measures, to a positive one-standard-deviation global consumer confidence shock. Solid lines and broken lines indicate median (50th) and 5th–95th percentiles, respectively, among 1,000 Bayesian draws. Vertical axis indicates percentage points or unit changes and horizontal axis indicates months. FEVD decomposition (panel B) is based on 40 months forecasting horizon. Vertical axis indicates percent.

Figure A.13. Estimation Results: Model with Business Confidence



Note: The impulse responses (panel A) are based on the five-variable global FAVAR model, which separately employs confidence and uncertainty measures, to a positive one-standard-deviation global consumer confidence shock. Solid lines and broken lines indicate median (50th) and 5th–95th percentiles, respectively, among 1,000 Bayesian draws. Vertical axis indicates percentage points or unit changes and horizontal axis indicates months. FEVD decomposition (panel B) is based on 40 months forecasting horizon. Vertical axis indicates percent.

Figure A.14. Estimation Results: Model with the VIX



Note: The impulse responses (panel A) are based on the five-variable global FAVAR model, which separately employs confidence and uncertainty measures, to a positive one-standard-deviation global consumer confidence shock. Solid lines and broken lines indicate median (50th) and 5th–95th percentiles, respectively, among 1,000 Bayesian draws. Vertical axis indicates percentage points or unit changes and horizontal axis indicates months. FEVD decomposition (panel B) is based on 40 months forecasting horizon. Vertical axis indicates percent.

References

Ahir, H., N. Bloom, and D. Furceri. 2018. "The World Uncertainty Index." Available at SSRN 3275033.

Ahmed, M. I., and S. P. Cassou. 2016. "Does Consumer Confidence Affect Durable Goods Spending during Bad and Good Economic Times Equally? *Journal of Macroeconomics* 50 (December): 86–97.

Akerlof, G. A., and R. J. Shiller. 2010. *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism.* Princeton University Press.

Angeletos, G.-M., and J. La'O. 2013. "Sentiments." *Econometrica* 81 (2): 739–79.

Audrino, F., and A. Tetereva. 2019. "Sentiment Spillover Effects for US and European Companies." *Journal of Banking and Finance* 106 (September): 542–67.

Bachmann, R., and E. R. Sims. 2012. "Confidence and the Transmission of Government Spending Shocks." *Journal of Monetary Economics* 59 (3): 235–49.

Baker, S. R., N. Bloom, and S. J. Davis. 2016. "Measuring Economic Policy Uncertainty." *Quarterly Journal of Economics* 131 (4): 1593–1636.

Baker, S. B., N. Bloom, S. J. Davis, and K. Kost. 2019. "Policy News and Equity Market Volatility." NBER Working Paper No. 25720.

Baker, S. R., N. Bloom, and S. J. Terry. 2020. "Using Disasters to Estimate the Impact of Uncertainty." NBER Working Paper No. 27167.

Bansal, R., and I. Shaliastovich. 2010. "Confidence Risk and Asset Prices." *American Economic Review* 100 (2): 537–41.

Barsky, R. B., and E. R. Sims. 2012. "Information, Animal Spirits, and the Meaning of Innovations in Consumer Confidence." *American Economic Review* 102 (4): 1343–77.

Batchelor, R., and P. Dua. 1998. "Improving Macro-economic Forecasts: The Role of Consumer Confidence." *International Journal of Forecasting* 14 (1): 71–81.

Beaudry, P., M. Dupaigne, and F. Portier. 2011. "Modeling News-Driven International Business Cycles." *Review of Economic Dynamics* 14 (1): 72–91.

Beaudry, P., and F. Portier. 2006. "Stock Prices, News, and Economic Fluctuations." *American Economic Review* 96 (4): 1293–1307.

Benhabib, J., P. Wang, and Y. Wen. 2015. "Sentiments and Aggregate Demand Fluctuations." *Econometrica* 83 (2): 549–85.

Berry, S., and M. Davey. 2004. "How Should We Think about Consumer Confidence?" *Quarterly Bulletin* (Bank of England) 44 (3, Autumn): 282–90.

Bloom, N. 2009. "The Impact of Uncertainty Shocks." *Econometrica* 77 (3): 623–85.

Caldara, D., and M. Iacoviello. 2018. "Measuring Geopolitical Risk." International Finance Discussion Paper No. 1222, Board of Governors of the Federal Reserve System.

Cesaroni, T., and S. Iezzi. 2017. "The Predictive Content of Business Survey Indicators: Evidence from SIGE." *Journal of Business Cycle Research* 13 (1): 75–104.

Daas, P. J., and M. J. Puts. 2014. "Social Media Sentiment and Consumer Confidence." Technical Report, ECB Statistics Paper.

Dees, S., and P. S. Brinca. 2013. "Consumer Confidence as a Predictor of Consumption Spending: Evidence for the United States and the Euro Area." *International Economics* 134 (August): 1–14.

Dées, S., and J. Güntner. 2017. "Forecasting Inflation across Euro Area Countries and Sectors: A Panel VAR Approach." *Journal of Forecasting* 36 (4): 431–53.

Dées, S., and S. Zimic. 2019. "Animal Spirits, Fundamental Factors and Business Cycle Fluctuations." *Journal of Macroeconomics* 61 (September): Article 103123.

Eickmeier, S. 2007. "Business Cycle Transmission from the US to Germany—A Structural Factor Approach." *European Economic Review* 51 (3): 521–51.

Farmer, R. E. 2012. "Confidence, Crashes and Animal Spirits." *Economic Journal* 122 (559): 155–72.

Fei, S. 2011. "The Confidence Channel for the Transmission of Shocks." Working Paper No. 314, Banque de France.

Gertler, M., and P. Karadi. 2015. "Monetary Policy Surprises, Credit Costs, and Economic Activity." *American Economic Journal: Macroeconomics* 7 (1): 44–76.

Gilchrist, S., and E. Zakrajšek. 2012. "Credit Spreads and Business Cycle Fluctuations." *American Economic Review* 102 (4): 1692–1720.

Gorodnichenko, Y., T. Pham, and O. Talavera. 2021. "Social Media, Sentiment and Public Opinions: Evidence from #Brexit and #USElection." *European Economic Review* 136 (July): Article 103772.

Ha, J., M. A. Kose, and F. Ohnsorge. 2019. *Inflation in Emerging and Developing Economies: Evolution, Drivers, and Policies.* World Bank Publications.

Ha, J., M. A. Kose, C. Otrok, and E. S. Prasad. 2020. "Global Macro-financial Cycles and Spillovers." NBER Working Paper No. 26798.

Husted, L., J. Rogers, and B. Sun. 2020. "Monetary Policy Uncertainty." *Journal of Monetary Economics* 115 (November): 20–36.

Ilut, C. L., and M. Schneider. 2014. "Ambiguous Business Cycles." *American Economic Review* 104 (8): 2368–99.

Jaimovich, N., and S. Rebelo. 2009. "Can News about the Future Drive the Business Cycle?" *American Economic Review* 99 (4): 1097–1118.

Jones, P. M., and E. Olson. 2013. "The Time-Varying Correlation between Uncertainty, Output, and Inflation: Evidence from a DCC-GARCH Model." *Economics Letters* 118 (1): 33–37.

Jurado, K., S. C. Ludvigson, and S. Ng. 2015. "Measuring Uncertainty." *American Economic Review* 105 (3): 1177–1216.

Karnizova, L., and H. Khan. 2015. "The Stock Market and the Consumer Confidence Channel: Evidence from Canada." *Empirical Economics* 49 (2): 551–73.

Kose, M. A., H. Matsuoka, U. Panizza, and D. Vorisek. 2019. "Inflation Expectations: Review and Evidence." CEPR Discussion Paper No. 13601.

Kose, M. A., C. Otrok, and E. Prasad. 2012. "Global Business Cycles: Convergence or Decoupling?" *International Economic Review* 53 (2): 511–38.

Kose, M. A., C. Otrok, and C. H. Whiteman. 2003. "International Business Cycles: World, Region, and Country-Specific Factors." *American Economic Review* 93 (4): 1216–39.

———. 2008. "Understanding the Evolution of World Business Cycles." *Journal of International Economics* 75 (1): 110–30.

Lachowska, M. 2016. "Expenditure and Confidence: Using Daily Data to Identify Shocks to Consumer Confidence." *Oxford Economic Papers* 68 (4): 920–44.

Lagerborg, A. H., E. Pappa, and M. O. Ravn. 2020. "Sentimental Business Cycles." CEPR Discussion Paper No. 15098.

Leduc, S. 2010. "Confidence and the Business Cycle." FRBSF Economic Letter No. 2010-35, Federal Reserve Bank of San Francisco.

Leduc, S., and Z. Liu. 2016. "Uncertainty Shocks are Aggregate Demand Shocks." *Journal of Monetary Economics* 82 (September): 20–35.

Lee, G. 2006. "The Effectiveness of International Knowledge Spillover Channels." *European Economic Review* 50 (8): 2075–88.

Levchenko, A. A., and N. Pandalai-Nayar. 2020. "TFP, News, and 'Sentiments': The International Transmission of Business Cycles." *Journal of the European Economic Association* 18 (1): 302–41.

Miranda-Agrippino, S., and H. Rey. 2015. "World Asset Markets and the Global Financial Cycle." NBER Working Paper No. 21722.

Møller, S. V., H. Nørholm, and J. Rangvid. 2014. "Consumer Confidence or the Business Cycle: What Matters More for European Expected Returns?" *Journal of Empirical Finance* 28 (September): 230–48.

Nowzohour, L., and L. Stracca. 2020. "More than a Feeling: Confidence, Uncertainty, and Macroeconomic Fluctuations." *Journal of Economic Surveys* 34 (4): 691–726.

Pigou, A. C. 1927. "The Laws of Diminishing and Increasing Cost." *Economic Journal* 37 (146): 188–97.

Püttmann, L. 2018. "Patterns of Panic: Financial Crisis Language in Historical Newspapers." Available at SSRN 3156287.

Romer, C. D., and D. H. Romer. 2010. "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks." *American Economic Review* 100 (3): 763–801.

Shapiro, A. H., M. Sudhof, and D. J. Wilson. 2020. "Measuring News Sentiment." *Journal of Econometrics* 228 (2): 221–43.

Starr, M. A. 2012. "Consumption, Sentiment, and Economic News." *Economic Inquiry* 50 (4): 1097–1111.

Stock, J. H., and M. W. Watson. 2005. "Understanding Changes in International Business Cycle Dynamics." *Journal of the European Economic Association* 3 (5): 968–1006.

Taylor, K., and R. McNabb. 2007. "Business Cycles and the Role of Confidence: Evidence for Europe." *Oxford Bulletin of Economics and Statistics* 69 (2): 185–208.

van Aarle, B., and C. Moons. 2017. "Sentiment and Uncertainty Fluctuations and Their Effects on the Euro Area Business Cycle." *Journal of Business Cycle Research* 13 (2): 225–51.

Venturini, F. 2015. "The Modern Drivers of Productivity." *Research Policy* 44 (2): 357–69.