MEASURING GLOBAL AND COUNTRY-SPECIFIC UNCERTAINTY*

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Abstract: Using individual survey data from the *Consensus Forecast* over the period of 1989-2014, we propose a monthly measure of macroeconomic uncertainty covering 46 countries. Our measure is based on market participants and derives from two components: common uncertainty, defined as the conditional volatility of future aggregate shocks and idiosyncratic uncertainty, captured by the disagreement among professional forecasters. Common uncertainty shocks produce the large and persistent negative response in real economic activity, whereas the contributions of idiosyncratic uncertainty shocks are negligible.

JEL classification: E24; E32

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1. Introduction

Heightened economic uncertainty, at both national and global levels, greatly contributed to the 2007-09 recession and shaped the speed of the subsequent recovery. Six years after the end of the recession, there is still no sign of a complete global recovery. Advanced economies are uncertain about the effects of monetary policy normalization and emerging market economies are uncertain about the growth challenges ahead. Surrounded with historically high uncertainty, economists face great challenges in understanding the origins of economic uncertainty and analyzing its causal impacts on real economy, e.g. Stock and Watson (2012).

Since there is no objective measure of uncertainty, economists have used numerous different proxies. A ubiquitous proxy is the implied or realized volatility in stock markets, such as VIX, e.g. Bloom (2009). However, the volatility in Wall Street might not reflect uncertainty in Main Street. For instance, changes in the VIX might be due to leverage or financial stress, despite low levels of economic uncertainty; see Bekaert et al. (2013). Jurado, et al. (2015) develop an alternative measure of economic uncertainty: the common variation in uncertainty across hundreds of economic series. Their measure reflects uncertainty around objective statistical forecasts, rather than perceived uncertainty by market participants. Moreover, as they focus on common, not idiosyncratic, uncertainty, there is no role for private information and heterogeneous agent models. A third leading proxy is based on the frequency of references to policy-related uncertainty in the newspapers, e.g. Baker, et al. (2013). As aptly pointed out by Hansen (2015), this news-based uncertainty measure puts a high bar for the attentiveness of reporters and editors, who might miss uncertainty events if they neglect to write a story on the subject. The fourth proxy for uncertainty is cross-sectional disagreement of economic

agents, calculated as the dispersion in directional or point forecasts, e.g. Bachmann et al. (2013). When disagreement is taken to indicate uncertainty, the underlying assumption is that this inter-personal dispersion measure is an acceptable proxy for the average dispersion of intra-personal uncertainty. As shown by Lahiri and Sheng (2010), however, disagreement is only a part of uncertainty and misses an important component: the volatility of aggregate shocks.

To address some of the limitations in the existing measures, we develop a comprehensive measure of global economic uncertainty. Similar to Scotti (2013), Jo and Sekkel (2015) and Rossi and Sekhposyan (2015), our measure is based on subjective forecasts of market participants and reflects their perceived uncertainty. In contrast to these three papers, our uncertainty measure includes both components: common uncertainty as emphasized in Jurado et al. (2015) and idiosyncratic uncertainty as documented in Lahiri and Sheng (2010). We estimate the common component as the perceived variability of future aggregate shocks and idiosyncratic component as the disagreement among professional forecasters across three different layers. First, we estimate the variable-specific uncertainty for eight nominal and real economic indicators. Second, we measure the country-specific uncertainty as the simple average of standardized components of variable-specific uncertainty. Finally, we propose an index of global uncertainty, which is a rather new concept in the literature. Constructed using a large set of countries, corresponding to more than 90 percent of the world economy, this global measure is more comprehensive than the previously proposed measures, e.g. Berger and Herz (2014).

The main findings can be summarized as follows. All uncertainty measures are countercyclical and at all layers, combined uncertainty is more countercyclical than

corresponding common or idiosyncratic components. A comparison of our country-specific uncertainty measures with alternative leading measures for a subset of countries shows that our measures have fewer peaks, all around the recessions, and have persistent heightened uncertainty during these recession episodes. Using VAR analysis, we find that shocks to country-specific uncertainty are associated with large and persistent drops in real activity characterized in Jurado et al. (2015). Further investigation shows that common uncertainty shocks produce large and persistent responses in real activity, whereas the contributions of idiosyncratic uncertainty shocks are negligible. This result is in contrast with Choi and Loungani (2015) who find that idiosyncratic uncertainty shocks derived from financial markets have persistent and dominant effects on real activity.

The rest of the paper is organized as follows. Section 2 details the methodology on measuring uncertainty. Section 3 introduces the data used in this paper. Section 4 describes the properties of economic uncertainty measures. Section 5 presents the dynamic relationship between uncertainty and economic activity and Section 6 concludes. The appendix includes three parts - detailed information on the dataset, additional regression results and an alternative derivation for the decomposition of uncertainty.

2. Methodology: Estimating Uncertainty

Let $F_{it} = E\left(Y_t \middle| I_{i,t-h}\right)$ be the forecast made by individual i at time $t-h$. Then individual i's uncertainty in predicting the variable Y_t is given by U_{ith}:

$$U_{ith} = E\left\{\left[Y_t - E\left(Y_t \middle| I_{i,t-h}\right)\right]^2 \middle| I_{i,t-h}\right\}. \quad (1)$$

Given a panel of forecasts, we define the uncertainty of a "typical" forecaster, selected randomly from among all forecasters with equal probability, as the simple average of

individual forecast uncertainties, e.g. Giordani and Söderlind (2003). Following Lahiri and Sheng (2010), we decompose the uncertainty of a typical forecaster into two components:

$$U_{th} \equiv \frac{1}{n}\sum_{i=1}^{n} U_{ith} = \sigma^2_{\lambda_{th}} + D_{th}, \qquad (2)$$

where $\sigma^2_{\lambda_{th}}$ is the perceived variability of future aggregate shocks and D_{th} is the disagreement among professional forecasters. Equation (2) states that the uncertainty of a typical forecaster can be decomposed into two parts: uncertainty that is common to all forecasters and uncertainty that arises from heterogeneity of individual forecasters. The first component is the empirical variance of the consensus forecast, which is conventionally the common uncertainty; see Clements (2014). We need to point out that the decomposition of uncertainty for a typical forecaster is similar to the decomposition of volatility for a typical stock as in Campbell et al. (2001). Following their approach, we provide an alternative derivation of equation (2) in the appendix.

The conditional volatility of common shocks has long been estimated using GARCH-type models, dating back to Engle (1982). Under such a framework, the estimates of conditional volatility depend on innovations to Y_t and therefore cannot be separated from first-moment shocks. For this reason, we use the stochastic volatility model to estimate common uncertainty. The stochastic volatility model permits construction of a shock to the second moment that is independent of innovations to Y_t. This exogeneity is consistent with the theoretical literature which presumes the existence of an uncertainty shock that independently

affects real activity. Estimation of the common uncertainty using a stochastic volatility model has the following specification:

$$\ln \sigma_{\lambda_t}^2 = \alpha + \beta \ln \sigma_{\lambda_{t-1}}^2 + \tau v_t, \quad (3)$$

where v_t is an independent and identically distributed random variable. The estimation of the parameters can be done using Markov Chain Monte Carlo methods as in Kim et al. (1998). To prevent the impacts of the outliers, we apply the stochastic volatility model (and also the GARCH model for a robustness check) to median forecast errors instead of mean forecast errors. Following the same logic, we measure forecast disagreement as the interquartile range. Since these two components of uncertainty measure have different scales, we standardize them using the min-max normalization rule. Applying this rule, both common and idiosyncratic uncertainty components are scaled between 0 and 1, and the sum of these two is bounded between 0 and 2 for all variables.

To estimate country-specific economic uncertainty, we take the weighted average of eight variable-specific uncertainty estimates for each country. We present the results using equal weights in the paper. As an alternative, we also estimate the country-specific uncertainty as the first principal component of eight variable-specific uncertainty measures and find that the results are very similar.

Unlike the variable-specific and country-specific uncertainty measures, global uncertainty receives little attention in the literature. This is possibly due to insufficient data to comprehensively analyze global uncertainty. Most of the literature focuses on a single economy, especially the US. The existing global uncertainty measures are based on too few countries and tend to focus on developed economies. For instance, Hirata et al. (2013) construct a measure of global uncertainty based on 7 economies and Berger and Herz (2014) estimate

global uncertainty using 9 advanced economies and two variables: output growth and inflation. To address this limitation, we use a dataset of 46 advanced and emerging market economies, covering more than 90 percent of the world economy today. For these economies, we include 8 variables for each country, covering both real and nominal variables. Taking advantage of this rich dataset, we construct a measure of global uncertainty as the PPP-weighted average of the country-specific uncertainties.

3. Data

We use survey data of macroeconomic forecasts to compute uncertainty measures. The forecast data are from the Consensus Forecasts, publications of the Consensus Economics Inc., a private macroeconomic survey firm based in London. This survey is a comprehensive dataset with a large coverage of advanced and emerging market economies. For each country the survey asks similar questions to a panel of 10-30 professional forecasters on the first week of each month. For some countries, the definition of variables vary slightly (i.e. manufacturing production instead of industrial production) and for others some questions are omitted because of possible data limitations. Other than these, the surveys have a near uniform design for all countries in the sample, which makes the results comparable across countries. This study covers all 46 countries with monthly forecasts available for the annual growth rates of GDP, consumption, investment, industrial production, and levels of inflation, short-term and long-term interest rates, and the unemployment rate. These eight variables enable us to capture uncertainty both in nominal and real macroeconomic indicators, where inflation, short-term and long-term interest rates are in nominal and the rest are in real terms. Table A.1 in the appendix provides detailed information on the country, time and variable coverage of the dataset.

Forecasts for all variables except interest rates are fixed event forecasts. For every month, each survey participant provides forecasts for both the current and the next calendar year. These fixed event forecasts get closer to the actual values when the forecasting horizon is shorter. Following Dovern, et al. (2012), we transform the fixed event forecasts of all variables into fixed horizon forecasts with the following adjustment:

$$F_{i,t+12|t} = \frac{k}{12} F_{i,t+k|t} + \frac{12-k}{12} F_{i,t+12+k|t}, \qquad (4)$$

where $F_{i,t+k|t}$ and $F_{i,t+12+k|t}$ are the two forecasts based on the information set at time *t* with horizons of $k \in \{1, \dots, 12\}$ and $k + 12$ months, respectively. The average of two fixed event forecasts weighted by their share in the forecasting horizon approximates the fixed horizon forecast, $F_{i,t+12|t}$, for the next 12 months. For interest rates, survey participants provide both three-month and twelve-month ahead forecasts. To be consistent with the horizon of the forecasts for other variables, we use the twelve-month ahead forecasts for both short-term and long-term interest rates.

Turning to the actual values, monthly series are available for industrial production, inflation, unemployment, short-term and long-term interest rates. For real GDP, consumption and investment, we use quarterly series since they are not available at the monthly frequency. The main sources of actual values are Global Data Source of IMF, Haver Analytics, OECD Analytical databases and country statistical offices. To match the actual values with the fixed-horizon forecasts, we perform the appropriate data transformation.[‡] We explore the properties

1. Take as an example the survey conducted in January 1991. At the beginning of January, the survey asks forecasts for industrial production and inflation for 1991. For these two monthly variables, we calculate the actual values as the growth rate between December 1990 and December 1991. Similarly, for real GDP, consumption and investment, we calculate the respective actual values as the growth rate between the fourth quarter of 1990 to the fourth quarter of 1991. For the unemployment rate, the actual value reflects the rolling 12-month window average, and in this example equals the average of the unemployment rates from January to December 1991. The

of these forecasts through the Mincer-Zarnowitz regression of median forecast error on forecast. The intercept, denoted by α, is expected to be zero for an unbiased forecast and the slope coefficient, denoted by β, is expected to be zero if forecasters efficiently incorporate publicly available information. Table A.2 in the appendix shows that most forecasts are biased and often inefficient in incorporating new information. Despite these inefficiencies, we use forecast data because they reflect market participants' perceptions of economic development in the future. This perception is key to capturing how economic agents experience uncertainty in the economy; see also Scotti (2013), Jo and Sekkel (2015) and Rossi and Sekhposyan (2015).

4. Properties of Economic Uncertainty

We estimate variable-specific uncertainty (VSU) for eight indicators: rates of inflation, unemployment, short-term and long term interest, and growth rates of output, investment, consumption, and industrial production. For most of the economies in the sample, the VSU is countercyclical for all series. Moreover, some VSU estimates are highly correlated. Table 1 shows that for the United States, the pairwise correlations are quite high for most of the VSU estimates. Interestingly, pairwise correlations between all VSU estimates except long-term interest rate are higher for the common than the idiosyncratic component. For instance, the correlation between inflation and investment growth is 0.27 for idiosyncratic uncertainty, but 0.78 for common uncertainty. If one estimates uncertainty at the country level using only forecast disagreement, then there would be too many uncertainty spikes due to idiosyncratic shocks in individual series. On the other hand, if one estimates uncertainty using only the common component, then the series would be too smooth. These findings support that

forecasts of the two interest rates in this study are easily comparable to the actual values. For both the short- and long-term interest rates, the actual values are the monthly data released for the target date.

combined estimation of these two reflects the uncertainty in the entire economy better than any individual estimate.

For all countries, common uncertainty is less volatile and on average, higher than idiosyncratic uncertainty. There are very few peaks in common uncertainty and those peaks are usually around recession periods. During recession episodes, the level of uncertainty increases for most variables. For instance, in the United States, the uncertainty for output, consumption, investment, unemployment rate and short-term interest rates increases during all three recession periods covered in the sample of 1989-2014. Interestingly, some regional recession episodes are associated with higher uncertainty for almost all series than global recession episodes. For instance, in Indonesia and South Korea, some of the VSU peaks around the 1997 Asian financial crisis are higher than those around the recent global recession. This is consistent with the findings of Hirata, et al. (2013): since the mid-1980s the importance of regional factors has increased and global factors play a lesser role in explaining international business cycles.

Turning to the country-specific uncertainty (CSU), Figure 1 plots the uncertainty estimates for 46 advanced and emerging market economies. The CSU is usually high around recession episodes, especially during the recent global recession. Almost in all countries, the CSU peaked around 2009, even though the country itself did not experience any recession (i.e. China and Australia). For some emerging market economies, the uncertainty during earlier recessions has been higher than the uncertainty during the latest global recession. For instance, the largest uncertainty peak for Argentina is around 2001-2002, when there was a deep financial crisis in the country, whereas for Hong Kong it is around 1997-1998 Asian financial crisis.

The uncertainty at the national level influences the variable-specific uncertainty. To explore this impact, Table 2 presents the proportion of variable-specific uncertainty that may be explained by the country-specific counterpart for the entire sample and subsamples of recessions and expansions. For the entire sample, on average, the explanatory power of the CSU for the variable-specific uncertainty is almost the same during recessions ($R^2 = 0.585$) and expansions ($R^2 = 0.576$). For the advanced economies, however, it is higher during recessions ($R^2 = 0.51$) than during expansions ($R^2 = 0.46$). Shorter time coverage of the emerging market economies makes it difficult to compare the explanatory power at different phases of the business cycle. For eight out of fifteen advanced economies, the CSU explains output growth uncertainty the most. Furthermore, the explanatory power varies over business cycles. For instance, in the United Kingdom, the CSU best explains investment growth uncertainty during recessions but least during expansions. In Japan, the variable that the CSU explains the most is inflation uncertainty during recessions but output growth uncertainty during expansions. For emerging market economies, the evidence is rather mixed. For instance, R^2 is highest for industrial production uncertainty in China, Poland, and Czech Republic; for consumption uncertainty in Argentina, Brazil, Colombia, Peru, South Korea, Philippines, Lithuania, and Romania; for investment uncertainty in Bulgaria, Croatia and Russia. These results are largely consistent with the sources of economic growth in these economies.

To summarize, our country-specific uncertainty measure complements the uncertainty estimate proposed by Jurado, et al. (2015) in two dimensions. First, the forecasts in their paper are based on a very large set of economic information for only the United States, such data is not readily available for other countries. Furthermore, they generate forecasts from augmented autoregressive models and measure uncertainty from the econometrician's perspective. In

contrast, we use surveys of professional forecasters available for many countries and focus on market participants' perceived uncertainty. Second, they measure macroeconomic uncertainty as the common factor of all uncertainty estimates of hundreds of financial and macroeconomic variables. In contrast, our uncertainty measure captures both common and idiosyncratic uncertainties, which we subsequently show to have different effects on economic activity.

With national uncertainty at hand, we estimate global uncertainty as the weighted average of country-specific uncertainties. Figure 2 shows that global uncertainty is strongly countercyclical and rises during the global recessions of 1991 and 2009, identified by Kose and Terrones (2015). The country-specific uncertainty is potentially influenced by global uncertainty because of large trade and financial interconnectedness among economies. Table 3 shows how much of the country-specific uncertainty can be explained by global uncertainty. In some of the Asian economies, parallel to the earlier observations, global uncertainty explains only a small fraction of the country-specific uncertainty. For instance, R^2 is 0.435 in Hong Kong and 0.079 in Thailand. On the other hand, in some of the Eastern European economies, global uncertainty can explain a large fraction of the country-specific uncertainty, e.g. $R^2 = 0.925$ in Lithuania, 0.904 in Latvia and 0.886 in Bulgaria. Table 3 also shows that global uncertainty amplifies the country-specific uncertainty for almost half of the sample, where the coefficient is larger than 1. This amplification is less evident for its common component than idiosyncratic component. Finally, global uncertainty has the largest explanatory power relative to its two components. Parallel to other layers of uncertainty, the sum of both components of uncertainty better reflects worldwide uncertainty than any individual component.

5. Uncertainty and Economic Activity

Table 4 presents the correlations among uncertainty, its two components, and other

uncertainty measures for the United States. Our uncertainty measure has the highest correlation (0.79) with the uncertainty measure proposed by Jurado et al. (2015) and the lowest correlation (0.18) with the news-based policy uncertainty proposed by Baker, et al. (2013). Interestingly, the measure of Jurado et al. (2015) has a higher correlation with the combined uncertainty than with its idiosyncratic (0.59) or common component (0.75). The lower correlation with idiosyncratic uncertainty reflects that disagreement captures other information, such as heterogeneous models and differential interpretation of public information, which are ignored by the common uncertainty.

Figure 3 compares our country-specific uncertainty with other uncertainty measures from the literature, where all measures are standardized to have zero mean and unit variance for easy comparison. For almost all twelve countries included in this comparison, the increases in our uncertainty measures are more persistent in recessions compared to alternative uncertainty measures. For the United States, all uncertainty measures are countercyclical. Only our uncertainty and the policy uncertainty measure exceed the 1.65 standard deviation line for all three recession periods. However, the policy uncertainty exceeds this line many times after the end of the latest recession. In contrast, the uncertainty measure of Jurado et al. (2015) exceeds the line only once during the latest recession, and the VXO exceeds the line six times, covering the three recessions and three non-recession periods. For the United Kingdom, the policy uncertainty exceeds the 1.65 standard deviation line five times, whereas our measure exceeds the line in two recessions out of three. For Canada, France, and Germany, our measure usually performs better than the policy uncertainty in capturing the recessionary episodes. For the other countries, the comparison is between our measure and the news-based uncertainty index of Baker et al. (2013). Based on the uncertainty-related keyword search on main national

newspapers, the news-based indexes often experience large spikes during non-recessionary episodes, implying that their uncertainty measure heavily weights uncertainty outside of the scope of economy-wide uncertainty. On the other hand, our uncertainty measures for these countries exceed the 1.65 standard deviation line during most of the recessionary episodes and remain low during expansionary periods.

Next, we analyze economic uncertainty and macroeconomic dynamics. One of the most pronounced reasons for the slow recovery has been the elevated macroeconomic uncertainty during and after the global recession. To explain this slow recovery, some studies emphasize the demand side impacts of uncertainty via consumption and investment. With high uncertainty, households save more and postpone their consumption, especially for durable goods. Similarly, companies delay their investment decisions and choose to "wait and see" until high economic uncertainty is resolved (Bernanke, 1983; Dixit and Pindyck, 1994). Other studies investigated the supply side impacts of uncertainty through credit provision and productivity growth. When economic uncertainty is high, banks are reluctant to provide loans, and credit conditions for companies tighten, especially for new start-up companies which are good sources of innovation and high productivity growth, e.g. Gilchrist, et al. (2014).

The dynamics between uncertainty and economic activity has long been analyzed using vector autoregression (VAR) models. To easily benchmark with the results in the literature, we employ the VAR analysis as well. We use an eight-variable VAR model and present the results for the United States only. Our VAR model has the following specification:

$$\begin{bmatrix} \log(S\&P500\ index) \\ Uncertainty\ measure \\ Federal\ funds\ rate \\ \log(wages) \\ \log(consumer\ price\ index) \\ Hours \\ \log(employment) \\ \log(industrial\ production) \end{bmatrix}$$

Figure 4 plots the impulse responses of industrial production and employment to a one standard deviation uncertainty shock. There is clear evidence of overshooting when the VXO or the policy uncertainty is used as the proxy. In the middle of the third year after the hit of the VXO shock, both industrial production and employment increase over their initial levels. The overshooting is even faster when the policy uncertainty is used as a proxy. This result is in line with Bloom (2009) but not with Jurado et al. (2015) and Scotti (2013), both of which replicate the analysis in Bloom (2009) and find no evidence of overshooting when variables are not HP-filtered. Both employment and industrial production decline sharply in response to a one standard deviation shock to the uncertainty measure of Jurado et al. (2015) and these declines remain persistent for the five years following the initial shock.

We also analyze the impact of the two components of country-specific uncertainty through the VAR model. The idiosyncratic component, forecast disagreement shock, has less significant impacts on industrial production and employment. In contrast, common uncertainty shocks have a large and long-lived impact on both industrial production and employment, with the peak impact occurring after two to three years. Therefore, the "wait-and-see" mechanism is observed in the common component of the uncertainty rather than its idiosyncratic component. This result stands at odds with the conclusion of Choi and Loungani (2015) that aggregate uncertainty (parallel to our common component of uncertainty) has an immediate

impact on unemployment, which dissipates within a year, whereas sectoral uncertainty (parallel to our idiosyncratic component of uncertainty) has a long-lived impact on unemployment. Turning to our country-specific uncertainty measure, which includes both common and idiosyncratic components, the responses of both industrial production and employment are not significant during the first nine months following the shock. The significant negative impact of the shock on industrial production starts around 10 months after the shock and the effect remains significant, keeping industrial production below its initial level until the middle of the third year.

Due to the imperfect correlation between common and idiosyncratic uncertainty, we perform an additional analysis by jointly studying their roles in explaining business cycle fluctuations. To this end, we include both uncertainty measures in the VAR model specification as follows

$$\begin{bmatrix} \log(stock\ price) \\ common\ uncertainty \\ idiosyncratic\ uncertainty \\ monetary\ policy\ rate \\ \log(consumer\ price\ index) \\ \log(industrial\ production) \end{bmatrix}$$

As shown in Figure 6, the two variants of uncertainty have different effects on industrial production. Common uncertainty shocks have large and persistent impacts whereas idiosyncratic uncertainty shocks have short-lived and negligible effects on industrial production. This pattern holds for most of G7 countries, including France, Italy, Japan, United Kingdom and United States. For Canada and Germany, however, both types of uncertainty shocks seem to have only very limited and short-lived effects.

Using global uncertainty measure and monthly variables, we conduct a similar exercise in the global dimension. Our VAR model includes seven variables in the following order: stock prices, global uncertainty, short term interest rate, oil prices, food prices, unemployment rate and industrial production. Besides global uncertainty, we also use its common and idiosyncratic components, replacing the uncertainty measure iteratively in the model. Figure 5 shows the impulse response functions. For industrial production (panel A), there is an immediate decline following the global uncertainty shock, but the decrease dissipates within a few months. The response to the idiosyncratic uncertainty shock has a similarly short-lived impact, but an overshooting occurs after six months following the initial shock. The response to the common uncertainty shock, on the other hand, has a long-lived impact on industrial production, with the peak impact occurring after two years. The difference in the impact of the common and idiosyncratic components of the uncertainty shock shows how these two parts capture different features of global uncertainty.

As illustrated in panel B of Figure 5, the global uncertainty shocks have a long-lived impact on unemployment, which is consistent with what we observe following the recent global recession. The significant increase in unemployment following the uncertainty shock dissipates almost after 30 months. The idiosyncratic uncertainty shocks are associated with high initial response in unemployment rate, which then overshoots after 30 months. The common uncertainty shocks are associated with more persistent and long-lived high unemployment rates and the impacts peak around 30 months. These findings are consistent with the intuition that employers "wait-and-see" before they decide to lay off after the initial shock and then hire later on during the recovery. This result again shows that the "wait-and-see" type of behavior is more related to the common rather than idiosyncratic component of

global uncertainty.

6. Conclusion

This paper makes important contributions to the growing literature on measuring uncertainty. First, we propose a new monthly index of uncertainty which has both common and idiosyncratic components, namely, perceived variability of future aggregate shocks and the disagreement among forecasters. By including these two components, the uncertainty measure captures economic uncertainty along different dimensions. Second, we use actual forecasts of real time market analysts instead of using hindsight to specify econometric forecasts. As such, our uncertainty measure captures uncertainty for market participants, who have common and idiosyncratic features, and can be estimated for any countries with data on economic forecasts.

Compared to alternative leading measures for a subset of countries, our country-specific uncertainty measures have fewer volatile peaks and more persistent and heightened uncertainty during recessions. Using the VAR analysis, we find that shocks to country-specific uncertainty are associated with large and persistent drops in real activity as characterized in Jurado et al. (2015). This result also holds for the world economy: global uncertainty shocks have long-lived effects on industrial production and unemployment. A deeper investigation shows that the two components of economic uncertainty exhibit strikingly different behavior. Common uncertainty shocks account for a large fraction of fluctuations in economic activity at business cycle frequencies, whereas idiosyncratic uncertainty shocks play a small role. This result contrasts with Choi and Loungani (2015) who find that idiosyncratic uncertainty shocks

derived from financial markets have persistent and dominant effects on real activity. Further research is warranted to quantify the economic effects of different types of uncertainty.

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Table 1. Correlation between Variable-specific Uncertainty Measures:United States

A. Correlation between Variable-specific Uncertainty Measures

	Output	Inflation	Consumption	Investment	Industrial production	Unemployment rate	Short-term interest rate	Long-term interest rate
Output	1.00							
Inflation	0.57	1.00						
Consumption	0.79	0.51	1.00					
Investment	0.77	0.64	0.61	1.00				
Industrial production	0.82	0.70	0.61	0.79	1.00			
Unemployment rate	0.77	0.53	0.72	0.70	0.67	1.00		
Short-term interest rate	0.43	0.22	0.55	0.42	0.37	0.28	1.00	
Long-term interest rate	0.41	0.27	0.27	0.42	0.33	0.47	0.24	1.00

B. Correlation between Variable-specific Idiosyncratic Uncertainty Measures

	Output	Inflation	Consumption	Investment	Industrial production	Unemployment rate	Short-term interest rate	Long-term interest rate
Output	1.00							
Inflation	0.38	1.00						
Consumption	0.60	0.36	1.00					
Investment	0.54	0.27	0.53	1.00				
Industrial production	0.56	0.46	0.53	0.51	1.00			
Unemployment rate	0.49	0.30	0.53	0.46	0.39	1.00		
Short-term interest rate	0.19	0.02	0.17	0.15	0.02	0.02	1.00	
Long-term interest rate	0.35	0.36	0.33	0.28	0.29	0.17	0.31	1.00

C. Correlation between Variable-specific Common Uncertainty Measures

	Output	Inflation	Consumption	Investment	Industrial production	Unemployment rate	Short-term interest rate	Long-term interest rate
Output	1.00							
Inflation	0.53	1.00						
Consumption	0.83	0.50	1.00					
Investment	0.75	0.78	0.60	1.00				
Industrial production	0.87	0.68	0.62	0.83	1.00			
Unemployment rate	0.71	0.54	0.68	0.68	0.69	1.00		
Short-term interest rate	0.54	0.30	0.61	0.53	0.44	0.42	1.00	
Long-term interest rate	0.20	0.20	0.16	0.22	0.19	0.49	0.17	1.00

Note: Output, consumption, investment, and industrial production stand for the growth rates of these indicators. The sample is between 1989M11-2014M7 for all estimates.

Table 2. R-square: Variable-specific Uncertainty on Country-specific Uncertainty

	Output	Consumption	Investment	Industrial production	Unemployment rate	Inflation	Short-term interest rate	Long-term interest rate	Average
United States									
Full sample	0.822	0.678	0.763	0.734	0.690	0.506	0.348	0.303	0.606
Recessions	0.833	0.628	0.657	0.662	0.506	0.807	0.065	0.000	0.520
Expansions	0.715	0.554	0.618	0.550	0.513	0.158	0.292	0.364	0.471
United Kingdom									
Full sample	0.777	0.805	0.564	0.659	0.479	0.627	0.512	0.511	0.617
Recessions	0.721	0.803	0.857	0.648	0.124	0.662	0.424	0.157	0.550
Expansions	0.618	0.663	0.240	0.413	0.534	0.438	0.414	0.646	0.496
France									
Full sample	0.696	0.498	0.612	0.640	0.429	0.224	0.342	0.422	0.483
Recessions	0.903	0.150	0.875	0.712	0.811	0.747	0.038	0.686	0.615
Expansions	0.465	0.519	0.401	0.418	0.343	0.004	0.444	0.442	0.380
Germany									
Full sample	0.698	0.528	0.399	0.568	0.251	0.342	0.540	0.317	0.455
Recessions	0.855	0.101	0.667	0.839	0.031	0.544	0.793	0.251	0.510
Expansions	0.645	0.700	0.326	0.477	0.378	0.273	0.459	0.365	0.453
Italy									
Full sample	0.424	0.520	0.701	0.275	0.385	0.650	0.281	0.703	0.492
Recessions	0.431	0.375	0.705	0.272	0.303	0.581	0.247	0.641	0.444
Expansions	0.356	0.372	0.561	0.182	0.367	0.627	0.393	0.709	0.446
Canada									
Full sample	0.753	0.696	0.484	0.675	0.793	0.601	0.583	0.660	0.656
Recessions	0.097	0.395	0.016	0.541	0.596	0.349	0.622	0.802	0.427
Expansions	0.688	0.572	0.436	0.593	0.746	0.533	0.557	0.638	0.595
Japan									
Full sample	0.663	0.323	0.577	0.363	0.183	0.432	0.535	0.220	0.412
Recessions	0.745	0.477	0.553	0.257	0.705	0.834	0.744	0.148	0.558
Expansions	0.618	0.241	0.593	0.372	0.082	0.286	0.524	0.304	0.378
Spain									
Full sample	0.814	0.801	0.907	0.785	N/A	0.751	0.094	0.428	0.654
Recessions	0.478	0.319	0.768	0.743	N/A	0.579	0.682	0.143	0.530
Expansions	0.726	0.624	0.854	0.752	N/A	0.624	0.062	0.472	0.588
Australia									
Full sample	0.539	0.188	0.430	0.379	0.587	0.647	0.641	0.410	0.478
Recessions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansions	0.539	0.188	0.430	0.379	0.587	0.647	0.641	0.410	0.478
New Zealand									
Full sample	0.826	0.483	0.316	0.588	0.242	0.341	N/A	N/A	0.466
Recessions	0.678	0.493	0.057	0.772	0.001	0.216	N/A	N/A	0.370
Expansions	0.794	0.424	0.386	0.510	0.194	0.271	N/A	N/A	0.430
Netherlands									
Full sample	0.514	0.041	0.414	0.508	N/A	0.180	0.017	0.562	0.319
Recessions	0.705	0.243	0.125	0.772	N/A	0.239	0.400	0.836	0.474
Expansions	0.155	0.088	0.388	0.153	N/A	0.176	0.000	0.224	0.169
Norway									
Full sample	0.669	0.372	0.446	0.025	N/A	0.103	0.634	0.514	0.395
Recessions	0.567	0.805	0.735	0.070	N/A	0.065	0.401	0.544	0.455
Expansions	0.665	0.329	0.419	0.084	N/A	0.105	0.740	0.556	0.414
Sweden									
Full sample	0.788	0.529	0.646	0.676	N/A	0.532	0.224	0.368	0.538
Recessions	0.739	0.155	0.802	0.739	N/A	0.269	0.774	0.785	0.609
Expansions	0.746	0.456	0.596	0.596	N/A	0.499	0.223	0.480	0.514
Switzerland									
Full sample	0.760	0.183	0.723	0.568	N/A	0.362	N/A	0.166	0.460
Recessions	0.893	0.027	0.660	0.890	N/A	0.802	N/A	0.209	0.580
Expansions	0.691	0.123	0.679	0.494	N/A	0.282	N/A	0.191	0.410
Euro Zone									
Full sample	0.857	0.710	0.887	0.860	0.680	0.568	N/A	N/A	0.760
Recessions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansions	0.857	0.710	0.887	0.860	0.680	0.568	N/A	N/A	0.760

Table 2. Continued

	Output	Consumption	Investment	Industrial production	Unemployment rate	Inflation	Short-term interest rate	Long-term interest rate	Average
Turkey									
Full sample	0.919	0.897	0.817	0.889	N/A	0.687	0.259	N/A	0.745
Recessions	0.936	0.818	0.905	0.904	N/A	0.000	0.307	N/A	0.645
Expansions	0.926	0.876	0.828	0.857	N/A	0.659	0.203	N/A	0.725
Argentina									
Full sample	0.824	0.921	0.812	0.833	N/A	0.858	0.793	N/A	0.840
Recessions	0.976	0.832	0.881	0.737	N/A	0.503	0.536	N/A	0.744
Expansions	0.903	0.927	0.831	0.852	N/A	0.924	0.824	N/A	0.877
Brazil									
Full sample	0.783	0.808	0.732	0.535	N/A	0.056	0.201	N/A	0.519
Recessions	0.696	0.805	0.555	0.466	N/A	0.128	0.458	N/A	0.518
Expansions	0.806	0.816	0.782	0.555	N/A	0.031	0.136	N/A	0.521
Chile									
Full sample	0.786	0.731	0.392	0.650	N/A	0.405	0.204	N/A	0.528
Recessions	0.143	0.278	0.816	0.852	N/A	0.244	0.842	N/A	0.529
Expansions	0.748	0.714	0.207	0.683	N/A	0.211	0.161	N/A	0.454
Colombia									
Full sample	0.693	0.725	0.454	0.624	N/A	0.544	N/A	N/A	0.608
Recessions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansions	0.693	0.725	0.454	0.624	N/A	0.544	N/A	N/A	0.608
Mexico									
Full sample	0.832	0.719	0.612	0.739	N/A	0.507	0.132	N/A	0.590
Recessions	0.852	0.652	0.012	0.676	N/A	0.372	0.555	N/A	0.520
Expansions	0.728	0.554	0.385	0.609	N/A	0.560	0.287	N/A	0.521
Peru									
Full sample	0.658	0.840	0.770	N/A	N/A	0.459	N/A	N/A	0.682
Recessions	0.689	0.918	0.933	N/A	N/A	0.676	N/A	N/A	0.804
Expansions	0.711	0.850	0.736	N/A	N/A	0.391	N/A	N/A	0.672
Venezuela									
Full sample	0.898	0.566	0.609	N/A	N/A	0.092	0.785	N/A	0.590
Recessions	0.901	0.443	0.917	N/A	N/A	0.107	0.922	N/A	0.658
Expansions	0.883	0.574	0.696	N/A	N/A	0.076	0.742	N/A	0.594
Taiwan									
Full sample	0.766	0.744	0.694	0.755	0.873	0.508	0.138	0.569	0.631
Recessions	0.864	0.752	0.721	0.959	0.667	0.745	0.910	0.708	N/A
Expansions	0.679	0.687	0.637	0.685	0.823	0.396	0.132	0.320	0.545
Hong Kong									
Full sample	0.807	0.707	0.779	0.716	0.907	0.694	0.705	0.139	0.682
Recessions	0.806	0.688	0.858	0.794	0.335	0.826	0.858	0.009	0.647
Expansions	0.807	0.598	0.677	0.682	0.899	0.521	0.465	0.245	0.612
India									
Full sample	0.435	N/A	0.357	0.183	N/A	0.281	0.117	0.042	0.236
Recessions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansions	0.435	N/A	0.357	0.183	N/A	0.281	0.117	0.042	0.236
Indonesia									
Full sample	0.927	0.900	0.888	0.803	N/A	0.886	0.803	0.229	0.777
Recessions	0.439	0.289	0.272	0.013	N/A	0.261	0.703	0.648	0.375
Expansions	0.882	0.810	0.852	0.781	N/A	0.789	0.760	0.351	0.746
South Korea									
Full sample	0.894	0.925	0.904	0.537	0.884	0.872	0.727	0.210	0.744
Recessions	0.611	0.560	0.607	0.338	0.723	0.641	0.335	0.310	0.516
Expansions	0.875	0.920	0.880	0.569	0.861	0.840	0.654	0.085	0.711
Malaysia									
Full sample	0.835	0.778	0.727	0.620	N/A	0.363	0.383	0.628	0.619
Recessions	0.826	0.706	0.866	0.142	N/A	0.395	0.613	0.919	0.638
Expansions	0.789	0.778	0.727	0.617	N/A	0.229	0.333	0.535	0.573
Philippines									
Full sample	0.762	0.764	0.536	0.713	N/A	0.109	0.001	N/A	0.481
Recessions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansions	0.762	0.764	0.536	0.713	N/A	0.109	0.001	N/A	0.481
China									
Full sample	0.377	0.491	0.407	0.777	N/A	0.623	N/A	0.671	0.558
Recessions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansions	0.377	0.491	0.407	0.777	N/A	0.623	N/A	0.671	0.558

Table 2. Continued

	Output	Consumption	Investment	Industrial production	Unemployment rate	Inflation	Short-term interest rate	Long-term interest rate	Average
Singapore									
Full sample	0.713	0.543	0.559	0.438	N/A	0.375	0.208	0.280	0.445
Recessions	0.716	0.200	0.651	0.158	N/A	0.541	0.230	0.554	0.436
Expansions	0.667	0.545	0.526	0.511	N/A	0.350	0.167	0.254	0.431
Thailand									
Full sample	0.884	0.862	0.763	0.407	N/A	0.446	0.004	0.244	0.516
Recessions	0.888	0.903	0.928	0.426	N/A	0.537	0.603	0.071	0.622
Expansions	0.849	0.766	0.482	0.529	N/A	0.146	0.000	0.092	0.409
Russia									
Full sample	0.902	0.894	0.945	0.944	N/A	0.527	N/A	N/A	0.842
Recessions	0.920	0.894	0.931	0.944	N/A	0.022	N/A	N/A	0.742
Expansions	0.902	0.849	0.976	0.968	N/A	0.807	N/A	N/A	0.900
Bulgaria									
Full sample	0.791	0.701	0.941	0.899	N/A	0.742	N/A	N/A	0.815
Recessions	0.790	0.582	0.924	0.812	N/A	0.607	N/A	N/A	0.743
Expansions	0.575	0.732	0.896	0.885	N/A	0.794	N/A	N/A	0.776
Ukraine									
Full sample	0.951	0.938	0.827	0.893	N/A	0.145	N/A	N/A	0.751
Recessions	0.977	0.962	0.929	0.961	N/A	0.057	N/A	N/A	0.777
Expansions	0.936	0.923	0.811	0.844	N/A	0.262	N/A	N/A	0.755
Czech Republic									
Full sample	0.869	0.880	0.874	0.897	N/A	0.656	N/A	0.479	0.776
Recessions	0.934	0.878	0.865	0.902	N/A	0.823	N/A	0.652	0.842
Expansions	0.808	0.876	0.888	0.912	N/A	0.792	N/A	0.297	0.762
Slovakia									
Full sample	0.892	0.641	0.717	0.769	N/A	0.274	N/A	N/A	0.659
Recessions	0.537	0.520	0.028	0.420	N/A	0.106	N/A	N/A	0.322
Expansions	0.871	0.505	0.707	0.818	N/A	0.309	N/A	N/A	0.642
Estonia									
Full sample	0.906	0.869	N/A	0.840	N/A	0.905	N/A	N/A	0.880
Recessions	0.937	0.952	N/A	0.891	N/A	0.909	N/A	N/A	0.922
Expansions	0.876	0.739	N/A	0.754	N/A	0.936	N/A	N/A	0.826
Latvia									
Full sample	0.868	N/A	0.504	0.862	N/A	0.913	N/A	N/A	0.787
Recessions	0.586	N/A	0.526	0.207	N/A	0.504	N/A	N/A	0.456
Expansions	0.790	N/A	0.467	0.842	N/A	0.909	N/A	N/A	0.752
Hungary									
Full sample	0.780	N/A	0.026	0.742	N/A	0.079	0.849	0.693	0.528
Recessions	0.782	N/A	0.095	0.836	N/A	0.075	0.876	0.902	0.594
Expansions	0.610	N/A	0.004	0.666	N/A	0.010	0.652	0.301	0.374
Lithuania									
Full sample	0.890	0.902	0.848	0.798	N/A	0.748	N/A	N/A	0.837
Recessions	0.235	0.725	0.339	0.590	N/A	0.000	N/A	N/A	N/A
Expansions	0.867	0.823	0.766	0.691	N/A	0.881	N/A	N/A	0.806
Croatia									
Full sample	0.687	0.707	0.808	0.455	N/A	0.390	N/A	N/A	0.609
Recessions	0.791	0.672	0.802	0.394	N/A	0.239	N/A	N/A	0.580
Expansions	0.784	0.918	0.980	0.948	N/A	0.955	N/A	N/A	0.917
Slovenia									
Full sample	0.853	0.032	0.842	0.468	N/A	0.689	N/A	N/A	0.577
Recessions	0.897	0.000	0.776	0.582	N/A	0.803	N/A	N/A	0.612
Expansions	0.858	0.076	0.908	0.265	N/A	0.690	N/A	N/A	0.559
Romania									
Full sample	0.906	0.936	0.904	0.738	N/A	0.134	N/A	N/A	0.724
Recessions	0.906	0.999	0.456	0.947	N/A	0.581	N/A	N/A	0.778
Expansions	0.893	0.925	0.928	0.758	N/A	0.173	N/A	N/A	0.735
Poland									
Full sample	0.735	0.132	0.561	0.804	N/A	0.123	N/A	N/A	0.471
Recessions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansions	0.735	0.132	0.561	0.804	N/A	0.123	N/A	N/A	0.471

Note: Each cell presents the R-square of the regressions of respective variable-specific uncertainty on country-specific uncertainty measures. Recession episodes are from Claessens, Kose, Ozturk, Terrones (2016, forthcoming). The last column presents the average of the R-square in each economy. Numbers in red are the smallest values and numbers in green are the largest values in the row they stand.

Table 3. R-square: Country-specific Uncertainty on Global Uncertainty

	Uncertainty (total)		Idiosyncratic Uncertainty		Common Uncertainty	
	β	R^2	β	R^2	β	R^2
Estonia	1.597***	0.880	1.369***	0.698	1.190***	0.816
Bulgaria	1.396***	0.886	1.247***	0.586	1.012***	0.812
Lithuania	1.351***	0.925	1.136***	0.686	1.024***	0.873
Latvia	1.346***	0.904	1.122***	0.772	1.032***	0.802
Taiwan	1.320***	0.891	1.228***	0.692	1.007***	0.875
Peru	1.296***	0.694	1.075***	0.373	0.943***	0.644
Russia	1.268***	0.836	1.147***	0.481	0.922***	0.678
Philippines	1.255***	0.857	1.216***	0.490	0.913***	0.780
United States	1.212***	0.782	1.249***	0.686	0.808***	0.670
Canada	1.211***	0.677	1.008***	0.488	0.891***	0.703
United Kingdom	1.210***	0.711	1.230***	0.654	0.844***	0.702
New Zealand	1.161***	0.798	1.071***	0.557	0.820***	0.678
Euro Zone	1.144***	0.679	1.329***	0.623	0.863***	0.618
Czech Republic	1.122***	0.906	0.866***	0.706	0.889***	0.817
Mexico	1.108***	0.789	1.132***	0.642	0.801***	0.819
Romania	1.104***	0.803	0.902***	0.483	0.761***	0.687
Turkey	1.081***	0.849	0.800***	0.386	0.947***	0.887
China	1.071***	0.428	1.334***	0.418	0.678***	0.354
Hong Kong	1.047***	0.435	0.844***	0.306	0.814***	0.476
Colombia	1.043***	0.724	0.954***	0.538	0.773***	0.562
Chile	1.023***	0.724	1.152***	0.596	0.730***	0.685
Sweden	1.000***	0.517	0.832***	0.328	0.819***	0.592
Singapore	0.988***	0.708	0.891***	0.494	0.739***	0.721
Brazil	0.970***	0.731	0.947***	0.535	0.747***	0.800
Australia	0.968***	0.566	1.071***	0.534	0.660***	0.592
Switzerland	0.961***	0.808	0.856***	0.506	0.769***	0.780
Japan	0.954***	0.692	0.867***	0.465	0.747***	0.671
Germany	0.946***	0.625	0.765***	0.457	0.723***	0.636
Ukraine	0.911***	0.544	0.863***	0.269	0.649***	0.428
France	0.903***	0.571	0.740***	0.385	0.717***	0.584
Slovakia	0.890***	0.872	0.856***	0.489	0.698***	0.837
Croatia	0.885***	0.711	0.588***	0.274	0.799***	0.651
Spain	0.860***	0.378	0.830***	0.397	0.660***	0.366
Hungary	0.783***	0.819	0.933***	0.571	0.614***	0.833
Slovenia	0.722***	0.537	0.833***	0.441	0.562***	0.452
Italy	0.702***	0.315	0.584***	0.221	0.609***	0.388
Poland	0.632***	0.788	0.899***	0.616	0.391***	0.775
Malaysia	0.605***	0.180	0.553***	0.156	0.477***	0.191
Netherlands	0.541***	0.451	0.648***	0.234	0.406***	0.504
South Korea	0.500***	0.090	0.495***	0.109	0.400***	0.106
India	0.460***	0.432	0.292***	0.053	0.373***	0.504
Norway	0.452***	0.215	0.356***	0.054	0.382***	0.407
Argentina	0.412***	0.076	0.311***	0.048	0.352***	0.092
Thailand	0.350***	0.079	0.327***	0.049	0.300***	0.110
Indonesia	0.208***	0.017	0.276***	0.029	0.163***	0.021
Venezuela	0.039	0.001	0.183***	0.026	-0.022	0.000

Note: Economies are sorted with respect to their estimated coefficients in uncertainty (total). Each result is based on bivariate regressions of country-specific uncertainty on global uncertainty. *** indicates significance at 1 percent level.

Table 4. Correlations of Uncertainty Measures: United States

	Country-specific uncertainty	Common uncertainty	Idiosyncratic uncertainty	Economic policy uncertainty	News-based policy uncertainty	Jurado et al. (2015)	VXO
Country-specific uncertainty	1.00						
Common uncertainty	0.94	1.00					
Idiosyncratic uncertainty	0.80	0.54	1.00	0.00			
Economic policy uncertainty	0.18	0.05	0.36	1.00			
News-based policy uncertainty	0.19	0.07	0.35	0.90	1.00		
Jurado et al. (2015)	0.79	0.75	0.59	0.28	0.27	1.00	
VXO	0.54	0.48	0.49	0.40	0.49	0.60	1.00

Note: News-based policy uncertainty and economic policy uncertainty measureas are from the policy uncertainty website of Baker, Bloom, and Davis (2013).

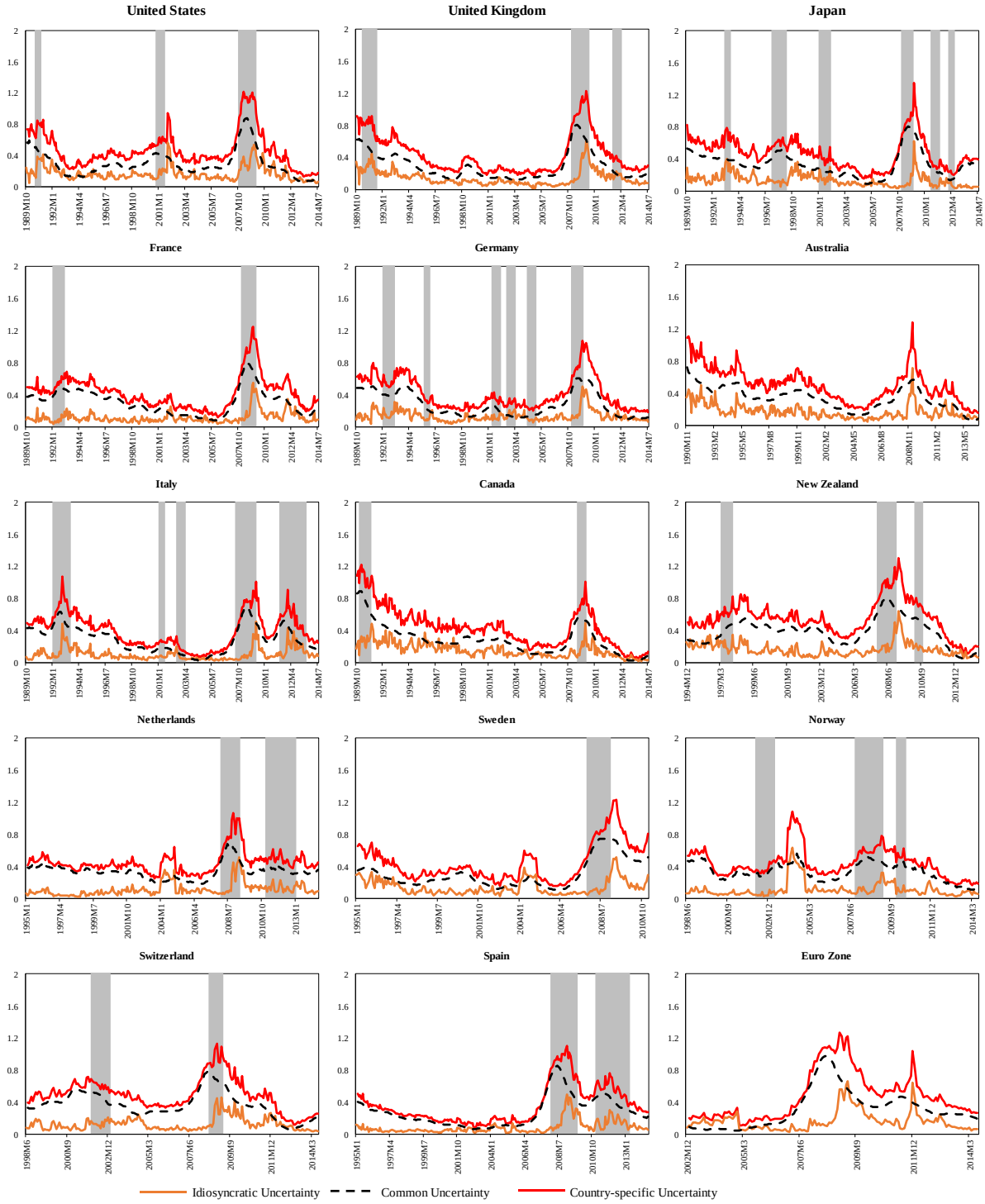

Figure 1. Country-Specific Uncertainty

Note : Country-specific uncertainty is the sum of idiosyncratic and common uncertainty. Gray bars indicate the period of recessions as identified in Claessens, Kose, Ozturk, Terrones (2016, forthcoming).

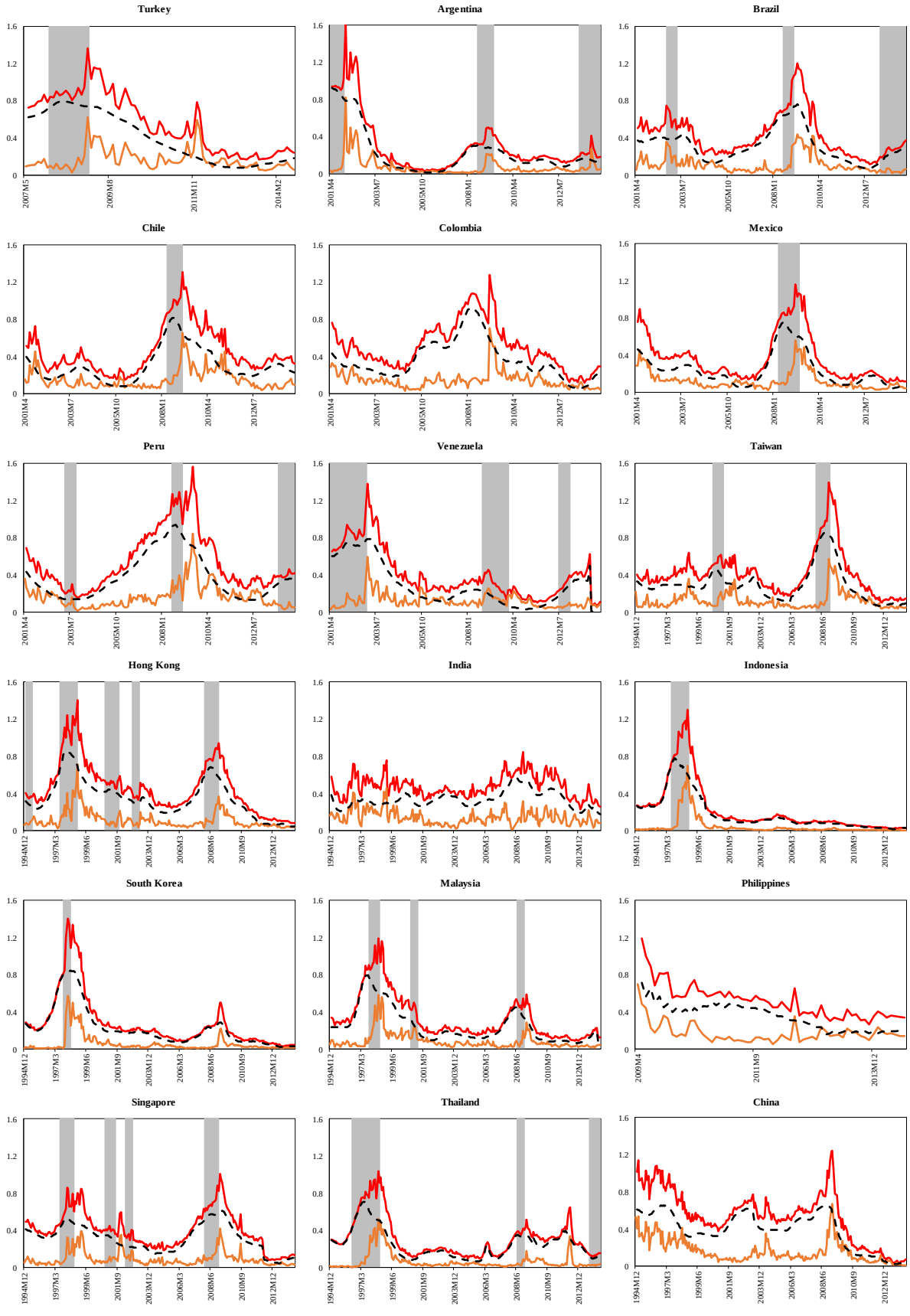

Figure 1. Country-Specific Uncertainty (continued)

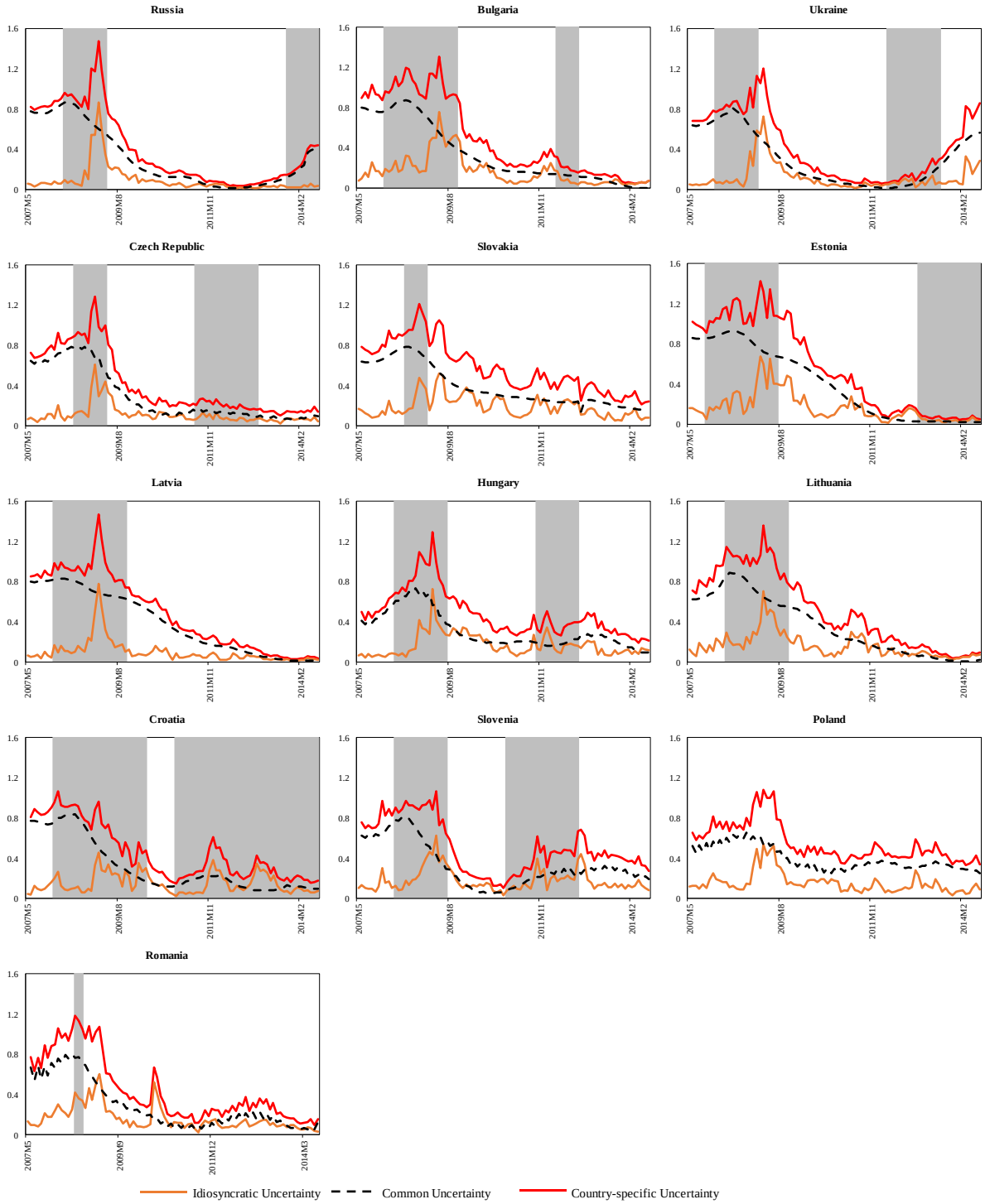

Figure 1. Country-Specific Uncertainty (continued)

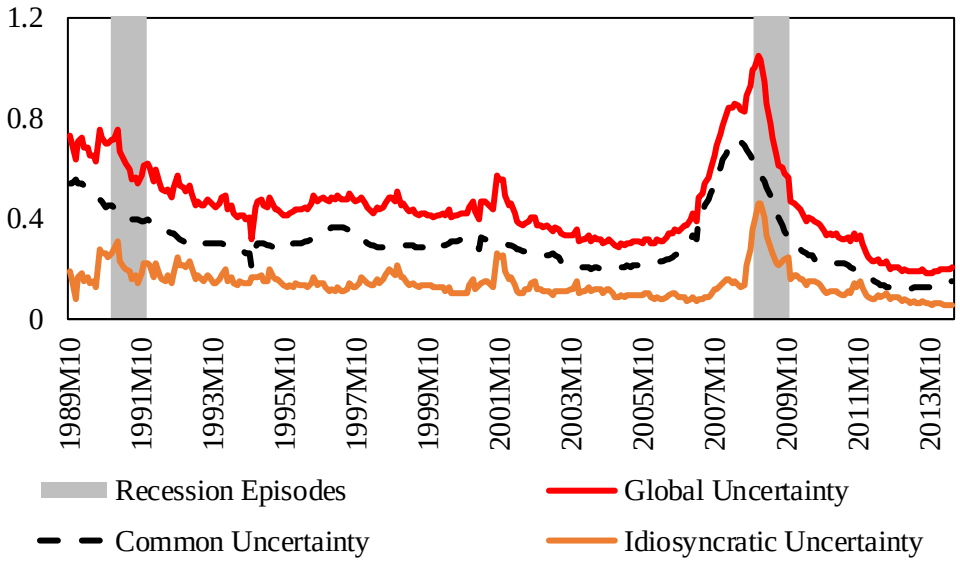

Figure 2. Global Uncertainty

Note: Each line presents the PPP-weighted average of the respective measure for 46 economies. Gray bars present the global recession episodes identified by Kose and Terrones (2015).

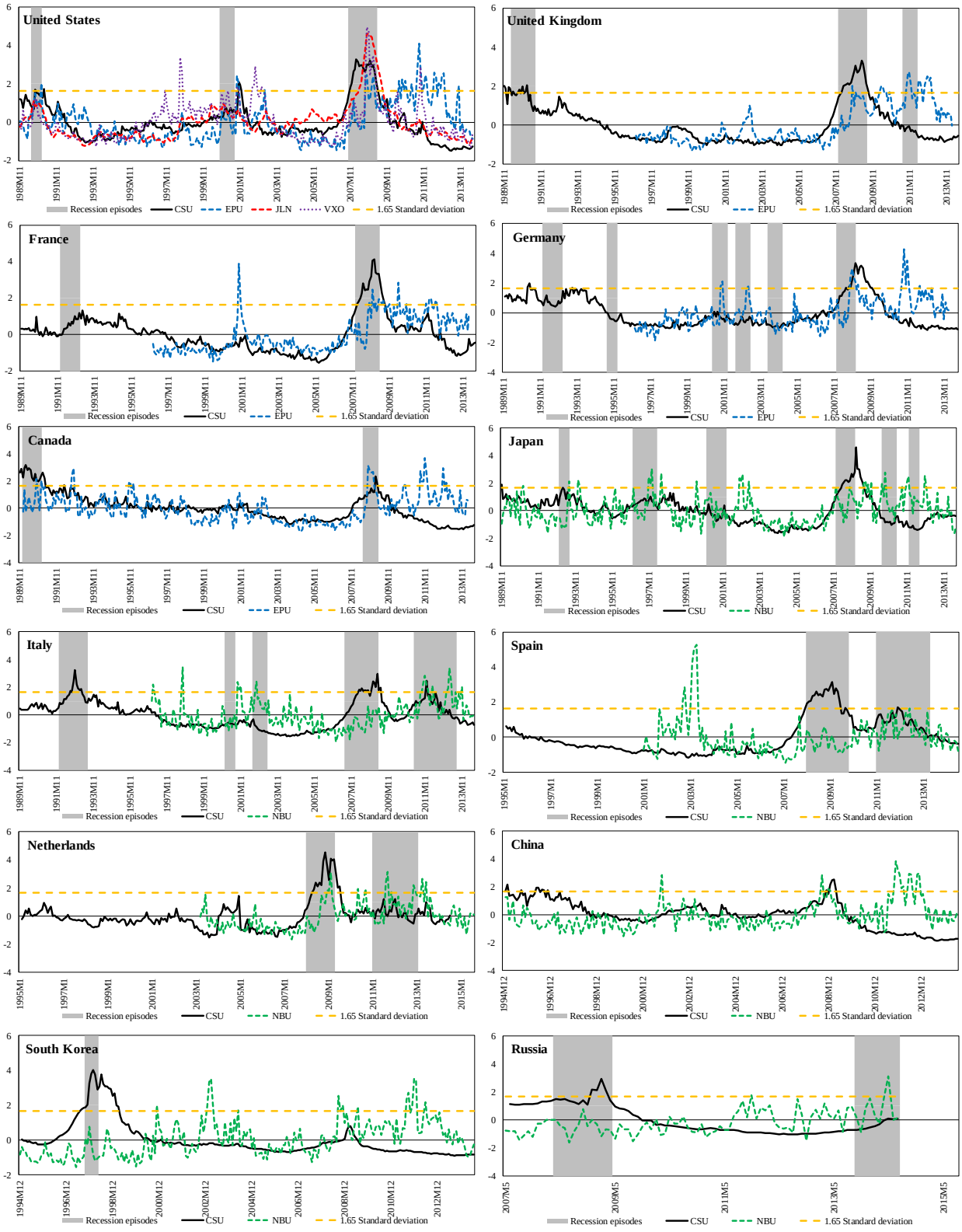

Figure 3. Comparison of Uncertainty Measures

Note: Each uncertainty measure is standardized by subtracting the mean and dividing by the standard deviation. CSU = country-specific uncertainty, JLN=uncertainty measure from Jurado et al (2015), EPU=economic policy uncertainty (Baker et al, 2013), NBU=news-based uncertainty (Baker et al, 2013).

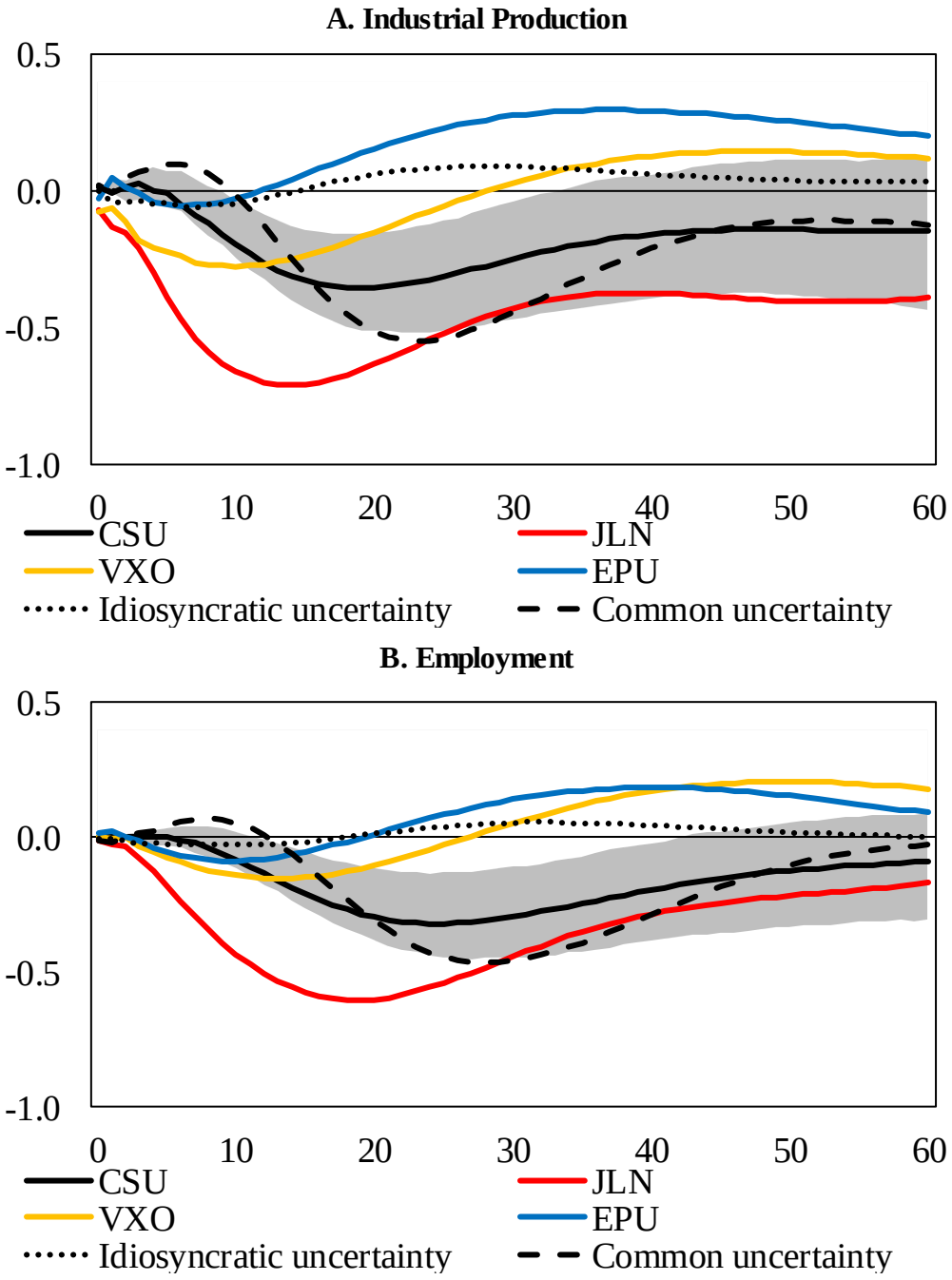

Figure 4. Responses to Uncertainty Shocks

Note : Panel A (Panel B) plots the responses of industrial production (employment) to uncertainty shocks identified recursively in eight-variable VAR system estimated separately for each of the uncertainty measures. CSU=country-specific uncertainty; JLN=uncertainty estimate from Jurado et. al (2015), EPU= economic policy uncertainty estimate from Baker et. al (2013). Dotted (dashed) line is the response to the forecast disagreement shocks, where CSU is replaced with idiosyncratic uncertainty (common uncertainty) component. Shaded regions present 64 percent confidence intervals using Killian (1998) bias-corrected bootstrap.

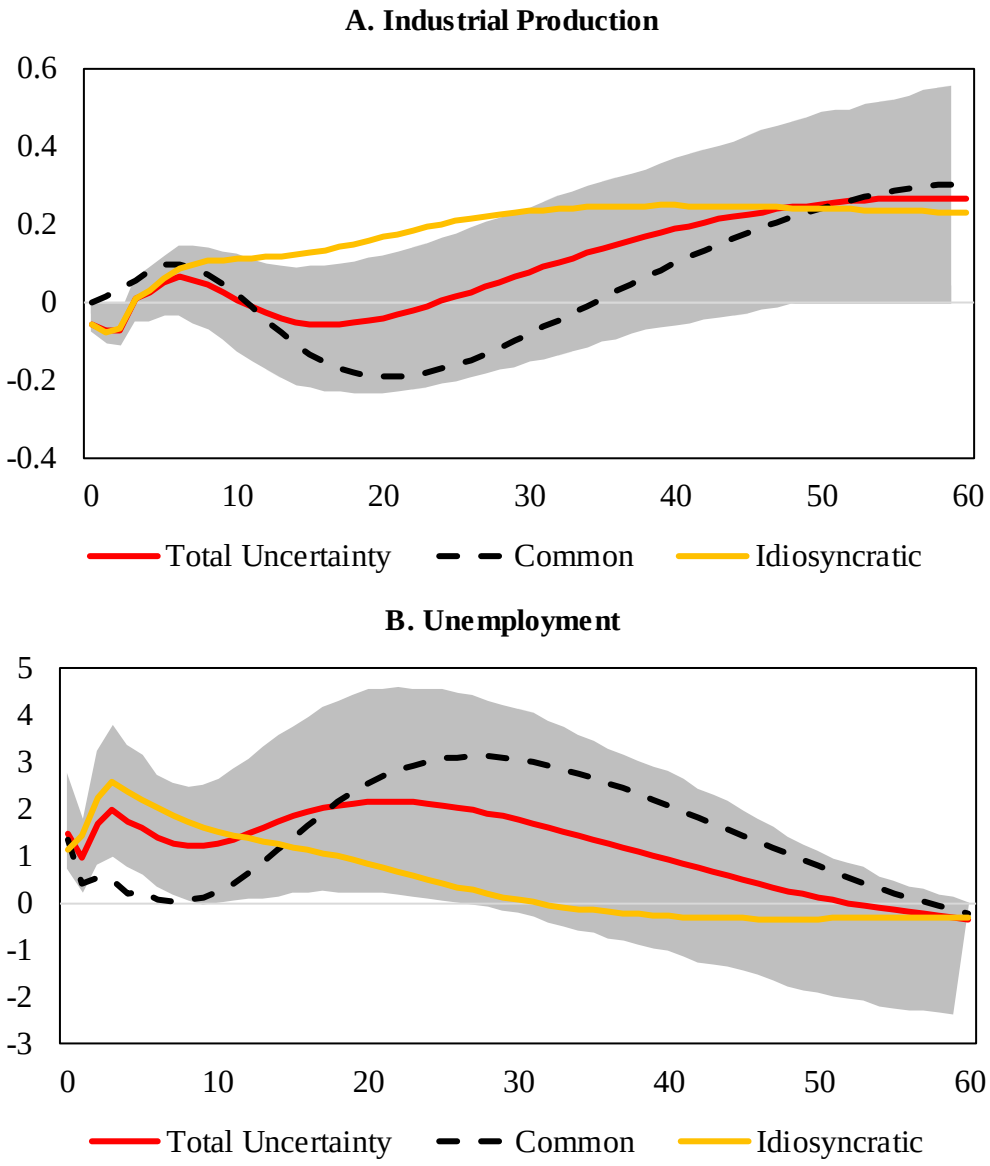

Figure 5. Responses to Global Uncertainty Shocks

Note: Panel A (Panel B) plots the responses of industrial production (unemployment rate) to uncertainty shocks identified recursively in a seven-variable VAR system estimated separately for total uncertainty and its common and idiosyncratic components.

Figure 6. Reponse of industrial production to common and idiosyncratic uncertainty shocks

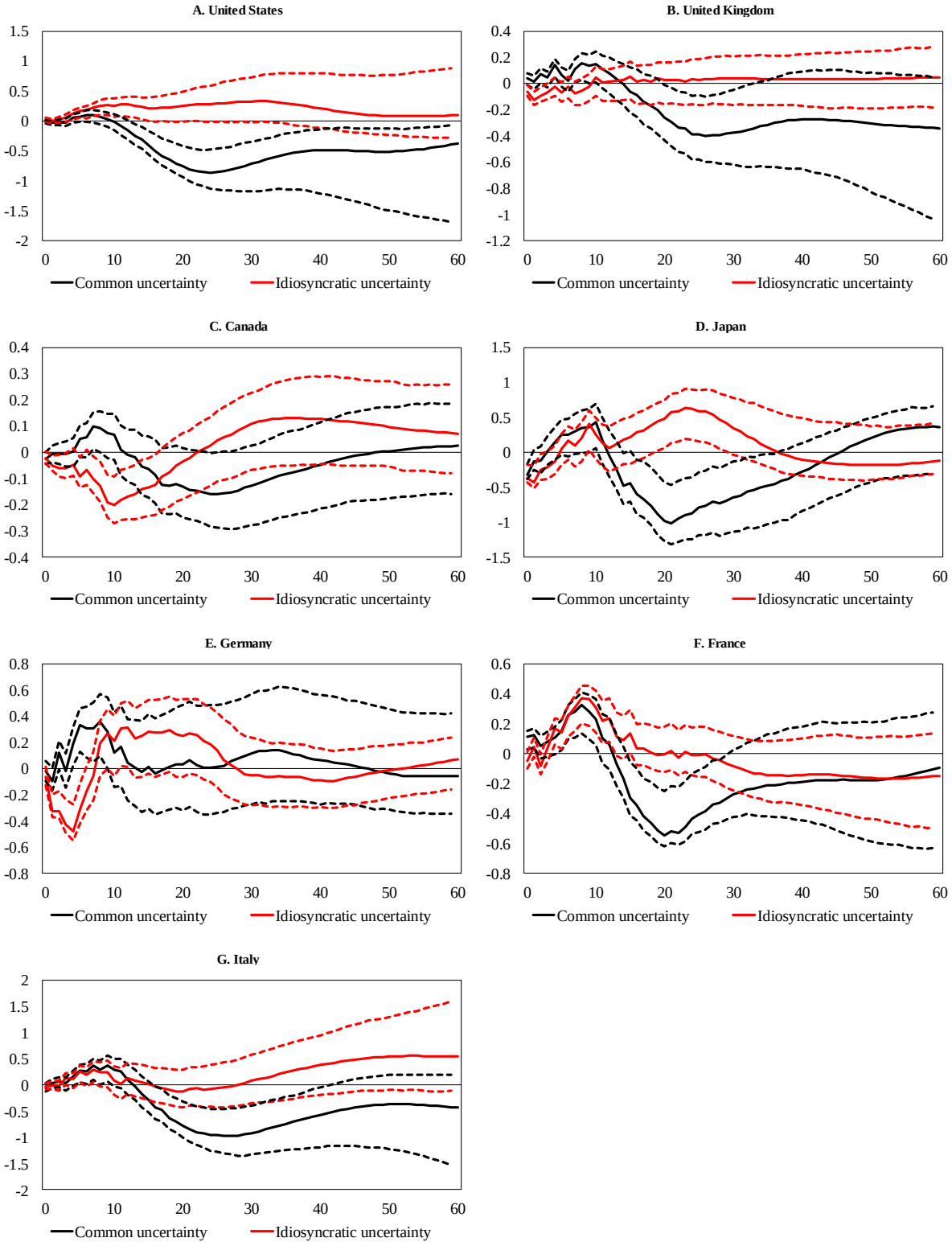

Table A.1. Data Coverage of Survey-based Forecast Dataset

	Data Coverage	GDP growth	Consuption growth	Investment growth	Industrial production growth	Inflation rate	Unemployment rate	Short-term interest rate	Long-term interest rate
Advanced Economies									
G7 Countries									
Canada	1989M11-2014M7	✓	✓	✓	✓	✓	✓	✓	✓
France	1989M11-2014M7	✓	✓	✓	✓	✓	✓	✓	✓
Germany	1989M11-2014M7	✓	✓	✓	✓	✓	✓	✓	✓
Italy	1989M11-2014M7	✓	✓	✓	✓	✓	✓	✓	✓
Japan	1989M11-2014M7	✓	✓	✓	✓	✓	✓	✓	✓
United Kingdom	1989M11-2014M7	✓	✓	✓	✓	✓	✓	✓	✓
United States	1989M11-2014M7	✓	✓	✓	✓	✓	✓	✓	✓
Western Europe									
Euro zone	2002M12-2014M7	✓	✓	✓	✓	✓	✓	✗	✗
Netherlands	1995M1-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Norway	1998M6-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Spain	1995M1-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Sweden	1995M1-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Switzerland	1998M6-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Asia-Pacific									
Australia	1990M11-2014M7	✓	✓	✓	1991M01	✓	✓	✓	✓
New Zealand	1994M12-2014M7	✓	✓	✓	✓	✓	✓	✓	✓
Emerging Market Economies									
Latin America									
Argentina	2001M4-2014M7	✓	✓	✓	✓	✓	✗	✓	✗
Brazil	2001M4-2014M7	✓	✓	✓	✓	✓	✗	✓	✗
Chile	2001M4-2014M7	✓	✓	✓	✓	✓	✗	✓	✗
Mexico	2001M4-2014M7	✓	✓	✓	✓	✓	✗	✓	✗
Venezuela	2001M4-2014M7	✓	✓	✓	✓	✓	✗	✓	✗
Colombia	2001M4-2014M7	✓	✓	✓	✓	✓	✗	✗	✗
Peru	2001M4-2014M7	✓	✓	✓	✓	✓	✗	✗	✗
Eastern Europe									
Bulgaria	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✗	✗
Croatia	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✗	✗
Czech Republic	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Estonia	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✗	✗
Hungary	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Latvia	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✗	✗
Lithuania	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✗	✗
Poland	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Romania	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✗	✗
Russia	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✗	✓
Slovakia	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Slovenia	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✗	✗
Turkey	2007M5-2014M7	✓	✓	✓	✓	✓	✗	✓	✗
Ukraine	2007M5-2014M7	✓	✓	2008M06	✓	✓	✗	✗	✗
Asia Pacific									
China	1994M12-2014M7	✓	✓	✓	✓	✓	✗	✗	2003M07
Hong Kong	1994M12-2014M7	✓	✓	✓	✓	✓	2003M06	✓	✓
India	1994M12-2014M7	✓	✗	✓	✓	✓	✗	✓	✓
Indonesia	1994M12-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Malaysia	1994M12-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
Philippines	2009M4-2014M7	✓	✓	✓	✓	✓	✗	✓	✗
Singapore	1994M12-2014M7	✓	✓	✓	✓	✓	✗	✓	✓
South Korea	1994M12-2014M7	✓	✓	✓	✓	✓	✓	✓	✓
Taiwan	1994M12-2014M7	✓	✓	✓	✓	✓	2003M09	✓	2006M03
Thailand	1994M12-2014M7	✓	✓	✓	✓	✓	✗	✓	✓

Source: Consensus Forecasts database of the Consensus Economics, Inc.

Notes: ✓ sign indicates the dataset covers the related variable; ✗ sign indicates that the dataset does not cover the related variable. If a series starts later than the others for a country, the check or cross signs are replaced with the start date of that specific series.

Table A.2. Forecast Efficiency Regression Results

	α	β	F	p-value
United States				
Output	0.787***	-0.339***	8.9	0.0
Industrial production	1.163**	-0.617***	19.6	0.0
CPI	1.553***	-0.632***	25.5	0.0
Consumption	0.227	0.012	5.4	0.0
Investment	-0.101	-0.412***	97.6	0.0
Unemployment rate	0.052	-0.013	0.9	0.4
Short-term interest rate	-0.123***	0.015***	62.6	0.0
Long-term interest rate	-0.301***	0.037***	61.6	0.0
France				
Output	0.570***	-0.463***	25.4	0.0
Industrial production	-0.009	-0.998***	75.4	0.0
CPI	0.889***	-0.529***	29.0	0.0
Consumption	0.438***	-0.362***	15.8	0.0
Investment	0.012	-0.516***	52.2	0.0
Unemployment rate	2.657***	-0.326***	592.2	0.0
Short-term interest rate	-0.403***	0.097***	64.3	0.0
Long-term interest rate	-0.152***	0.022***	11.5	0.0
Italy				
Output	-0.297	-0.298***	34.8	0.0
Industrial production	-0.199	-1.068***	56.7	0.0
CPI	0.461***	-0.175***	13.7	0.0
Consumption	-0.225	-0.271***	24.5	0.0
Investment	-1.936***	0.052	27.9	0.0
Unemployment rate	1.466***	-0.209***	60.8	0.0
Short-term interest rate	0.044	0.014	15.2	0.0
Long-term interest rate	0.012	0.007	4.7	0.0
Canada				
Output	-0.209	0.007	2.1	0.1
Industrial production	1.093***	-0.422***	10.5	0.0
CPI	0.889***	-0.494***	11.6	0.0
Consumption	1.539***	-0.548***	10.7	0.0
Investment	1.716**	-0.782***	109.5	0.0
Unemployment rate	-0.136	0.022	1.3	0.3
Short-term interest rate	-0.189***	0.043***	52.2	0.0
Long-term interest rate	-0.246***	0.030***	46.2	0.0
Australia				
Output	1.388***	-0.398***	8.5	0.0
Industrial production	1.907***	-0.836***	44.0	0.0
CPI	1.915***	-0.784***	24.9	0.0
Consumption	1.707***	-0.459***	37.5	0.0
Investment	3.462***	-0.672***	62.4	0.0
Unemployment rate	-0.395***	0.034**	28.1	0.0
Short-term interest rate	0.058	-0.014	1.6	0.2
Long-term interest rate	-0.257***	0.024**	30.5	0.0
Netherlands				
Output	0.353*	-0.101	1.6	0.2
Industrial production	1.619***	-1.315***	33.9	0.0
CPI	0.031	-0.047	0.5	0.6
Consumption	0.125	0.040	1.1	0.3
Investment	-0.108	0.056	0.1	0.9
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	-0.024	0.016**	2.1	0.1
Long-term interest rate	-0.096**	-0.000	27.6	0.0
Sweden				
Output	1.682***	-0.678***	7.1	0.0
Industrial production	0.817	-0.891***	36.7	0.0
CPI	1.107***	-0.800***	76.1	0.0
Consumption	2.192***	-0.907***	50.0	0.0
Investment	1.854**	-0.574***	15.2	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	-0.437***	0.032***	179.3	0.0
Long-term interest rate	-0.247***	0.025***	53.2	0.0
Euro Zone				
Output	0.261	-0.382**	3.3	0.0
Industrial production	0.806	-1.313***	39.7	0.0
CPI	1.272***	-0.697***	5.3	0.0
Consumption	0.014	-0.231**	4.1	0.0
Investment	-0.501	-0.257*	3.7	0.0
Unemployment rate	1.653***	-0.147***	56.1	0.0
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A

	α	β	F	p-value
United Kingdom				
Output	0.542**	-0.230**	3.1	0.0
Industrial production	-0.160	-0.867***	78.1	0.0
CPI	-0.706***	0.040	47.7	0.0
Consumption	0.239	0.103	14.1	0.0
Investment	-0.038	-0.472***	27.8	0.0
Unemployment rate	3.450***	-0.351***	981.9	0.0
Short-term interest rate	-0.022	0.022***	25.6	0.0
Long-term interest rate	-0.136***	0.021***	9.8	0.0
Germany				
Output	0.689**	-0.451***	4.4	0.0
Industrial production	1.902***	-1.272***	42.1	0.0
CPI	-0.084	0.004	1.0	0.4
Consumption	0.546***	-0.430***	10.3	0.0
Investment	0.355	-0.735***	94.3	0.0
Unemployment rate	-0.676***	0.049**	18.6	0.0
Short-term interest rate	-0.055**	0.024***	14.8	0.0
Long-term interest rate	-0.155***	0.019***	24.5	0.0
Japan				
Output	0.789***	-0.849***	35.1	0.0
Industrial production	1.424***	-1.750***	142.9	0.0
CPI	0.015	-0.172***	6.4	0.0
Consumption	0.671***	-0.696***	32.9	0.0
Investment	-0.755***	-0.811***	198.6	0.0
Unemployment rate	0.323***	-0.092***	31.2	0.0
Short-term interest rate	0.008	0.028***	15.5	0.0
Long-term interest rate	-0.045*	0.004	8.3	0.0
Spain				
Output	-0.096	0.143**	8.5	0.0
Industrial production	-0.442	-0.798***	63.0	0.0
CPI	1.099***	-0.465***	10.6	0.0
Consumption	-0.045	0.014	0.0	1.0
Investment	-0.192	0.019	0.1	0.9
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	-0.003	0.006	0.6	0.6
Long-term interest rate	-0.014	-0.001	0.7	0.5
New Zealand				
Output	2.630***	-0.929***	24.1	0.0
Industrial production	1.055	-1.116***	62.5	0.0
CPI	0.793***	-0.408***	6.5	0.0
Consumption	1.156**	-0.159	20.3	0.0
Investment	1.132	-0.174*	1.9	0.1
Unemployment rate	-0.021	-0.000	0.3	0.7
Short-term interest rate	-0.231***	0.044***	13.2	0.0
Long-term interest rate	-0.247***	0.021	26.5	0.0
Norway				
Output	2.075***	-1.149***	42.6	0.0
Industrial production	-1.532***	-0.578***	30.2	0.0
CPI	1.929***	-1.044***	21.3	0.0
Consumption	3.140***	-0.973***	36.6	0.0
Investment	0.982*	-0.082	1.8	0.2
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	-0.132***	0.037***	6.6	0.0
Long-term interest rate	-0.226***	0.022*	25.3	0.0
Switzerland				
Output	1.527***	-0.739***	15.3	0.0
Industrial production	2.783***	-1.081***	53.6	0.0
CPI	0.381***	-0.759***	20.6	0.0
Consumption	1.728***	-1.107***	106.9	0.0
Investment	1.129**	-0.644***	8.2	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	-0.048***	0.005	11.8	0.0
Long-term interest rate	-0.112***	0.032***	18.1	0.0

Table A.2. Continued

	α	β	F	p-value		α	β	F	p-value
Turkey					**Argentina**				
Output	5.993***	-1.775***	27.2	0.0	Output	2.822***	-0.549***	8.7	0.0
Industrial production	6.384***	-1.820***	42.8	0.0	Industrial production	3.482***	-0.989***	20.8	0.0
CPI	18.258***	-2.369***	260.6	0.0	CPI	11.058***	-0.928***	65.0	0.0
Consumption	4.293***	-1.519***	31.8	0.0	Consumption	2.352***	-0.278*	4.4	0.0
Investment	6.271***	-1.528***	10.0	0.0	Investment	6.233***	-0.604***	4.5	0.0
Unemployment rate	N/A	N/A	N/A	N/A	Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	3.242***	-0.150***	110.1	0.0	Short-term interest rate	1.390**	-0.104*	2.6	0.1
Long-term interest rate	N/A	N/A	N/A	N/A	Long-term interest rate	N/A	N/A	N/A	N/A
Brazil					**Chile**				
Output	2.313**	-0.732***	4.7	0.0	Output	1.097	-0.294**	3.7	0.0
Industrial production	5.097***	-1.927***	35.9	0.0	Industrial production	-1.786	0.195	3.6	0.0
CPI	4.174***	-0.563***	20.9	0.0	CPI	2.806***	-0.853**	5.2	0.0
Consumption	-0.217	0.087	0.4	0.7	Consumption	4.246***	-0.665***	14.0	0.0
Investment	4.028**	-0.975***	14.5	0.0	Investment	3.047**	-0.376**	3.3	0.0
Unemployment rate	N/A	N/A	N/A	N/A	Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	-0.372*	0.037**	4.5	0.0	Short-term interest rate	0.354***	-0.043*	7.0	0.0
Long-term interest rate	N/A	N/A	N/A	N/A	Long-term interest rate	N/A	N/A	N/A	N/A
Colombia					**Mexico**				
Output	3.536***	-0.746***	61.0	0.0	Output	1.515**	-0.721***	20.0	0.0
Industrial production	6.142***	-1.875***	39.1	0.0	Industrial production	1.259**	-0.919***	76.6	0.0
CPI	1.026***	-0.248***	7.2	0.0	CPI	3.179***	-0.741***	39.9	0.0
Consumption	2.229***	-0.467***	21.0	0.0	Consumption	2.069**	-0.781***	10.3	0.0
Investment	7.024***	-0.615***	17.8	0.0	Investment	0.894	-0.497***	9.8	0.0
Unemployment rate	N/A	N/A	N/A	N/A	Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A	Short-term interest rate	-0.089*	0.026***	6.0	0.0
Long-term interest rate	N/A	N/A	N/A	N/A	Long-term interest rate	N/A	N/A	N/A	N/A
Peru					**Venezuela**				
Output	5.679***	-0.990***	44.0	0.0	Output	2.355	-0.661*	2.0	0.1
Industrial production	12.040***	-2.513***	24.5	0.0	Industrial production	5.635**	-2.136***	8.8	0.0
CPI	3.825***	-1.415***	23.3	0.0	CPI	9.879***	-0.323**	8.1	0.0
Consumption	4.287***	-0.751***	25.4	0.0	Consumption	2.570***	-0.319**	3.4	0.0
Investment	5.251***	-0.444*	4.8	0.0	Investment	0.682	0.194	1.4	0.2
Unemployment rate	N/A	N/A	N/A	N/A	Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A	Short-term interest rate	2.042***	-0.123**	16.7	0.0
Long-term interest rate	N/A	N/A	N/A	N/A	Long-term interest rate	N/A	N/A	N/A	N/A
Taiwan					**Hong Kong**				
Output	6.560***	-1.499***	67.6	0.0	Output	4.376***	-1.236***	49.4	0.0
Industrial production	13.972***	-2.708***	62.7	0.0	Industrial production	-3.400***	1.871***	49.1	0.0
CPI	0.830***	-0.854***	69.5	0.0	CPI	-0.696***	-0.117***	28.2	0.0
Consumption	1.338***	-0.455***	22.3	0.0	Consumption	3.572***	-1.075***	36.6	0.0
Investment	5.229***	-1.625***	60.0	0.0	Investment	0.436	-0.460**	10.0	0.0
Unemployment rate	0.982***	-0.232***	15.1	0.0	Unemployment rate	0.075	-0.059***	28.4	0.0
Short-term interest rate	-0.200***	0.010	101.6	0.0	Short-term interest rate	-0.399***	-0.035**	152.8	0.0
Long-term interest rate	0.099**	-0.114***	65.8	0.0	Long-term interest rate	-2.697***	0.079*	352.4	0.0
India					**Indonesia**				
Output	8.004***	-1.186***	21.6	0.0	Output	2.046**	-0.491***	7.5	0.0
Industrial production	3.900***	-0.663***	10.7	0.0	Industrial production	4.561***	-1.398***	60.0	0.0
CPI	3.284***	-0.445***	12.9	0.0	CPI	8.017***	-0.694***	18.7	0.0
Consumption	N/A	N/A	N/A	N/A	Consumption	2.636***	-0.606***	13.4	0.0
Investment	7.817***	-0.851***	14.6	0.0	Investment	0.625	-0.261*	3.2	0.0
Unemployment rate	N/A	N/A	N/A	N/A	Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	0.317***	-0.045***	4.5	0.0	Short-term interest rate	-1.158*	0.184***	14.8	0.0
Long-term interest rate	2.317***	-0.356***	80.3	0.0	Long-term interest rate	-1.074**	-0.120*	295.4	0.0
South Korea					**Malaysia**				
Output	5.084***	-1.133***	26.1	0.0	Output	5.391***	-1.084***	25.9	0.0
Industrial production	14.227***	-2.218***	83.5	0.0	Industrial production	6.653***	-1.272***	49.8	0.0
CPI	2.392***	-0.793***	17.3	0.0	CPI	2.279***	-0.924***	41.0	0.0
Consumption	4.186***	-1.211***	30.1	0.0	Consumption	4.046***	-0.627***	8.6	0.0
Investment	2.431***	-0.946***	28.9	0.0	Investment	3.070	-0.860***	7.7	0.0
Unemployment rate	1.253***	-0.275***	35.2	0.0	Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	-0.300***	0.055***	11.6	0.0	Short-term interest rate	0.611***	-0.284***	277.0	0.0
Long-term interest rate	0.496***	-0.117***	15.9	0.0	Long-term interest rate	-0.214	-0.273***	819.4	0.0
Philippines					**China**				
Output	8.789***	-1.539***	146.0	0.0	Output	6.293***	-0.628***	59.9	0.0
Industrial production	21.242***	-3.146***	123.0	0.0	Industrial production	10.077***	-0.802***	25.3	0.0
CPI	3.634***	-1.025***	15.2	0.0	CPI	1.076***	-0.664***	140.4	0.0
Consumption	-0.678	0.257*	17.8	0.0	Consumption	8.242***	-0.964***	878.4	0.0
Investment	21.479***	-2.862***	47.6	0.0	Investment	11.604***	-1.014***	323.5	0.0
Unemployment rate	N/A	N/A	N/A	N/A	Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	0.098	-0.412***	47.3	0.0	Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A	Long-term interest rate	-1.728***	-0.248***	8795.0	0.0

Table A.2. Continued

	α	β	F	p-value
Singapore				
Output	7.388***	-1.403***	50.9	0.0
Industrial production	13.030***	-2.190***	25.7	0.0
CPI	1.172***	-0.722***	21.6	0.0
Consumption	6.424***	-1.485***	33.7	0.0
Investment	2.625**	-0.502**	3.3	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	0.394***	-0.555***	127.2	0.0
Long-term interest rate	-1.297	-0.212	904.7	0.0
Russia				
Output	1.305*	-1.007***	13.2	0.0
Industrial production	4.404***	-1.995***	58.4	0.0
CPI	8.152***	-0.867***	17.6	0.0
Consumption	5.181***	-1.139***	16.5	0.0
Investment	3.087***	-1.129***	15.5	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A
Slovakia				
Output	2.667***	-1.237***	17.5	0.0
Industrial production	5.359***	-1.210***	14.8	0.0
CPI	0.105	-0.255	5.3	0.0
Consumption	-0.421*	-0.416***	21.6	0.0
Investment	3.355**	-1.998***	11.5	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	-0.008	-0.061***	31.1	0.0
Long-term interest rate	0.151	-0.012	3.8	0.0
Latvia				
Output	-1.211*	-0.463***	11.0	0.0
Industrial production	2.219*	-1.452***	42.5	0.0
CPI	0.782*	-0.375***	3.9	0.0
Consumption	-0.662	-1.022***	41.5	0.0
Investment	-5.328**	0.108	3.6	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A
Lithuania				
Output	0.498	-0.856***	15.8	0.0
Industrial production	3.005***	-1.443***	38.6	0.0
CPI	1.013**	-0.413***	3.9	0.0
Consumption	-0.488	-0.570***	11.3	0.0
Investment	-0.663	-0.865***	10.5	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A
Slovenia				
Output	0.190	-1.476***	18.5	0.0
Industrial production	2.606***	-2.437***	41.2	0.0
CPI	1.488***	-0.901***	15.3	0.0
Consumption	-0.412	-0.571***	24.1	0.0
Investment	-5.092***	-1.011***	16.5	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A
Poland				
Output	2.660***	-0.854***	43.9	0.0
Industrial production	6.978***	-1.781***	82.5	0.0
CPI	-1.928***	0.615***	9.8	0.0
Consumption	0.687**	-0.279***	6.8	0.0
Investment	2.624***	-0.777***	26.6	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	0.032	0.019	10.7	0.0
Long-term interest rate	-0.207*	0.038*	1.8	0.2

	α	β	F	p-value
Thailand				
Output	3.673***	-1.073***	45.8	0.0
Industrial production	7.827***	-1.631***	46.5	0.0
CPI	2.240***	-0.784***	27.0	0.0
Consumption	2.035***	-0.742***	22.8	0.0
Investment	-3.072*	-0.266	18.1	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	1.646***	-0.747***	64.2	0.0
Long-term interest rate	2.069***	-0.558***	129.5	0.0
Bulgaria				
Output	0.315	-0.746***	11.0	0.0
Industrial production	2.389**	-2.110***	33.8	0.0
CPI	0.685	-0.450***	5.0	0.0
Consumption	0.515	-1.074***	8.9	0.0
Investment	-8.768***	0.630**	27.6	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A
Estonia				
Output	-0.497	-0.672***	12.7	0.0
Industrial production	6.231***	-1.850***	34.2	0.0
CPI	2.515***	-0.872***	12.4	0.0
Consumption	-1.276	-0.623***	16.1	0.0
Investment	-4.188*	-0.117	2.8	0.1
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A
Hungary				
Output	0.144	-0.889***	14.2	0.0
Industrial production	4.543***	-2.003***	58.5	0.0
CPI	-1.305**	0.190	4.5	0.0
Consumption	-1.155***	-0.308**	7.9	0.0
Investment	-0.916	-0.680***	9.9	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	-0.428***	0.085***	12.2	0.0
Long-term interest rate	-0.735***	0.146***	14.2	0.0
Croatia				
Output	-1.396***	-1.042***	42.6	0.0
Industrial production	-1.689***	-1.348***	35.1	0.0
CPI	0.679	-0.494***	10.7	0.0
Consumption	-0.076	-0.413	1.3	0.3
Investment	-7.266***	0.648*	47.6	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A
Romania				
Output	0.320	-0.518*	1.9	0.2
Industrial production	5.936***	-1.546***	32.6	0.0
CPI	0.426	-0.142	1.0	0.4
Consumption	1.236***	-1.051***	6.5	0.0
Investment	-5.745**	-0.595	15.1	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A
Ukraine				
Output	-3.084***	-0.680**	16.4	0.0
Industrial production	-2.812**	-1.587***	27.5	0.0
CPI	11.274***	-0.804***	8.3	0.0
Consumption	-0.997	-0.321	2.1	0.1
Investment	-11.767***	-0.318	17.0	0.0
Unemployment rate	N/A	N/A	N/A	N/A
Short-term interest rate	N/A	N/A	N/A	N/A
Long-term interest rate	N/A	N/A	N/A	N/A

Note: The results are from the OLS regression. Median forecast error is regressed on constant and median forecast. Sample size varies between countries and indicators. ***, **, * indicate the level of statistical significance at 1, 5, and 10 percent levels, respectively.

Appendix: Alternative derivation of equation (2)

Let e_{it} be individual i's forecast error at time t. Then the mean forecast error, e_t, is defined as the weighted average of individual forecast errors:

$$e_t = \sum_{i=1}^{N} w_{it}\ e_{it}. \quad \text{(A1)}$$

Motivated by the literature on the capital asset pricing model (CAPM), we specify the relationship between individual and mean forecast errors as follows

$$e_{it} = \beta_i\ e_t + \varepsilon_{it}, \quad \text{(A2)}$$

where β_i measures individual i's risk arising from exposure to mean forecast error. The β_i below 1 indicates either an individual forecast error with lower volatility than the consensus, or an individual forecast error is not highly correlated with mean forecast error. In equation (A2), ε_{it} and e_t are assumed to be independent. Note that equations (A1) and (A2) together impose the following restriction $\sum_{i=1}^{N} w_{it}\ \beta_i = 1$.

Taking the variance on both sides of equation (A2), we get

$$Var(e_{it}) = \beta_i^2 Var(e_t) + Var(\varepsilon_{it}). \quad \text{(A3)}$$

In equation (A3), $Var(e_t)$ measures the common volatility and $Var(\varepsilon_{it})$ captures the idiosyncratic volatility. Clearly, estimation of idiosyncratic volatility requires knowing β_i, which introduces another layer of uncertainty in parameter estimation. To avoid this problem, we follow Campbell et al. (2001) and let u_{it} denote the difference between e_{it} and e_t :

$$e_{it} = e_t + u_{it}. \quad \text{(A4)}$$

Plugging (A4) into (A2) and re-arranging yields

$$u_{it} = (\beta_i - 1)\ e_t + \varepsilon_{it}. \quad \text{(A5)}$$

Taking the variance on both sides of equation (A4), we have

$$Var(e_{it}) = Var(e_t) + Var(u_{it}) + 2Cov(e_t, u_{it}) \quad \text{(A6)}$$

$$= Var(e_t) + Var(u_{it}) + 2(\beta_i - 1)Var(e_t),$$

where the second equality in equation (A6) follows from equation (A5). Given a panel of forecasts, we define the volatility of a "typical" forecast error, selected randomly from among all forecasters with equal probability, as the weighted average of individual forecast error variances:

$$\sum_{i=1}^{N} w_{it}\, Var(e_{it}) = Var(e_t) + \sum_{i=1}^{N} w_{it}\, Var(u_{it}). \quad \text{(A7)}$$

Note that the covariance term from equation (A6) drops out due to the standard restriction $\sum_{i=1}^{N} w_{it}\ \beta_i = 1$. Equation (A7) states that the volatility of a typical forecast error can be decomposed into two parts: volatility that is common to all forecasters and volatility that arises from the heterogeneity of individual forecasters.

The observed disagreement among forecasts (or forecast errors) can be expressed as

$$d_t = \sum_{i=1}^{N} w_{it}(e_{it} - e_t)^2 \quad \text{(A8)}$$

$$= \sum_{i=1}^{N} w_{it}[(\beta_i - 1)e_t + \varepsilon_{it}]^2$$

$$= \sum_{i=1}^{N} w_{it}\,[(\beta_i - 1)^2 {e_t}^2 + {\varepsilon_{it}}^2 + 2(\beta_i - 1)e_t\varepsilon_{it}].$$

The sample variance d_t is a random variable prior to observing the forecasts. Taking expectations, we get an expression for the non-random disagreement, denoted by D_t, as

$$D_t \equiv E(d_t) = \sum_{i=1}^{N} w_{it}\,[(\beta_i - 1)^2 E({e_t}^2) + E({\varepsilon_{it}}^2) + 2(\beta_i - 1)E(e_t\varepsilon_{it})] \quad \text{(A9)}$$

$$= \sum_{i=1}^{N} w_{it}\,[(\beta_i - 1)^2 Var(e_t) + Var(\varepsilon_{it})],$$

where the last equality holds since $E(e_t\varepsilon_{it}) = 0$.

By taking the variance on both sides of equation (A5), we have

$$Var(u_{it}) = (\beta_i - 1)^2 Var(e_t) + Var(\varepsilon_{it}). \quad \text{(A10)}$$

Plugging equations (A10) into equation (A9) yields

$$D_t = \sum_{i=1}^{N} w_{it} Var(u_{it}). \quad \text{(A11)}$$

Combining equation (A11) with equation (A7), we get

$$\sum_{i=1}^{N} w_{it} Var(e_{it}) = Var(e_t) + D_t, \quad \text{(A12)}$$

which is an alternative expression to equation (2) that decomposes the uncertainty of a typical forecaster into common and idiosyncratic uncertainty.

Finally, we show how our measure of idiosyncratic uncertainty, $\sum_{i=1}^{N} w_{it} Var(u_{it})$, relates to the "true" measure, $\sum_{i=1}^{N} w_{it} Var(\varepsilon_{it})$. To this end, we take the weighted average of equation (A10):

$$\sum_{i=1}^{N} w_{it} Var(u_{it}) = \sum_{i=1}^{N} w_{it} (\beta_i - 1)^2 \, Var(e_t) + \sum_{i=1}^{N} w_{it} Var(\varepsilon_{it}).$$

Thus, the wedge between the two idiosyncratic uncertainty measures is determined by the cross-sectional variance of β_i across all individual forecast errors, $\sum_{i=1}^{N} w_{it} (\beta_i - 1)^2$ and common uncertainty, $Var(e_t)$. If the cross-sectional variance of β_i across all individual forecast errors is sufficiently small, our measure of idiosyncratic uncertainty can be a reasonable proxy for the "true" measure of idiosyncratic uncertainty. Indeed, Campbell et al. (2001) find that plausible estimates of cross-sectional variance in betas are very small and as a result, $\sum_{i=1}^{N} w_{it} (\beta_i - 1)^2 \, Var(e_t)$ accounts for only a small fraction of idiosyncratic volatility.