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Macroeconomic effects of uncertainty shocks: Evidence from Korea [☆]Dooyeon Cho ^a, Husang Kim ^{b,*}^a Department of Economics and Department of Quantitative Applied Economics, Sungkyunkwan University, Seoul 03063, Republic of Korea^b Department of Economics, The University of Texas at Austin, Austin, TX, 78712, USA

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ABSTRACT

This paper proposes a new measure of economic policy uncertainty (EPU) for Korea by fine-tuning the keywords and exploiting information drawn from a wide variety of local newspapers. The uniqueness of our new EPU index lies mainly in the fact that it uses a set of keywords that correspond much more closely to actual language use and better reflect the economic environment of Korea, which is classified as a small open economy. After shocks to EPU being identified, we employ these shocks to estimate the impulse responses using local projections. Unlike the existing measure, our results show that shocks to EPU lead to a significant decline in macroeconomic aggregates such as output, consumption, investment, and employment. Thus our results suggest a refinement of the EPU index in general for other countries accordingly. We also develop policy-specific uncertainty indices and show that they capture important historical events related to the corresponding policies, such as monetary and fiscal measures.

1. Introduction

“The only certainty is that nothing is certain.”

– Pliny the Elder

A wealth of evidence shows that the negative effects of heightened economic uncertainty dominate the economy. Uncertainty can arise due to various reasons, including natural disasters, wars, economic and geopolitical shocks, and government decisions or indecisions. As such, the major concern for academic economists and policymakers alike has been to what extent and by what mechanism economic policy uncertainty (EPU) influences macroeconomic indicators such as output, consumption, investment, unemployment, inflation, and so on. Policy-related uncertainty may arise because of major economic shocks and disruptions, such as the global financial crisis, European sovereign debt crisis, and Brexit. It could also be induced through differences in market participants' interpretations of policymakers' statements.¹

As pointed out by Bloom (2014), uncertainty is an amorphous concept and broadly defined. This implies that it requires a wide range of proxies to be measured. Furthermore, the key challenge in analyzing the effects of uncertainty is identifying the direction of causality. Since uncertainty is an endogenous variable that moves with the business cycle, the key question is how to distinguish the separate causal effects of higher uncertainty. Numerous attempts have been made to quantify the degree of uncertainty, but one

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¹ Another potential source of policy uncertainty could be differences in policymakers' opinions about the economy. Uncertainty about the choices of policymakers, such as governments and central banks, might also contribute to policy uncertainty.

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of the most influential indicators of uncertainty is the EPU index developed by Baker et al. (2016) (BBD henceforth). In addition to their index for the US, they constructed EPU indices for 11 countries, including Korea.² Their EPU index was composed based on news articles, which indicate the level of policy uncertainty in the corresponding period, on the grounds that such a text-oriented proxy could represent both household and firm concerns about policy-related uncertainty. As discussed by Baker et al. (2020), there appear to be some major strengths of the news-based index. First, it is forward-looking, since it captures the real-time uncertainty perceived by the journalists. Second, it can also stretch back as long as the text data allow. Third, it can be constructed for various countries, which is the feature unavailable in the traditional uncertainty index such as the VIX. Fourth, the source of uncertainty can be specified by analyzing the relevant news reports. The development of the EPU index has triggered a large number of empirical studies as discussed in the following section.

The foundational work of BBD has also stimulated recent developments in category-specific policy uncertainty indices and augmented the EPU index with richer keywords and news coverage. We add to this recent drift in the literature by proposing a new measure of Korean EPU and category-specific policy uncertainty indices, derived using data from 13 Korean newspapers, covering the period from January 1990 to December 2020. Although we follow the BBD methodology, we refine the EPU index by fine-tuning the keywords and expressions, and expanding the Korean newspaper coverage. Our EPU index appears to share superficial similarities with the original BBD EPU index, but the indices differ considerably. Therefore, we discuss below the keywords that create those differences. We also provide some statistical properties of the new EPU index. It is persistent, positively skewed, and countercyclical. In addition, it tends to rise during recessionary periods, suggesting that policy-related uncertainty is closely associated with major economic shocks and disruptions.

We identify shocks to EPU that are orthogonal to the other variables in a structural vector autoregressive (SVAR) model. These shocks are then used to estimate the impulse responses using local projections. Using our new EPU measure, we show that macroeconomic aggregates – such as real output, real consumption, real investment, and employment – decline significantly in response to EPU shocks. This implies that the channel of policy uncertainty has a significant effect. However, the estimation results using the BBD EPU index indicate that deteriorating effects tend to either disappear or weaken significantly. This demonstrates why our construction strategy is more informative of EPU than the existing one. Finally, we develop policy-specific uncertainty indices, such as for monetary and fiscal policies that are associated with important historical events in Korea.

The remainder of this paper is organized as follows. Section 2 presents a literature review, in which we discuss previous studies regarding EPU. Section 3 presents the method used to measure our new EPU index. Section 4 presents the econometric framework and estimation procedure. Section 5 presents and discusses the estimation results. Finally, Section 6 provides concluding remarks.

2. Related literature

Ever since the groundbreaking and seminal work of Knight (1921) defining the concept of *uncertainty*, as the inability to form the probability distribution of events happening, there has been an abundance of attempts to quantify the amorphous concept.³ One traditional indicator of uncertainty is the option-implied volatility such as the VIX and VXO as explained in Bekaert et al. (2013) and Carrière-Swallow and Céspedes (2013). Bloom (2009) notes that the measures based on the stock market volatility are countercyclical and exhibit a strong correlation with key economic and political events. Another method involves the macro forecaster disagreement as documented by Bomberger (1996) and Clements (2008). Zarnowitz and Lambros (1987) explain that this is based on the assumption that the interpersonal disagreement represents the intrapersonal beliefs of a forecaster. The other relies on econometric forecast errors as a proxy of uncertainty as in Jurado et al. (2015). The underlying implication is that the economy is less predictable in recessions, resulting in large errors. Bloom (2014) illustrates that despite the diverse attempts to capture uncertainty, there is a broad consensus that uncertainty fluctuates along with business cycles and hampers macroeconomic outcomes.

Yet, the emergence of text analysis in economics and the growing availability of news data result in another proxy of uncertainty. BBD present a news-based EPU index, basically reflecting the relative frequency of newspaper articles that contain terms related to economic policy uncertainty. The measure is not only timely and forward-looking but also allows the ready ability to track down historical uncertainty and specify the source of uncertainty through text data. We relate to the work by closely following their methodology and constructing a new Korean EPU index. However, as noted by Ghirelli et al. (2019), the EPU index is sensitive to the set of relevant terms and media coverage. Consistent with this argument, we present the augmented Korean EPU index by employing a richer search expression set and broader press coverage.

Besides the overall EPU index, BBD also break down the EPU index into multiple specific policy categories such as fiscal, monetary, and trade policies. The foundational work of BBD has facilitated the development of category-specific policy uncertainty indices for other countries. However, surprisingly, despite the indices' usefulness and widespread application, just a few countries offer their own categorical policy uncertainty indices.⁴ We thus fill this gap by providing categorical Korean policy uncertainty indices.

² The Korean EPU index of Baker et al. (2016) is based on six Korean newspapers, starting in January 1990.

³ His work of economic theory distinguishes between risk, which is by nature measurable and quantifiable, and uncertainty, which can be neither measured nor quantified.

⁴ Specifically, the following studies provide the various types of categorical policy uncertainty indices: Baker et al. (2016) for the US, Hardouvelis et al. (2018) for Greece, Arbatli et al. (2022) for Japan, and Huang and Luk (2020) for China.

Table 1
Discrepancy in terms between our new EPU index and the BBD EPU index.

| New EPU index | BBD EPU index |
|---|--|
| A. Economy terms economy, economic | economy, economic, commerce |
| B. Uncertainty terms uncertain, uncertainty, concern | uncertain, uncertainty |
| C. Policy terms government Blue House cabinet meeting National Assembly (congress) authorities Bank of Korea central bank Ministry of Economy and Finance Financial Services Commission policy legislation law/bill government budget tax regulation deficit debt Federal Reserve (Fed) structural reform | government Blue House congress authorities legislation tax regulation Bank of Korea central bank deficit WTO law/bill Ministry of Economy and Finance |

Note. Any discrepancy in terms between our new EPU measure and the BBD EPU index is in bold.

The development of the EPU index led to numerous empirical investigations of uncertainty. A large strand of literature provides evidence that shocks to EPU are negatively associated with the performance of macroeconomic and financial variables such as output, unemployment, and stock market returns.⁵ Some found that the EPU index is conducive to enhancing the forecasting accuracy of money growth (Tarassow, 2019), explaining companies' debt-financing decisions (Li and Qiu, 2021), and examining the effectiveness of monetary policy (Aastveit et al., 2017). Our work contributes to these empirical endeavors by (i) proposing a new measure of EPU for Korea by fine-tuning the keywords and exploiting information drawn from a wide variety of local newspapers, (ii) discussing the keywords that cause the differences between our EPU index and the BBD EPU index, and (iii) confirming the negative effects of uncertainty on the Korean economy using our new EPU measure, which is not clearly demonstrated with the original BBD EPU index.

3. Methodology

3.1. Measuring economic policy uncertainty

The construction of our new EPU index closely follows the procedure outlined by BBD. After expanding the press coverage from 6 to 13, we first collect articles that jointly contain at least one term (in Korean) in each of the (E) Economy, (U) Uncertainty, and (P) Policy categories as in Table A.1 in Appendix.⁶ Data on news articles are collected from January 1990 to December 2020. Second, after aggregating the number of relevant articles by a newspaper and month, the counts are scaled by the total number of articles by the same newspaper to obtain a relative frequency count. Third, each newspaper's relative EPU counts are standardized to the unit standard deviation from the whole sample period. Fourth, we average the standardized series across newspapers by month to obtain our overall monthly Korean EPU index. Finally, the EPU index is normalized to have an average value of 100 over the sample period.⁷

Despite the procedural similarity, the uniqueness of our new index lies mainly in the broader press coverage and the richer set of keywords that correspond much more closely to the actual language used in newspapers. In addition, the term set better reflects the economic environment of Korea, which is classified as a small open economy. Table 1 shows a discrepancy between the original BBD's and our fine-tuned term sets. For instance, we have added "concern" to the uncertainty category because this word

⁵ For instance, see Ko and Lee (2015), Caggiano et al. (2017), Kang et al. (2017), and Chen and Tillmann (2021).

⁶ The list of newspapers is *Donga-ilbo*, *Hankyoreh*, *Kyunghyang Shinmun*, *The Korea Times*, *Maeil Economic Daily*, *Korea Economic Daily*, *Chosun-ilbo*, *JoongAng Daily*, *Kukmin Daily*, *Munhwa-ilbo*, *Seoul Shinmun Daily*, *Sekye-ilbo*, and *Seoul Economic Daily*. In addition to the first six newspapers, which were used by BBD, we have also added newspapers with a nationwide readership. The data on newspaper articles are sourced from the "Bigkinds" digital archive. Additional categories for other specific policy uncertainty indices are reported in Tables A2–A5 in Appendix.

⁷ The new overall EPU index and category-specific policy uncertainty indices for Korea are available from either https://www.policyuncertainty.com/korea_chokim.html or https://dooyeoncho.github.io/pages/new_korean_epu_index.html.

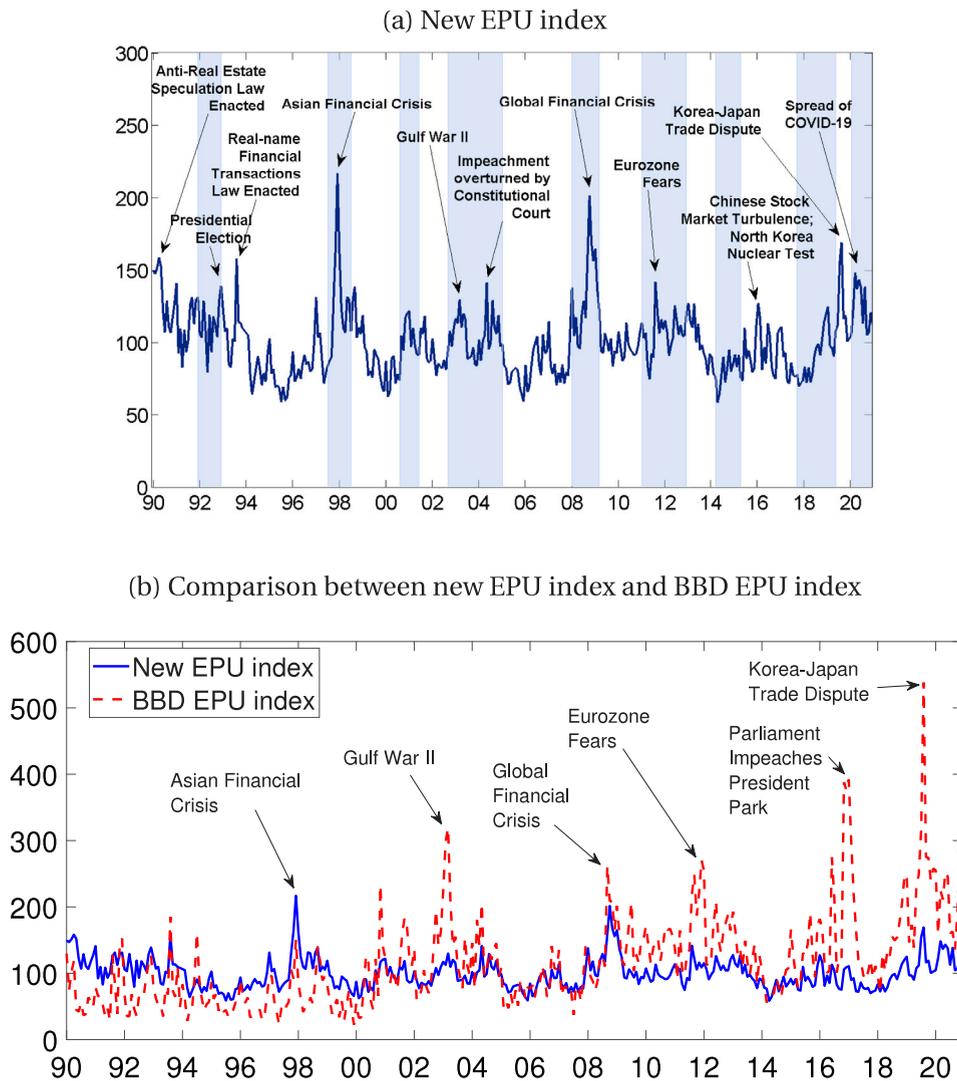


Fig. 1. EPU indices with major events over the sample period January 1990 to December 2020. In panel (a), shaded areas correspond to recessions in Korea based on OECD recession indicators.

is frequently used to express uncertainty in Korea.⁸ Moreover, following (Arbatli et al., 2022), the set contains terms that refer to policy-related issues (e.g., “cabinet meeting”, “structural reform”) and capture the external influences on a small open economy such as Korea (“Fed”). Finally, our term set is fine-tuned to represent overall policy uncertainty rather than a specific policy category.⁹ In particular, we have removed “WTO,” which tends to overemphasize specific events related to trade, from the term set and added it to one used in constructing the trade policy uncertainty index.

As these concerns are not suitably addressed in the construction of the term set by BBD, its measure of uncertainty appears to be inconsistent with the gravity of major economic events, thus deviating from its original purpose. Fig. 1 illustrates this issue by comparing the BBD EPU index with the new measure. While the highest spike in the BBD EPU index was observed around the

⁸ As suggested by an anonymous reviewer, we have also constructed the new EPU index excluding the term “concern” in the uncertainty terms. The correlation between our new EPU index including the term “concern” and one excluding the term “concern” is 0.632, indicating a positive relationship across the two indices constructed. They tend to move in a similar way over time, albeit with some deviations. While the negative effect of the identified EPU shock weakens, it still exhibits significant effects on macroeconomic variables. The estimation results are omitted to conserve space, but available on request from the authors.

⁹ We are grateful to an anonymous reviewer for this suggestion. We have included the terms “IMF”, “Foreign reserves”, and “Currency swaps” in the policy terms in constructing the EPU index that may help capture uncertainty in policy involvement since the relationship with the International Monetary Fund (IMF) might have shaped or constrained Korean economic policy. Interestingly, the correlation between our new EPU index and new EPU index including the terms “IMF”, “Foreign reserves”, and “Currency swaps” is 0.988, indicating that the two indices move quite closely together over time. Since the results are essentially equivalent to our baseline case, the estimation results are also omitted to conserve space, but available on request from the authors.

Table 2
Descriptive statistics.

| | Overall EPU | Monetary PU | Fiscal PU | Trade PU | FX PU |
|-------------|-------------|-------------|-----------|----------|--------|
| Mean | 100 | 100 | 100 | 100 | 100 |
| Median | 96.64 | 93.69 | 95.44 | 79.60 | 81.79 |
| Std. Dev. | 23.21 | 37.07 | 37.39 | 74.08 | 73.93 |
| Minimum | 58.48 | 31.21 | 38.69 | 22.54 | 9.72 |
| Maximum | 216.85 | 334.83 | 274.23 | 553.03 | 634.87 |
| Observation | 372 | 372 | 372 | 372 | 372 |

Note. Descriptive statistics for overall EPU and categorical policy uncertainty indices are reported over the sample period January 1990 to December 2020.

Table 3
Correlation matrix.

| | Overall EPU | Monetary PU | Fiscal PU | Trade PU | FX PU |
|-------------|-------------|-------------|-----------|----------|-------|
| Overall EPU | 1.00 | | | | |
| Monetary PU | 0.60 | 1.00 | | | |
| Fiscal PU | 0.77 | 0.60 | 1.00 | | |
| Trade PU | 0.23 | 0.02 | 0.08 | 1.00 | |
| FX PU | 0.54 | 0.56 | 0.40 | -0.05 | 1.00 |

Note. A pairwise correlation is reported among overall EPU and policy-specific uncertainty indices.

Korea–Japan trade dispute in 2019, our new measure, which reflects this issue, reached its peak during the Asian financial crisis of 1997/98. Such a difference represents the sensitivity of the EPU index to certain features of the construction methodology, such as keywords, expressions, and newspaper coverage as noted by Ghirelli et al. (2019). We also develop policy-specific uncertainty indices such as monetary, fiscal, trade, and foreign exchange (FX) policies, which are provided in Fig. A.1 in the Appendix. They capture significant historical events related to the corresponding policies, such as monetary and fiscal measures.

3.2. Descriptive statistics

Table 2 presents the descriptive statistics of the overall economic and category-specific policy uncertainty (PU) indices. The average value for each index is 100 due to normalization as explained earlier. The standard deviation for trade PU and FX PU is two to three times larger than that for overall EPU, monetary PU, and fiscal PU. This implies that trade PU and FX PU exhibit much more volatile dynamics compared to other indices. In addition, given that the index is derived from the relative frequency of news articles and that the median for monetary PU and fiscal PU is larger than other indices, this suggests that the frequency of news articles on those indices is relatively large with little variation over time. Contrastingly, the frequency of articles related to trade PU and FX PU is relatively small with large variation. Put differently, this indicates that the issues on monetary and fiscal policies are discussed regularly and extensively, whereas the discussions on trade and FX policies are relatively intermittent but intensive.¹⁰ Moreover, the median and standard deviation of monetary PU and fiscal PU appear to be similar to those of overall EPU. It implies that these two policies play a key role in accounting for the overall EPU index in line with the findings of BBD.

Table 3 reports a pairwise correlation among overall EPU and policy-specific uncertainty indices. Evidently, the fiscal PU, monetary PU, and FX PU indices are relatively highly correlated with the overall EPU index, exhibiting a correlation of 0.77, 0.60, and 0.54, respectively. In contrast, the trade PU index shows a relatively lower correlation of 0.23. This also suggests that monetary and fiscal policies are the key drivers of overall EPU in Korea.¹¹ It is interesting to note that the descending order of a correlation of each index with the overall EPU index (i.e., 0.77, 0.60, 0.54, 0.23 for fiscal, monetary, FX, trade PU, respectively) is consistent with the Japanese categorical policy uncertainty indices constructed by Arbatli et al. (2022).

3.3. Statistical properties of the EPU index

In this subsection, we discuss some key statistical properties of the overall EPU and policy-specific uncertainty indices. We find that the policy uncertainty indices appear to be sensitive to relevant economic events such as recessions. In addition, the indices are generally persistent, positively skewed, fat-tailed, and countercyclical.

Panel (a) in Fig. 1 presents the time series plot of our newly constructed overall EPU index. The shaded area indicates a recessionary period in Korea based on the dates provided by the Organization for Economic Cooperation and Development (OECD).¹² At the beginning of the recessionary period, our policy uncertainty measure starts rising and reaches a local peak in the middle of

¹⁰ For instance, the articles on the announcement of the Bank of Korea are reported and analyzed regularly. However, the issues such as the Free Trade Agreement or trade disputes are addressed only around the time of the event but dominate most of the news headlines.

¹¹ BBD also identify the fiscal matters as the largest source of uncertainty, and monetary policy as an important source of uncertainty.

¹² The only exception is the year 2020, which is shaded to reflect the recession associated with the recent COVID-19 outbreak (i.e., the pandemic recession) since the OECD database ends in 2019.

Table 4
Properties of policy uncertainty indices.

| | Overall EPU | Monetary PU | Fiscal PU | Trade PU | FX PU |
|-------------------------|-------------|-------------|-----------|----------|-------|
| AR(1) | 0.73 | 0.50 | 0.69 | 0.67 | 0.68 |
| Skewness | 1.12 | 1.51 | 1.03 | 2.46 | 3.09 |
| Kurtosis | 5.34 | 8.00 | 4.54 | 11.59 | 18.10 |
| Corr(0) with IPI growth | -0.14 | -0.13 | -0.09 | -0.04 | -0.08 |
| Corr(0) with CLI | -0.49 | -0.26 | -0.49 | -0.01 | -0.39 |
| Corr(0) with CCI | -0.23 | -0.10 | -0.37 | 0.04 | -0.12 |

Note. Corr(0) denotes each policy uncertainty index's contemporaneous correlation with industrial production index (IPI) growth, composite leading index (CLI), and composite coincident index (CCI), respectively.

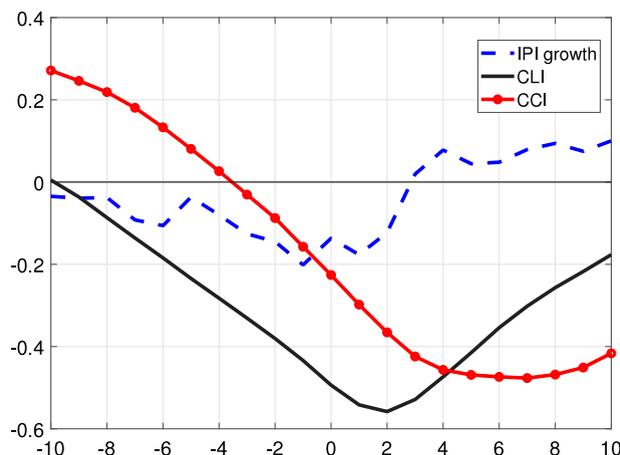


Fig. 2. Cross-correlation of the monthly EPU index with industrial production index (IPI) growth, composite leading index (CLI), and composite coincident index (CCI), respectively, for the lags of -10 to 10.

the recession. This is consistent with the commonly known pattern of uncertainty in that it appears to rise sharply in recessions and falls in booms as noted by Bloom (2014).¹³

Table 4 presents some additional properties of our policy uncertainty measures. We document that the policy uncertainty indices are generally persistent, positively skewed, and fat-tailed. The autoregressive of order 1, i.e., AR(1) coefficient for each categorical policy uncertainty index is well above 0.50. This implies that uncertainty shocks do not dissipate instantly, but rather have a lasting impact. The positive skewness and excess kurtosis reflect that while the policy uncertainty indices are usually lower than the average value during tranquil periods, they become extremely high when major economic events break out.

The countercyclical property of the EPU index is illustrated by the negative contemporaneous correlation with the industrial production index (IPI) growth rate, composite leading index (CLI), and composite coincident index (CCI).¹⁴ Furthermore, Fig. 2 displays the cross-correlation, i.e., the correlation between the overall EPU index at time t and the corresponding indicator (i.e., the IPI growth rate, CLI, and CCI, respectively) at time $t + k$. The countercyclical property of the EPU index is particularly more pronounced as evidenced by its magnitude of the cross-correlation with the CLI and CCI, which reaches its trough of -0.56 and -0.48 at $k = 2$ and 7 , respectively. This property is also apparently featured by its negative correlation with the IPI growth rate and CLI within the wide range of $k = -10$ and 2 . Interestingly, this appears to be consistent with the stylized facts discussed by Shin et al. (2018).

4. Econometric framework

4.1. Shocks to economic policy uncertainty

As in Chen and Tillmann (2021), we estimate an SVAR model to identify a shock to EPU that is orthogonal to other variables such as real output, inflation, and interest rate. The SVAR model is given as follows:

$$B_0 z_t = k + B_1 z_{t-1} + B_2 z_{t-2} + \dots + B_p z_{t-p} + u_t, \quad (1)$$

¹³ Other category-specific indices show a qualitatively similar pattern with the exception of the trade PU index. This index responds more sensitively to major trade-related events such as the launch of the World Trade Organization (WTO), the Free Trade Agreement (FTA), and trade disputes. It is worth noting that such trade-related events are a large source of uncertainty but hardly associated with recessions.

¹⁴ The IPI is sourced from the FRED database of the St. Louis Fed and the CLI and CCI are obtained from the database of the Bank of Korea.

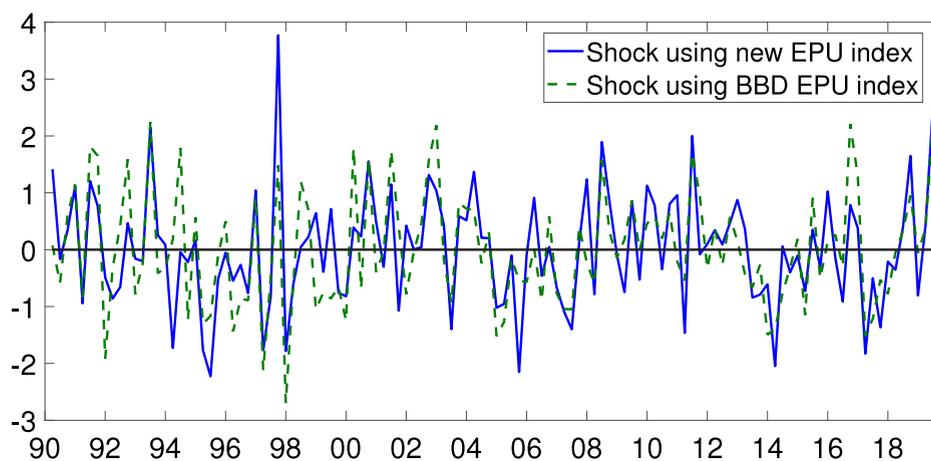


Fig. 3. Shocks identified in the SVAR model using our new EPU index and the BBD EPU index.

where $z_t = [y_t, \pi_t, i_t, epu_t]'$ consisting of the vector of endogenous variables. k is a vector of constants; B_0, B_1, \dots, B_p are coefficient matrices to be estimated, which capture the dynamics of the system and u_t is a vector of disturbances representing structural innovations, which are assumed to be serially uncorrelated and uncorrelated with each other. The matrix B_0 in Eq. (1) governs the contemporaneous relations among the endogenous variables in the system. The vector z_t includes four endogenous macroeconomic variables: (i) the log of real GDP (y_t), (ii) inflation (π_t), (iii) interest rate (i_t), and (iv) the log of EPU (epu_t). We estimate the SVAR model using quarterly data from Q1 1990 to Q4 2019.¹⁵ The lag order is selected to be one ($p = 1$) based on the Bayesian information criterion (BIC). We use standard Cholesky decompositions to identify orthogonal shocks using the ordering of the endogenous macroeconomic variables as discussed previously.

A set of restrictions on the matrix B_0 should be specified to identify structural innovations. We restrict the contemporaneous interaction between EPU and other endogenous variables in the system. In a given quarter, EPU is allowed to be affected by three other variables. However, shocks to EPU do not affect these three variables contemporaneously but react with a lag of one quarter. This type of ordering is widely used in the literature to identify uncertainty shocks. For instance, see Husted et al. (2019) among others. We could include more variables in the SVAR model. However, as more variables are included in the system, the number of parameters to be estimated increases dramatically. To avoid this issue, we obtain impulse responses with local projections using the identified EPU shock. Fig. 3 shows both EPU shocks, identified using our new EPU index and the BBD EPU index, in the SVAR model. There is comovement between the two series with some differences over time. The correlation between a shock using the new EPU index and one using the BBD EPU index is 0.71. These shock series are used in the estimation of local projections.

4.2. Model estimation using local projection

We estimate local projections proposed by Jordà (2005) to quantify the effects of EPU shocks on other macroeconomic variables in Korea. There are some distinct advantages of local projections over VAR models: (i) local projections are more robust to misspecification since they impose weaker assumptions on the dynamics of the data, (ii) a joint or point-wise analytic inference is readily implemented, and (iii) local projections are easier to estimate compared to VAR models. However, there is a drawback of local projections. One needs to identify structural shocks beforehand. Thus, we use the EPU shock identified as explained above in the estimation of local projections.

The impulse response of variable y_t at horizon h ($h = 0, 1, \dots, H$) is estimated as the coefficient β_h in the following equation:

$$y_{t+h} = \tau t + \alpha_h + \beta_h \varepsilon_t + \gamma_h X_t + u_{t+h} \quad (2)$$

where τ is the linear time trend, α_h is a constant, X_t is a vector of control variables, and ε_t is an identified EPU shock. The coefficient β_h corresponds to the response of variable y at time $t+h$ to the shock at time t . The impulse responses are the sequence of estimated β_h in Eq. (2).

For the dependent variable, we consider macroeconomic variables such as real GDP, real consumption, real investment, inflation, interest rate, employment, and a change in the exchange rate (i.e., Korean won per US dollar). The control variables include two lags of the EPU index, US EPU index, and monetary policy shock identified in the SVAR model. The model contains three lags of the dependent variable based on the BIC. Local projections are estimated by ordinary least squares (OLS). We also use Newey–West (robust) standard errors in the estimation of the model.

¹⁵ The quarterly EPU index is obtained by taking the three-month average of the monthly index within a quarter.

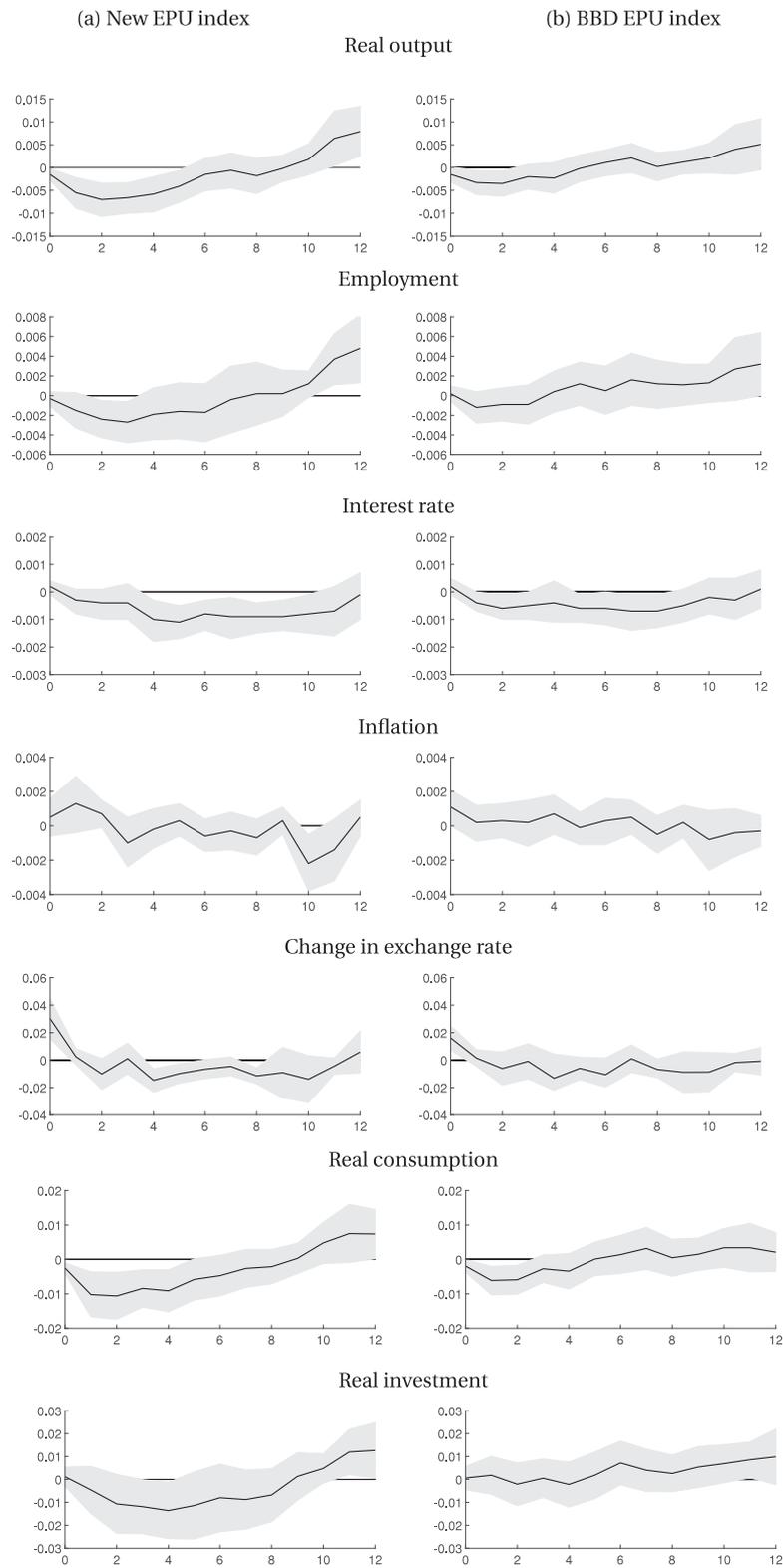


Fig. 4. Impulse responses to EPU shocks, with 90 percent confidence bands.

Table A.1
Term sets for our new EPU index.

| English term | Korean term |
|---|---------------------------------|
| A. Economy terms economy, economic | 경제, 경기 |
| B. Uncertainty terms uncertain, uncertainty, concern | 불확실, 불확실성, 리스크, 불투명, 불안, 우려, 걱정 |
| C. Policy terms | |
| government | 정부 |
| Blue House | 청와대 |
| cabinet meeting | 국무회의 |
| National Assembly (congress) | 국회, 의회 |
| authorities | 당국 |
| Bank of Korea | 한국은행, 한은 |
| central bank | 중앙은행 |
| Ministry of Economy and Finance | 기획재정부, 기재부 |
| Financial Services Commission | 금융위원회, 금융위 |
| policy | 정책 |
| legislation | 제정, 입법 |
| law / bill | 법안, 법률 |
| government budget | 예산, 재정 |
| tax | 세금 |
| regulation | 규제, 규정 |
| deficit | 적자, 부족 |
| debt | 부채, 채무 |
| Federal Reserve (Fed) | 연방준비제도, 연준, Fed, FRB |
| structural reform | 구조개혁, 구조조정 |

Table A.2
Term sets for the monetary policy uncertainty index.

| English term | Korean term |
|-------------------------------------|--------------------------------|
| monetary policy | 통화정책 |
| Bank of Korea | 한국은행 |
| BOK | 한은 |
| monetary easing | 금융완화 |
| further easing | 추가완화 |
| quantitative easing | 양적완화 |
| quantitative and qualitative easing | 질적완화 |
| monetary tightening | 통화긴축, 금융긴축 |
| negative interest rate | 마이너스 금리 |
| official discount rate | 공정할인율, 재할인율 |
| monetary operation | 통화 운용 |
| open market operation | 공개시장조작 |
| inflation target | 물가안정목표 |
| price target | 물가목표 |
| Monetary Policy Board | 금융통화위원회, 금통위, 금융통화운영위원회, 금통운영위 |
| base rate | 기준금리 |
| policy rate | 정책금리 |
| interest rates policy | 금리정책 |
| monetary authorities | 통화당국 |
| overnight lending rate | 롤금리 |

5. Empirical analysis

5.1. Estimation results of local projection

Fig. 4 shows the impulse responses by the local projections of macroeconomic variables to EPU shocks using both our new EPU and BBD EPU indices. In panel (a), the shock based on our new EPU index leads to statistically significant changes in each variable. A decline in real output reaches a trough after three quarters (-0.6%) and persists for approximately six quarters. The labor market

Table A.3
Term sets for the fiscal policy uncertainty index.

| English term | Korean term |
|--|---------------|
| fiscal policy | 재정정책 |
| government budget | 정부 예산 |
| “supplementary budget” or “government budget” | 추가경정예산, 추경 |
| General Account | 일반 회계 |
| Special Account | 특별 계정 |
| government deficit | 재정적자 |
| primary balance | 재정수지 |
| tax, taxation | 세금, 조세 |
| government spending/expenditure | 정부지출, 재정지출 |
| social security expenditures | 사회보장비 지출 |
| pension insurance premium | 국민연금 보험료 |
| health insurance premium | 국민건강 보험료 |
| “healthcare expenditures” or “medical care expenditures” | 의료비 지출 |
| nursing care expenditures | 간병비 지출 |
| public medical fee schedule | 의료보험수가, 의료수가 |
| salaries of government employees | 공무원급여 |
| Official Development Assistance (ODA) | 공적개발원조, ODA |
| defense spending | 국방비 |
| military spending | 군비 |
| outstanding government debt | 국채 발행 잔액 |
| public debt | 공공부문 부채, 공공부채 |
| Korean government bonds | 국채 |
| government debt | 정부부채 |
| local government debt | 지방채 |
| fiscal stimulus | 경기부양, 경기부양책 |

Table A.4
Term sets for the trade policy uncertainty index.

| English term | Korean term |
|--|----------------------------|
| trade issue | 통상문제, 무역문제 |
| non-tariff barrier | 비관세장벽 |
| import restriction | 수입제한 |
| the Super 301 provision of the Omnibus Trade and Competitiveness Act of 1988 | 포괄통상법, 종합무역법 |
| trade policy | 무역정책, 통상정책 |
| trade negotiation(s) | 무역협상 |
| WTO | 세계무역기구, WTO |
| GATT | 관세 및 무역에 관한 일반협정, GATT, 가트 |
| cutting tariff(s) or cut in tariff(s) | 관세 인하 |
| trade liberalization | 무역자유화 |
| import liberalization | 수입자유화 |
| market access | 시장접근 |
| trade agreement | 무역협정, 통상협정 |
| Trans-Pacific Strategic Economic Partnership Agreement | 환태평양경제동반자협정, TPP |
| Economic Partnership Agreement | 경제동반자협정, 경제연계협정 |
| Free Trade Agreement | 경제 파트너십 협정, EPA |
| trade dispute | 자유무역협정, FTA |
| import tariff | 무역분쟁 |
| Uruguay Round | 관세 |
| Doha Round | 우루과이라운드 |
| dumping | 도하라운드 |
| | 덤핑 |

responds through a fall in employment by approximately -0.3% within a year. The shock is followed by the expansionary monetary policy represented by the interest rate, with initially persistent cut-downs and an eventual recovery back to its steady state, similar

Table A.5
Term sets for the FX policy uncertainty index.

| English term | Korean term |
|--|------------------|
| foreign exchange policy | 외환정책, 환율정책 |
| market intervention | 시장개입 |
| foreign exchange intervention | 외환시장 개입, 외환당국 개입 |
| smoothing operation | 미세조정 |
| exchange rate stabilization | 환율 안정화, 환율 안정 조치 |
| exchange rate volatility mitigation | 환율 변동성 완화 |
| currency manipulation | 환율 조작 |
| exchange rate reserves | 외환보유고, 외환보유액 |
| dollar-selling and won-buying intervention | 달러매도/매입 개입 |

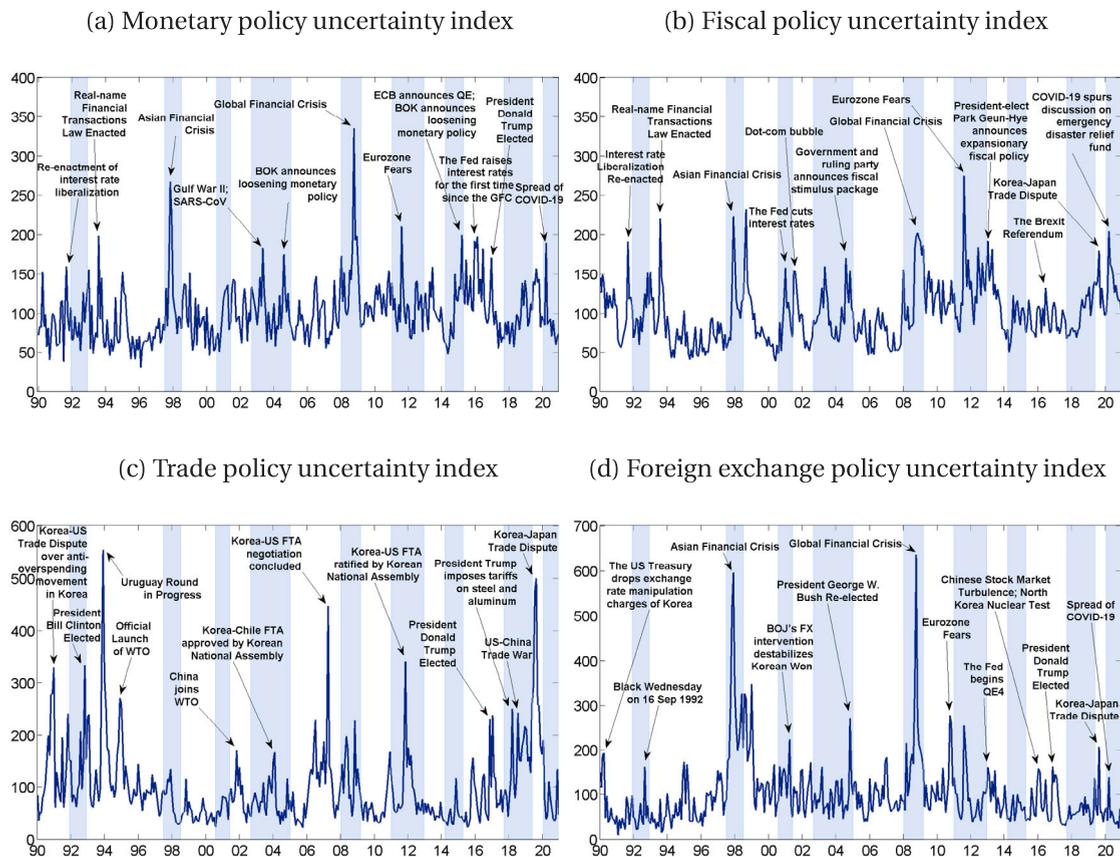


Fig. A.1. Category-specific uncertainty indices.

to the mechanism described by Colombo (2013). A temporary deflationary phase observed is attributable to a fall in aggregate demand. The shock is also associated with a sharp and immediate depreciation of the Korean won (or an appreciation of the US dollar), which reflects the fact that investors perceive the US dollar as a relatively safer asset than the Korean won in times of heightened uncertainty. Overall, these results are in line with the broad consensus in the empirical literature that shocks to EPU are negatively associated with macroeconomic and financial outcomes (Ko and Lee, 2015; Caggiano et al., 2017).

By contrast, in panel (b), a similar experiment using the BBD EPU index shows either weak or statistically insignificant responses of macroeconomic aggregates. The negative impact on real output lasts for less than three quarters, with half the magnitude (−0.3%) of the corresponding new EPU case. The interest and exchange rate also exhibit a pattern similar to that of our new EPU index, albeit with a much smaller magnitude and persistence. No significant responses of inflation or employment are observed. The stark difference in the results confirms the importance of country-specific search terms in constructing a more informative policy uncertainty index.

Reiterating the exercise after substituting real output with real consumption and real investment, respectively, strengthens our claim. The shock to our new EPU index leads to a contraction in the real variables by about −1% and −1.5% within a

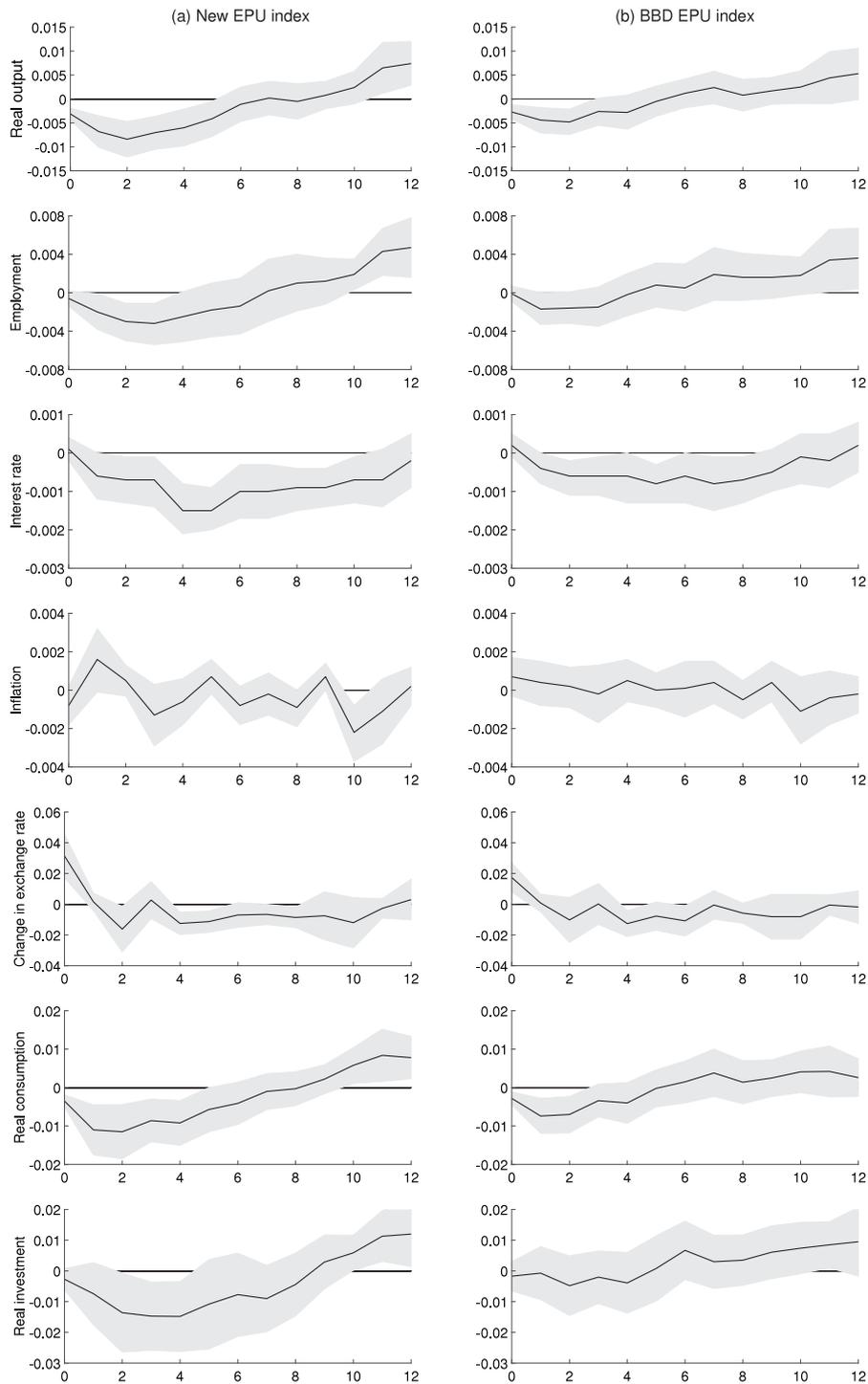


Fig. A.2. Impulse responses to EPU shocks, with 90 percent confidence bands: Ordering EPU first in the SVAR model when the shock is identified.

year, respectively. This is consistent with the explanation that heightened uncertainty prompts households and firms to delay consumption and investment through a higher precautionary motive and a larger option value of waiting (Colombo, 2013). However, an experiment using the BBD EPU index appears to fall short of corroborating this finding. The shock identified by the BBD EPU index yields a statistically insignificant effect on real investment and a relatively minor impact on real consumption, as evidenced by a smaller magnitude of -0.5% and a shorter persistence of three quarters. Therefore, the impulse responses by local projections illustrate the importance of press coverage, as well as the selection of keywords and search expressions, in building the EPU index.

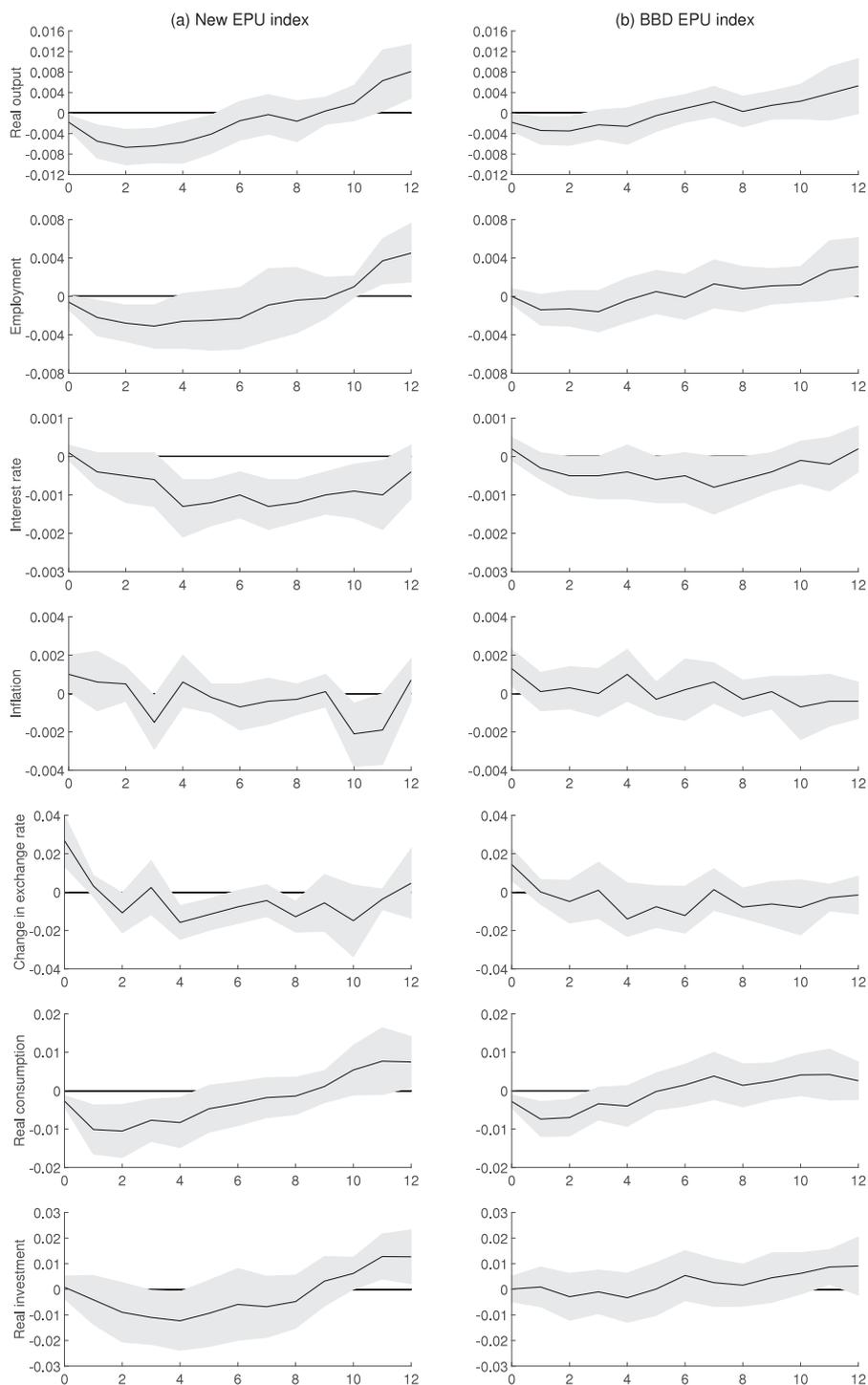


Fig. A.3. Impulse responses to EPU shocks, with 90 percent confidence bands: Considering 4 lags for the local projection.

5.2. Robustness checks

In this subsection, we verify the robustness of our empirical results under alternative specifications. First, we check whether the effect of a shock is robust to the ordering of variables in the SVAR model. Fig. A.2 in the Appendix presents the impulse responses of macroeconomic variables where the shock is identified after ordering the EPU index first in the SVAR system. The results are

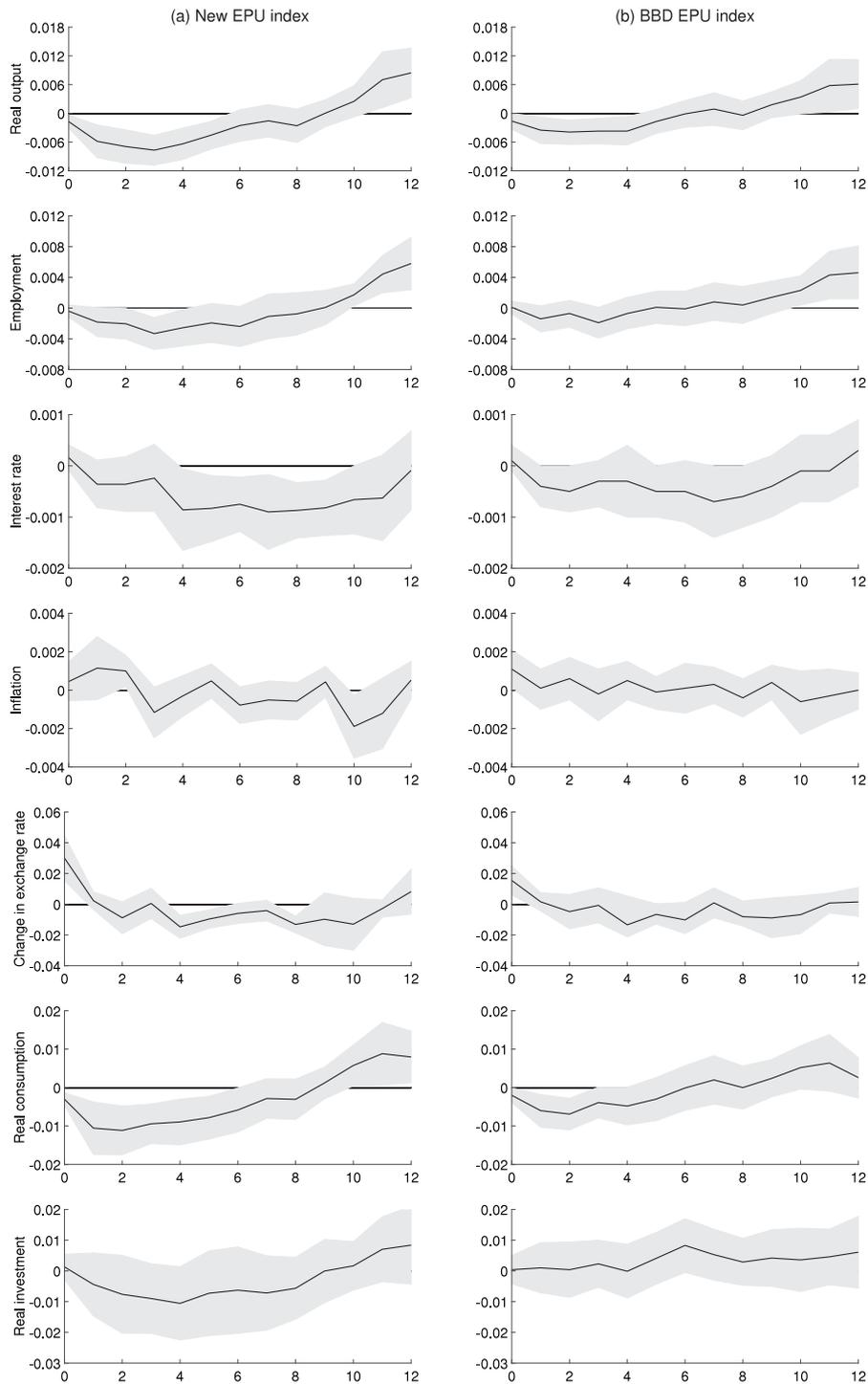


Fig. A.4. Impulse responses to EPU shocks, with 90 percent confidence bands: Including the COVID-19 period.

both quantitatively and qualitatively similar to the baseline case. While the shock, identified using the new EPU index, leads to a statistically significant change in all macroeconomic variables, the responses of employment, inflation, and real investment to the shock, identified using the original BBD EPU index, are statistically insignificant. Other variables, such as real output, the interest rate, exchange rate, and real consumption, which show statistically significant responses exhibit lower persistence and smaller magnitude than the corresponding new EPU cases. For instance, in the new EPU case, a decline in real output hits the lower bound

at about -0.8% and lasts for about 5 quarters, whereas such a response is observed with only half the size and persistence in the BBD EPU case (i.e., the lower bound of -0.4% and it lasts for just 2 quarters).

Second, the validity of the estimation results by local projections is confirmed with a different lag length. Fig. A.3 in the Appendix displays the impulse responses to an EPU shock after increasing the lag order to four in the estimation of a local projection. The results appear to be similar to the baseline case. Lastly, we extend the sample period to include the COVID-19 pandemic recession (i.e., up to Q4 2020). While most of the results remain qualitatively unchanged, the response of the interest rate to the shock, using the BBD EPU index, becomes statistically insignificant. Moreover, a positive response of real investment is observed, which appears to be counterintuitive. It contrasts with the negative response to the shock, identified using the new EPU index, though both are statistically insignificant.

6. Conclusion

This paper has developed new policy uncertainty indices for Korea from January 1990 to December 2020 based on a textual analysis of BBD by fine-tuning the keywords and expressions and expanding the newspaper coverage. We make several important contributions. First, we discuss the keywords that cause the differences between our new EPU index and the BBD EPU index. Despite their procedural similarity, our new index is unique in that it uses a set of keywords that correspond much more closely to actual language use and better reflect the economic environment of Korea, which is classified as a small open economy.

Second, we identify shocks to EPU that are orthogonal to the other variables in the SVAR model. These shocks are then used to estimate the impulse responses, employing local projections. Through our new EPU measure, we show that in response to EPU shocks, macroeconomic aggregates such as real output, real consumption, real investment, and employment decline significantly, which the shock, identified using the BBD EPU index, does not accurately reflect. The estimation results are found to be robust under alternative specifications. The results by local projections emphasize the importance of press coverage and the selection of keywords and expressions in constructing an EPU index. Thus, our results call for a refinement of the EPU index in general for other countries, reflecting actual language use and the economic environment accordingly.

Finally, in addition to the overall EPU index, we also construct category-specific policy uncertainty indices, that consider monetary, fiscal, trade, and FX policies. We show that they capture significant historical events related to the various policies, such as monetary and fiscal measures.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

See Tables A.1–A.5 and Figs. A.1–A.4.

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