

Measuring Economic Policy Uncertainty in China

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Abstract

We construct a new monthly index of Economic Policy Uncertainty for China in 2000-2018 based on Chinese newspapers. Different from the existing index, ours uses information from multiple local newspapers, and foreshadows declines in equity price, employment and output. Media censorship does not seem to have qualitative impact to our index. Moreover, we develop a daily uncertainty index and several policy-specific uncertainty indices for public use.

Keywords: Economic Policy Uncertainty, Chinese economy, media bias.

JEL Codes: E66, G18, L82.

1. Introduction

Economic theory suggests that uncertainty has sizable effects to the real economy. In their seminal paper, Baker, Bloom and Davis (2016) (henceforth BBD) use contents in newspaper articles to construct Economic Policy Uncertainty indices (henceforth EPU indices) for major economies. Such an index is interesting for China for a few reasons. China is the second largest economy in the world and a key player in international trade. Moreover, as an emerging

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economy, China has been implementing various economic policy reforms and subject to policy uncertainty shocks. Therefore, policy uncertainty shocks may have important implications to the macroeconomy in China in business cycle frequency.

BBD indeed constructed an EPU index for China. To deal with media censorship in Chinese media, they did not perform text searches on newspapers published in mainland China, but instead used information from a Hong Kong-based English newspaper, the *South China Morning Post (SCMP)*. But such a strategy is open to other problems. First, the Hong Kong-based newspaper is likely to choose to report news that has more relevance to the Hong Kong economy, which means that it may not fully reflect the level of economic policy uncertainty in China. Second, with only one newspaper in the sample, a change in editorial policy or preference can have large effect to the index.² Third, a rise in the resulting index does not have the expected effect to key Chinese macroeconomic variables. Lastly, with only one newspaper, it is impossible to construct higher frequency (such as daily) index and uncertainty index by policy category.

In this paper, we construct a new, robust China EPU index using 10 mainland Chinese newspapers for the period January 2000 to October 2018.³ The index captures a wide range of uncertainty in a timely manner. We conduct numerous robustness checks to make sure that our index is not sensitive to media censorship in China. We estimate a structural vector autoregressive (SVAR) model using our constructed EPU index and macroeconomic variables. Once we use our index instead of BBD's, Chinese equity returns, employment and output fall in response to an unexpected rise in economic policy uncertainty, indicating the policy uncertainty channel at work. These findings are consistent with what is found about the US economy. Finally, we also develop a daily index and uncertainty indices for several policy categories.

This paper is related to the literature that studies the relations between the Chinese EPU index and the real economy, using the EPU index constructed by BBD. However, results have been mixed. For instance, both Chen et al. (2018) and Arouri and Roubaud (2016) study the

² For instance, there were doubts concerning the potential change in editorial policy and decline in press freedom when the newspaper was acquired by a Chinese conglomerate (Alibaba Group) in 2016.

³ The index is being updated every month at <https://economicpolicyuncertaintyinchina.weebly.com/>.

relationship between the Chinese EPU and stock market returns. The former finds negative relationships but the latter finds no impact. Luk et al. (2018) study international spillover of uncertainty. They find that the Chinese EPU index implies implausibly large cross-border spillovers into China. Fontaine et al. (2017) find that Chinese EPU affects US economic activity during busts but not booms. Our paper suggests that one possible reason for these mixed results is the quality of the old EPU index.

In the rest of the paper, we first describe the construction of the EPU index and compare it with other uncertainty indices available for China. Next, demonstrate the robustness of the EPU index to newspaper selection and media bias through a number of checks. We then estimate an SVAR model to assess the macro-financial impact of uncertainty on the Chinese economy. The final section concludes.

2. Measuring EPU

2.1 Construction of the Index

The compilation strategy of the China EPU index follows BBD. We count the number of occurrences of articles discussing economic policy uncertainty in leading daily general interest Chinese-language newspapers. We construct a monthly index starting in January 2000 by searching for relevant keywords in the electronic archives of ten newspapers: *Beijing Youth Daily*, *Guangzhou Daily*, *Jiefang Daily*, *People's Daily Overseas Edition*, *Shanghai Morning Post*, *Southern Metropolis Daily*, *The Beijing News*, *Today Evening Post*, *Wen Hui Daily* and *Yangcheng Evening News*. We obtain newspaper contents and search for related keywords in the digital archives *Wisers Information Portal*. This platform covers important and influential papers from large cities representative of the newspaper market in urban areas. We select these ten papers out of the full sample of 114 newspapers because (1) they have the most complete data; and (2) these papers are distributed in major cities in China, namely Beijing, Shanghai, Guangzhou and Tianjin. Robustness checks regarding the choice of newspapers are conducted in the next section.

Table 1: Relevant Chinese Keywords (with Translations to English) for Compiling China Economic Policy Uncertainty Index

Criteria	English	Chinese
(1) Economic	economic/economy/financial	经济/金融
(2) Uncertainty	uncertainty/uncertain	不确定/不明确
	volatile	波动/震荡/动荡
	unstable/unclear	不稳/未明/不明朗/不清晰/未清晰
	unpredictable	难料/难以预料/难以预测 难以预计/难以估计/无法预料/无法预测/无法 预计/无法估计/不可预料/不可预测/不可预计 /不可估计
(3) Policy	policy/measures	政策/制度/体制/战略/措施/规章/规例/条例
	politics	政治/执政
	government/authority	政府/政委/国务院/人大/人民代表大会/中央
	president	国家主席/总书记/国家领导人
	prime minister	总理
	reform	改革/整改
	regulation	整治/规管/监管
	fiscal	财政
	tax	税
	People's Bank of China/PBOC	人民银行/央行
	deficit	赤字
	interest rate	利率

For each newspaper, we search for articles which contain at least one keyword in each of the three criteria, namely (1) Economy, (2) Uncertainty, and (3) Policy. Table 1 shows the keywords in each criterion and their English translation. We scale the number of articles in each month by the number of articles that meet criterion (1) for the same month.⁴ The series is then standardized to have a standard deviation of unity during the period from January 2000 to December 2011. We compute the simple average of the monthly series across ten newspapers. Lastly, the index is normalized to have an average value of 100 in the period from January 2000 to December 2011.

2.2 Properties of the Index

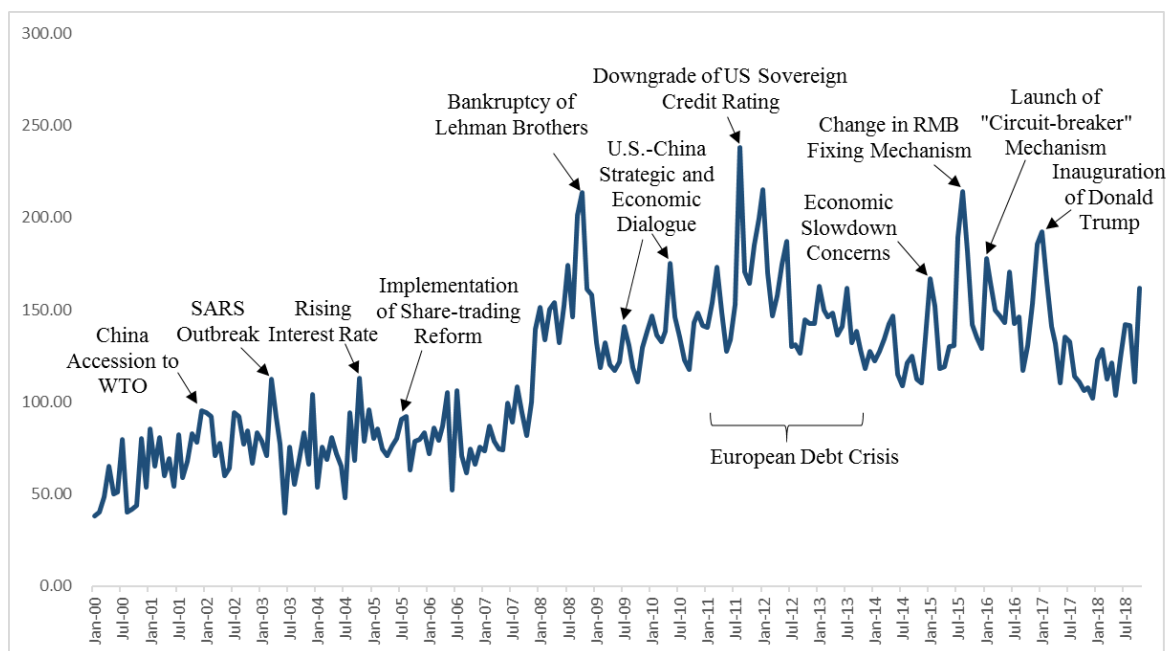
The resulting index, which we refer to as the benchmark index, is plotted in Figure 1. The index reflects key domestic policy changes, including an unanticipated renminbi depreciation and change in fixing mechanism in August 2015, and an unsuccessful launch of the “circuit-breaker” mechanism in Chinese stock markets in January 2016. It also shows spikes that coincide with key international events such as the bankruptcy of Lehman brothers in September 2008, and the inauguration of Donald Trump as the US president in January 2017. By construction, the index does not impose any prior view on whether the source of policy uncertainty is domestic or foreign. It could be the case that some foreign events are severe enough to have repercussions in China through trade linkages, international capital flows and confidence channels. Indeed, China did implement some economic policies in response to large global shocks (such as the four-trillion fiscal package in 2009 in the face of the 2008 GFC).⁵ However, we do not detect any jump in EPU in China during the 9/11 terrorist attack in September 2001 (the jumps in the US and global EPU index (Davis, 2016) are sizable). Moreover, there appears to be an upward structural shift in EPU in China after 2008. This is due to a rise in the use of keywords in the uncertainty term set around this period. One interpretation of this result is that the GFC might

⁴ For our entire dataset with 114 newspapers, around 5 million articles meet criterion (1), among which roughly 1% of the articles satisfy all three criteria.

⁵ In fact, our China index co-moves positively with EPU indices in other economies, with a coefficient of 0.47 with the US index, 0.67 with Hong Kong and 0.56 with Macao (using the index constructed by Luk (2018)). This is consistent with the fact that correlations of EPU indices between most country pairs are positive.

have raised the degree of perceived uncertainty in the Chinese economy, and this is reflected in the newspapers.⁶

Figure 1: China Economic Policy Uncertainty Index



Note: This plot shows the monthly China EPU Index constructed by the authors from January 2000 to October 2018 with annotated events.

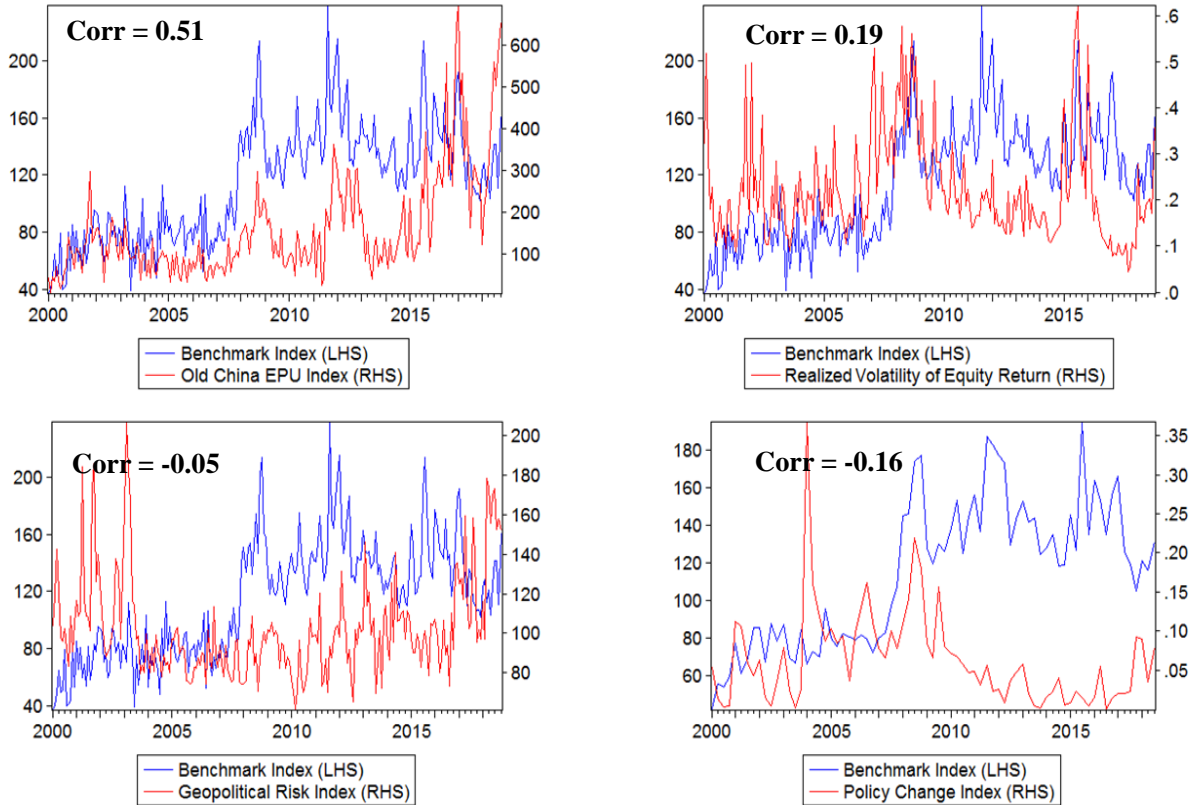
We compare our index with other existing indices related to uncertainty in China and find that ours is quite different from all the existing measures. The top left panel of Figure 2 compares our index with the old BBD index constructed with the *SCMP*. Both indices peak at key events such as the global financial crisis in September 2008, but there are important divergences between the indices. In addition, the *SCMP* index shows extreme volatility (note the right axis), particularly towards the end of the sample period. The correlation of the two indices is 0.51.

The top right plot of Figure 2 plots our index with the realized volatility of the Shanghai Stock Exchange Composite Index. The two indices tend to move together (with correlation of 0.19),

⁶ Consistent to this interpretation, Lee and Luk (2018) provide quantitative evidence that the Asian Financial Crisis has led to permanently higher perceived uncertainty in crisis-affected economies such as South Korea.

but the stock market volatility index does not pick up non-financial events such as the inauguration of Donald Trump.

Figure 2: Benchmark Index and Other Measures of Uncertainty



Note: This figure plots our benchmark index with old China EPU index, realized volatility of equity return, geographical risk index and policy change index in four sub-plots from January 2000 to October 2018. Old China EPU index is constructed by BBD with data available at www.policyuncertainty.com. Realized volatility of equity return of Shanghai (Securities) Composite Index is computed by authors. Geopolitical risk index is constructed by Caldara and Iacoviello (2018) with data available at <https://www2.bc.edu/matteo-iacoviello/gpr.htm>. Policy change index is compiled by Chan and Zhong (2018) extracted from <https://policychangeindex.com>.

The bottom left and right plots show the comparison with the geopolitical risk index and policy change index, both constructed using text-mining techniques on newspapers. Caldara et al. (2018) construct the geopolitical risk index by searching over a set of keywords related to geopolitical tensions. Chan and Zhong (2018) use machine learning techniques to detect how *People's Daily*, the government mouthpiece, prioritizes its policy issues on the front page. A rise in the policy

change index indicates major policy change in the near future, which is related to policy uncertainty. Neither of these indices correlates with our EPU index.⁷

2.3 A Daily EPU Index and Uncertainty Indices by Policy Category

Using the same method, we produce a daily EPU index for the sample period using all 114 newspapers. The monthly average of the daily EPU index correlates with our benchmark index at 0.95. Moreover, we construct monthly uncertainty indices for four policy categories, namely fiscal policy, trade policy, exchange rate and capital account policy, and monetary policy. A newspaper article is picked up by a policy category index if it satisfies the basic Economic, Policy, and Uncertainty criteria, together with an additional category-specific term set.⁸ Appendix A.1 reports the full term sets that define the policy categories and displays the indices.

3. Robustness

In this section, we conduct robustness checks on our benchmark EPU index. We focus on two respects, regarding our newspaper selection and the potential distortions due to media control.

To show that our choice of 10 newspapers does not distort the measure of uncertainty, we recompute the EPU index using all 114 general-interest newspapers available at *Wisers Information Portal*. See Appendix A.2 for the full list of the newspapers. One short-coming of this index is that newspapers enter and leave the archive, and so the count of newspapers is varying over time. Despite this, we find that the 114-newspaper index correlates at 0.96 with our benchmark index, indicating no systematic bias with our benchmark index.

As a further check, we randomly draw 10 newspapers from these 114 newspapers and construct an EPU index.⁹ We repeat this exercise for 10000 times. Figure 3 shows the 10-th and 90-th

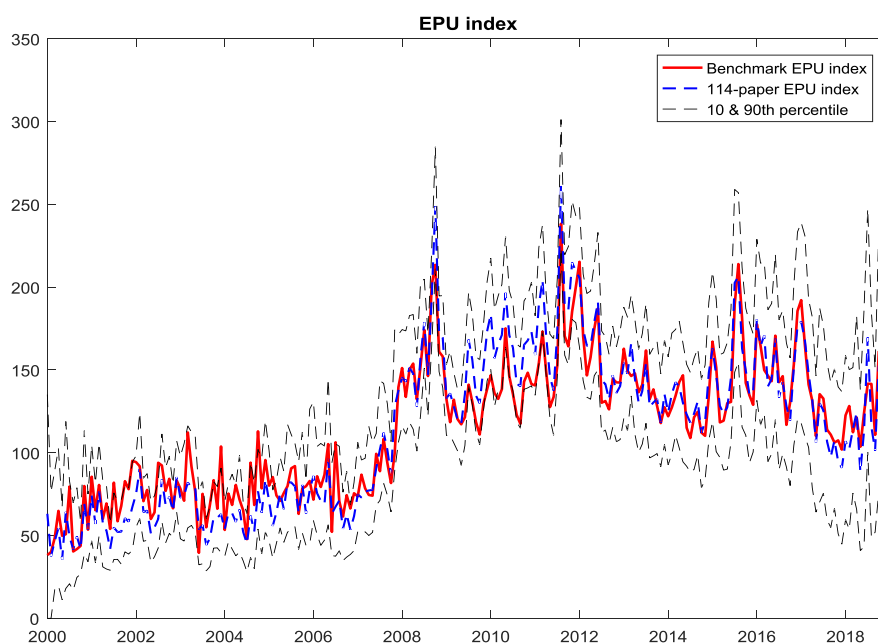
⁷ The policy change index is available in quarterly frequency. When we compute the correlation with it, we use our quarterly EPU index which is the three-month-average of the monthly index.

⁸ These indices are updated at <https://economicpolicyuncertaintyinchina.weebly.com/>.

⁹ For some newspapers we do not have data for the full sample period. We average across newspapers for each month by dividing by the number of newspapers which we have data for that month. If for a given month none of the ten papers has data, we discard these newspapers and redraw.

percentile of these indices together with our benchmark index and the 114-newspaper index. The benchmark index (red line) lies in between the two bands most of the time, again indicating that our newspaper choice for the benchmark index is reasonable.

Figure 3: Benchmark Index and 114-newspaper Index



Note: This plot shows our benchmark index, 114-newspaper index, and the 10-th and 90-th percentile of those indices constructed by repeating 10000 exercises.

Next, we investigate whether or to what extent media control in China may affect our index. In fact, all general-interest newspapers in mainland China are owned and supervised by the Chinese Communist Party Committees (CCPC). It should be noted, however, that even in democratic countries, such as the United States, newspapers exhibit media slant according to their political stance, which potentially affects their reporting (Gentzkow and Shapiro, 2010). For the Chinese index, we are mostly concerned with whether government censorship biases all newspapers systematically to the extent that it distorts the information conveyed by the index. According to the literature (Stockmann, 2013; Roberts, 2018; Brady, 2008), there are a number of ways in which the authorities guide decisions about news coverage. The most politically sensitive topics are prohibited from being reported. Moreover, there are topics that the media are allowed to

report but subject to official guidelines. The guidelines typically come in one of the following three forms. First, newspapers may be instructed to reprint news from the *Xinhua News Agency*, the official state-run press agency of China. For example, Roberts (2018) collects newspaper articles from 25 provincial and city level newspapers in 2012. She finds that there are about 50 instances in which articles are coordinated across more than 70% of papers, and that such coordination occurred during sensitive political meetings and around sensitive political scandals.¹⁰ Second, newspapers are sometimes instructed to de-emphasize stories by putting them on the back pages of the newspaper instead of the front page. This form of censorship, however, does not affect our EPU index.¹¹ Third, newspapers are sometimes instructed to “focus on positive propaganda”, such as focusing on rescue activities of government bodies to fight natural disasters rather than casualties. For instance, Roberts et al. (2016) find that *Xinhua News Agency* reports more positively about topics related to Chinese governance, relative to western news agencies such as the AP and AFP.

We provide three sets of checks in relation to media bias. The first set of checks concerns with cross-sectional bias, which means that some newspapers may be subject to more control than others uniformly over the entire sample period. Qin et al. (2018) provide some evidence that media differentiates their products according to the degree of media bias as a result of competition in the Chinese newspaper market. To this end, we make use of the media bias index constructed by Qin et al. (2018). They count for each newspaper keywords pertaining to nine content areas related to media bias and use principle-component analysis to extract a measure of media bias. The index is available for all 114 newspapers in our sample. We split these 114 papers into two groups with bias above and below the median, and construct an index with each group using the same keywords and aggregative method as the benchmark index. Table 2 reports the correlations of the indices. For instance, the correlations of our benchmark index and EPU indices computed using the more-biased and less-biased newspapers are 0.93 and 0.94

¹⁰ These events are the 2012 National People’s Congress in March, the 18th Party Congress in November, and the sentencing of Gu Kailai, the wife of the Party Secretary of Chongqing Bo Xilai, in August.

¹¹ There are leaked propaganda directives. For example, see “Ministry of Truth: Personal Wealth, Income Gap,” *China Digital Times*, February 6, 2013. Available at: <https://chinadigitaltimes.net/2013/02/ministry0of-truth-personal-wealth-income-gap/>.

respectively. The high similarity suggests that media bias does not have qualitative impact to our EPU index. Alternatively, we split the newspapers according to (1) ownership type; and (2) the rank of the supervising Chinese Communist Party Committee and construct EPU indices for each of these categories. These factors, again, do not have qualitative effects to the benchmark EPU index. Details of the analysis are provided in Appendix A.3.

Table 2: Correlations by Media Bias

	(1)	(2)	(3)	(4)
(1) Benchmark Index	1.00			
(2) 114-newspaper Index	0.96	1.00		
(3) More-bias Index	0.93	0.98	1.00	
(4) Less-bias Index	0.94	0.99	0.94	1.00

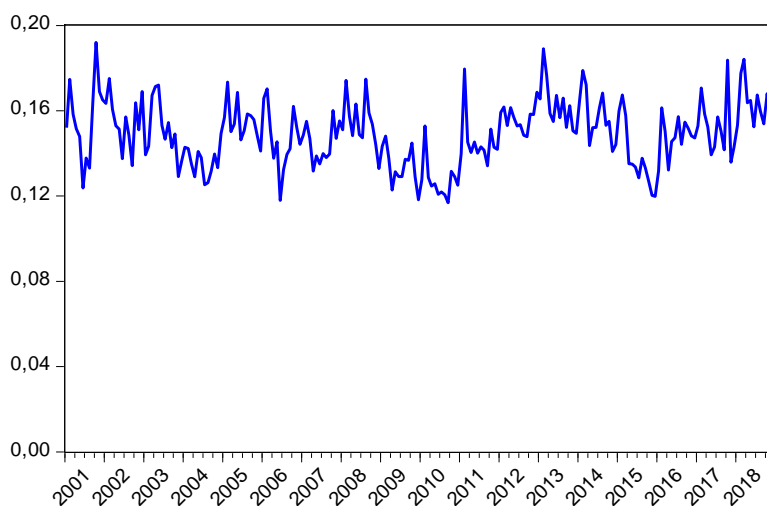
Note: This table shows the correlation matrix among our benchmark index, 114-newspaper index, more-bias index, and less-bias index from January 2000 to October 2018. These indices are constructed by the authors. All correlations are significantly different from zero at the 1 per cent level.

The second set of checks concerns with the varying degree of bias over time. For instance, media censorship may have changed after President Xi Jinping assumed office in 2013. Due to the time-series nature of our EPU index, time-varying media bias may affect statistical inference when one uses the EPU index in statistical analysis. We conduct three checks. First, to address the coordination problem, we check whether our index is affected by Chinese newspapers using contents provided by the *Xinhua News Agency*. We construct an index ignoring all articles that have the word “*Xinhua News Agency*” in the content.¹² The resulting index again is closely correlated, at 98%, with the benchmark index. Second, we look at the share of news in our 10 newspapers that have the word “*Xinhua News Agency*” in the content over time. Figure 4 shows that the share does not have any observable trends or structural breaks during our sample period. The third check asks how often newspaper articles mention key government units in their economic news. Specifically, we compute, with our 10 newspapers, the share of articles that use the keywords “*Politburo of the Communist Party*” or “*State Council*” or “*Central Government*”

¹² The Chinese words for “*Xinhua News Agency*” are “新华社” and “新华通讯社”.

in the content, out of all economic news (news articles that satisfy criterion (1) in Table 1).¹³ Figure 5 reports the evolution of this share over time. Again, we do not see any obvious trend over the sample period.¹⁴ It suggests that even though the overall degree of media bias in China might have been time-varying, the bias does not seem to have an observable effect on the way economic news is reported.

Figure 4: Share of News Using the Phrase “Xinhua News Agency” in Content



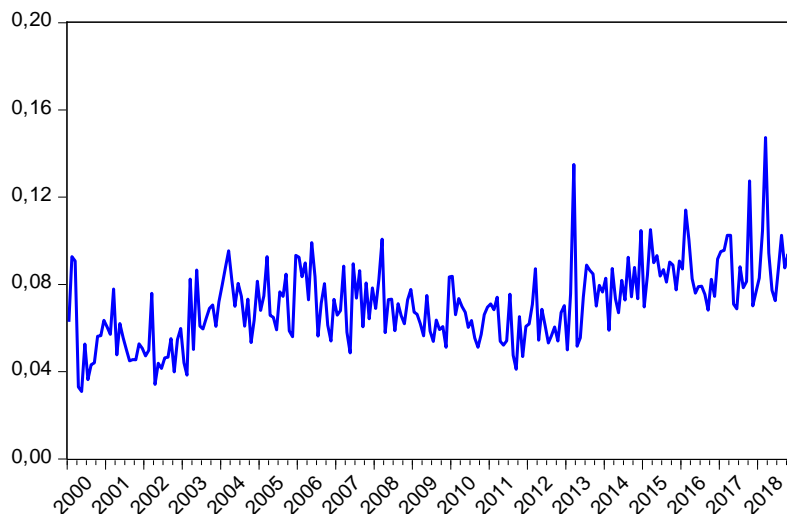
Note: The plot shows the number of news articles that have the phrase “Xinhua News Agency” in the content divided by the total number of newspaper articles for the same month and averaged across 10 benchmark newspapers.

Lastly, to address the issue of “focus on positive propaganda”, we compare the sentiments of news reported by mainland Chinese media and Hong Kong media. Note that media in Hong Kong is not subject to official media censorship. Therefore, if the Chinese authorities censor news that conveys negative sentiments in mainland China but media in Hong Kong is uncensored, we expect to observe more negative sentiments in the news in Hong Kong.

¹³ The Chinese words for the government units are “中央政治局”, “国务院”, and “中央人民政府”.

¹⁴ We conduct structural break tests for the period in March 2013 when President Xi Jinping assumed office, but we do not identify a break. Results are available from the authors.

Figure 5: Share of Economic News Mentioning Key Government Units



Note: The plot shows the share of economic news mentioning a key government unit in the content. In each newspaper, we count the number of articles that satisfy criterion (1) in Table 1 and use one of “*Politburo of the Communist Party*” or “*State Council*” or “*Central Government*” in the content. The count is scaled by the number of articles in criterion (1) in Table 1 for the same month and averaged across 10 benchmark newspapers.

To conduct the sentiment analysis, we pick 10 Chinese-language newspapers in Hong Kong to compare with our 10 mainland newspapers. We choose several economic events in our sample period. For each event, we collect all news articles in the two sets of newspapers that satisfy criteria (1), (2) and (3) in Table 1 together with an event-specific term set. For each article, we use *Jieba*, a Chinese text segmentation tool, to segment the text into words.¹⁵ We then partition words into positive, negative and other words, using *Commendatory and Derogatory Meaning of Chinese Words Dictionary* (Li, 2011). Our measurement of sentiment is defined as:

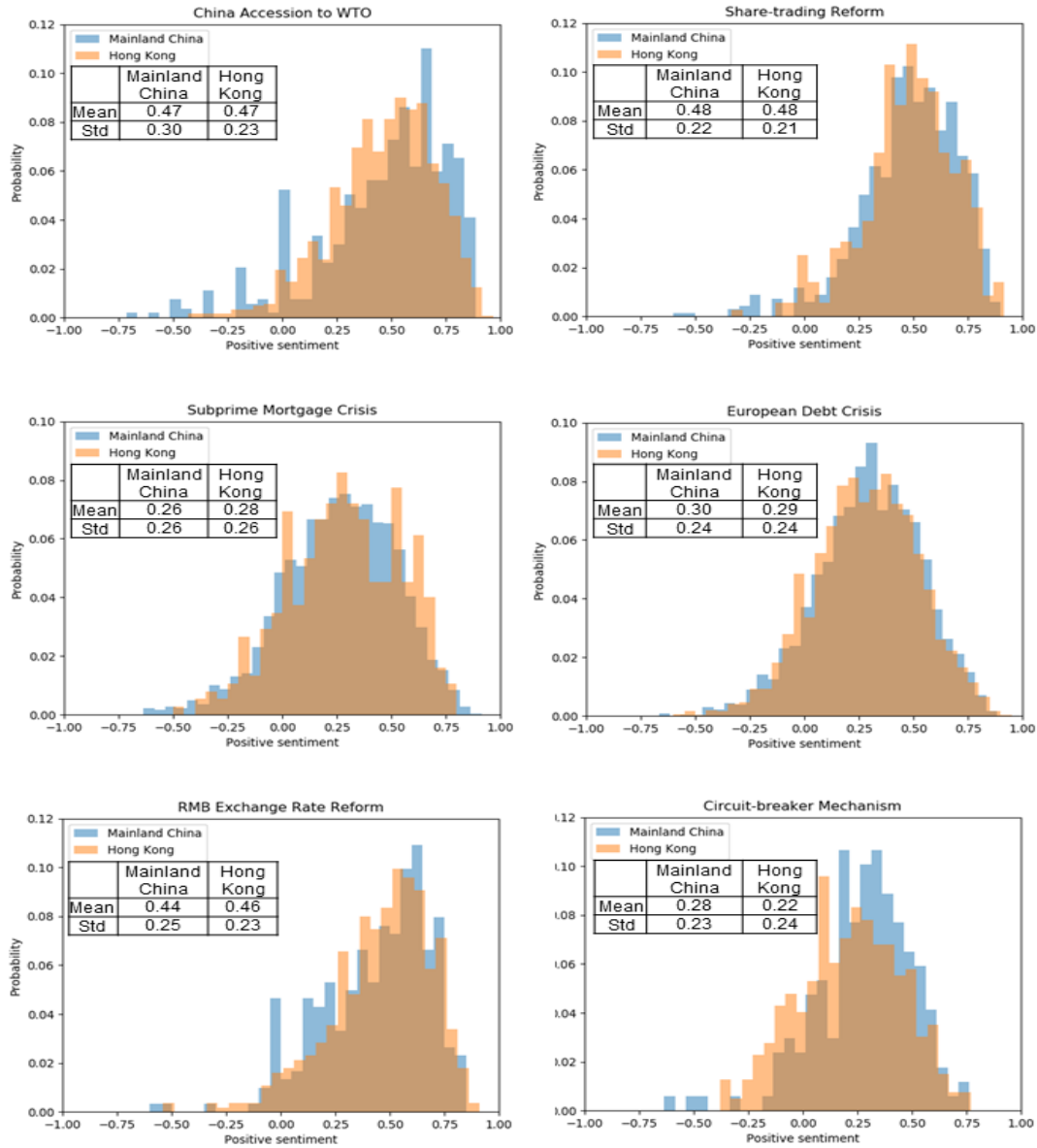
$$sentiment\ value = \frac{\#positive\ words - \#negative\ words}{\#positive\ words + \#negative\ words}.$$

Note that the sentiment of a news article is bounded by -1 and 1, where a larger value corresponds to a more positive sentiment. More details about newspapers, event selection and the

¹⁵ *Jieba* is a Chinese text segmentation module in *R*, *Python* and *Java*. The codes are downloadable from <https://github.com/fxsjy/jieba>.

procedure of the analysis are provided in Appendix A.4.

Figure 6: Distribution of Sentiment Values in Selected Events



Note: The histograms show the distributions of positive sentiment value of four annotated events. Twenty bins are used. The mean and standard deviation of the distributions are shown in the table in each sub-plot.

Figure 6 plots the distributions of sentiment values for the 10 mainland Chinese newspapers (shown in blue) and for the 10 Hong Kong newspapers (shown in red). The corresponding first and second moments are also reported. The events selected are China accession to the World Trade Organization (WTO), share-trading reform, subprime mortgage crisis, European debt crisis, RMB exchange rate reform and the unsuccessful launch of circuit-breaker mechanism. In general, the distributions of sentiments generated by mainland newspapers are similar to those generated by Hong Kong newspapers, and with similar means and standard deviations. Perhaps the only exception is the launch of the circuit-breaker mechanism in the Chinese stock market in 2016 (lower right panel) where the distribution of mainland Chinese articles has slightly more mass towards positive sentiment, and the mean of the sentiment for mainland Chinese articles (0.28) is slightly above that of Hong Kong articles (0.22). For the other time periods, we do not detect severe systematic censorship of news related to economic policy uncertainty.¹⁶

The ultimate validation of our EPU index comes from its correlation with key macroeconomic variables in the country. We will turn to this in the next section.

4. Structural Vector Autoregression (SVAR) with Macroeconomic Variables

In this section, we study the dynamic relationship between the EPU index and macroeconomic variables in China using a simple structural vector autoregressive (SVAR) model. Importantly we find that a positive innovation in our EPU index foreshadows a weakening of the macroeconomy, consistent with results in other countries. By contrast, if we replace the EPU index with the old one using the *SCMP*, this result disappears -- a rise in uncertainty does not lead to a statistically significant fall in economic activity.

Specifically, in our baseline analysis we consider a quarterly SVAR model with the following variables: economic policy uncertainty index, the log of Shanghai (Securities) Composite Index,

¹⁶ In the previous version of this paper, we used an online Chinese-language natural language processing platform, *BosonNLP*, to compute the sentiment value for each news article. Using that method, the distributions of sentiments generated by mainland and Hong Kong newspapers are similar.

benchmark interest rate, unemployment rate, and log real GDP.¹⁷ The quarterly EPU index is the three-month average of the monthly index. To identify shocks, we use a Cholesky decomposition with the order above. Following BBD, we arrange the EPU index first. Our sample runs from 2000Q1 to 2018Q2. We use two lags in the VAR based on the Akaike information criteria.

Figure 7 presents the impulse responses to a one-standard-deviation positive innovation to the EPU index, together with 95% bootstrapped confidence band. The shock leads to an immediate reduction in the equity price by about 3%, and output growth falls by about 0.1%, both statistically significant. The fall in output is short-lived, which only lasts for 3 quarters. The rise in unemployment rate lasts for 4 quarters. Moreover, the central bank responds by reducing the benchmark interest rate by about 0.1% for about 4 quarters.

We conduct a number of checks using alternative specifications. These include using one lag instead of two in the VAR, a bivariate VAR with real GDP and EPU only, a bivariate VAR with reverse ordering, arranging the EPU index in the last position, including the global EPU index before the China EPU index, and including the realized volatility of the Shanghai (Securities) Composite Index after the EPU index. These modifications lead to somewhat different impulse responses for the real GDP series. However, the key result of a negative output response to an unanticipated rise in the EPU index remains robust.¹⁸ (See Figure 8.)

Figure 9 repeats the SVAR exercise, this time using the old EPU index instead. Again, we investigate a one-standard-deviation increase in the EPU index. In this case, the EPU index rises by about 50 units, reflecting the more volatile nature of this index. The responses of

¹⁷ The data sources are as follows. The Shanghai (Securities) Composite Index is the three-month-averaged daily closing index obtained from Bloomberg. The benchmark one-year deposit rate is obtained from People's Bank of China. Unemployment rate data, extracted from CEIC, is registered unemployment rate in urban areas released by Ministry of Human Resources and Social Security. The quarterly real GDP of China is obtained from Federal Reserve Bank of Atlanta (See Chang, Chen, Waggoner and Zha; 2016). In the alternative specification, the old China EPU index is available at www.policyuncertainty.com.

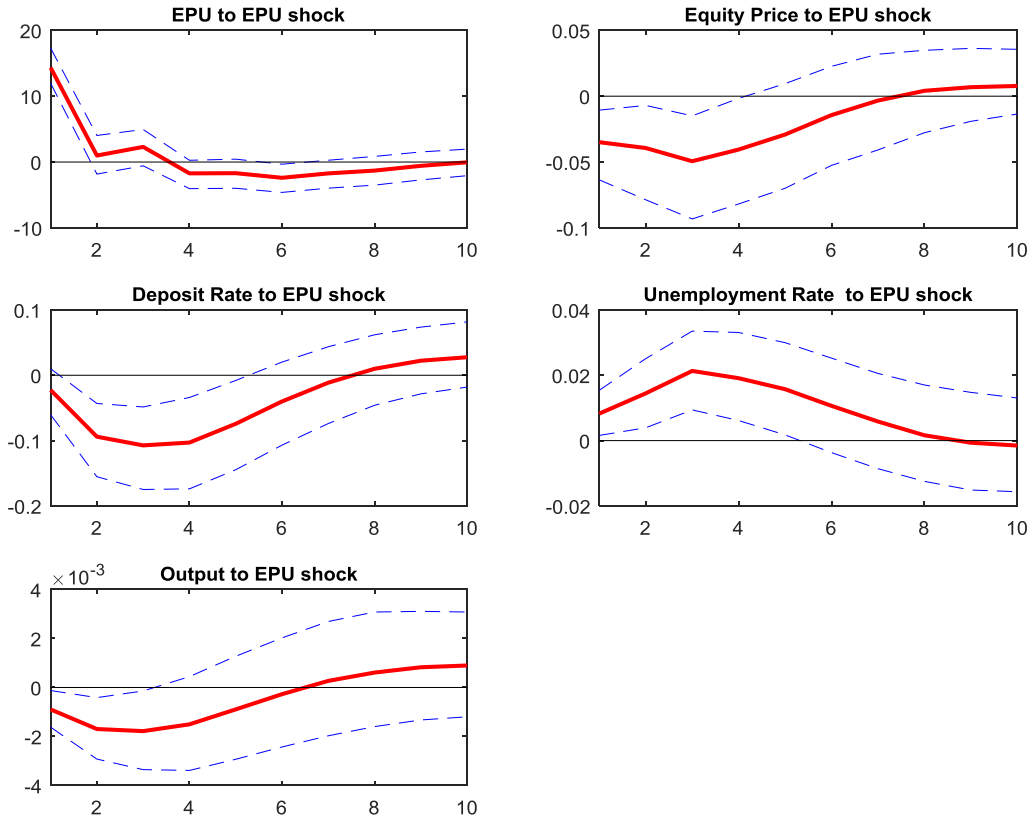
¹⁸ Moreover, we run alternative specifications in which the benchmark interest rate is replaced by the required reserve ratio and Sun's (2018) narrative monetary policy index respectively. We also tried the Employment Sub-index of the Manufacturing Purchasing Managers' Index instead of the unemployment rate. Our main results remain unchanged qualitatively.

macroeconomic variables are in the same direction as in Figure 7, but quantitatively smaller. We only detect an immediate negative response in the stock market index, which becomes statistically insignificant after three months. Importantly, a rise in this EPU index does not yield a statistically significant fall in output and employment, at a 95% significance level. That output does not fall in response to a rise in the old EPU index is robust to a bivariate VAR model with the EPU index and real GDP only. The left panels of Figure 10 show the impulse responses to an EPU shock using the EPU index constructed in this paper; and the right panels use the EPU index constructed by BBD. Output response remains negative for more than 10 quarters at a 95% significance level with our EPU index, but is not statistically different from zero with BBD's index.

5. Conclusions

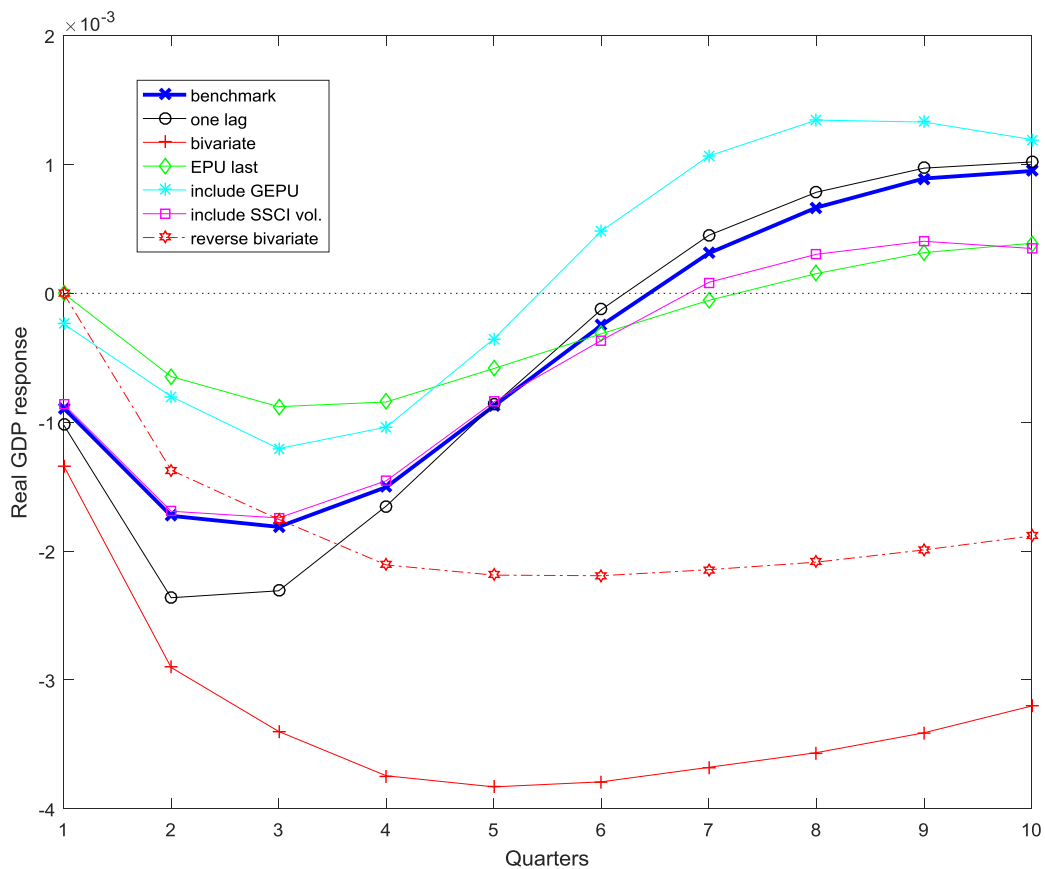
In this paper, we constructed a new economic policy uncertainty for China, using multiple mainland Chinese newspapers for the period 2000-2018. We showed that media bias does not significantly affect the quality of the index. We find that, when economic policy uncertainty is measured properly, a rise in uncertainty indeed depresses real economic activities such as output and employment, consistent with findings from other economies.

Figure 7: Impulse Responses to a One-standard-deviation Innovation in China EPU Index



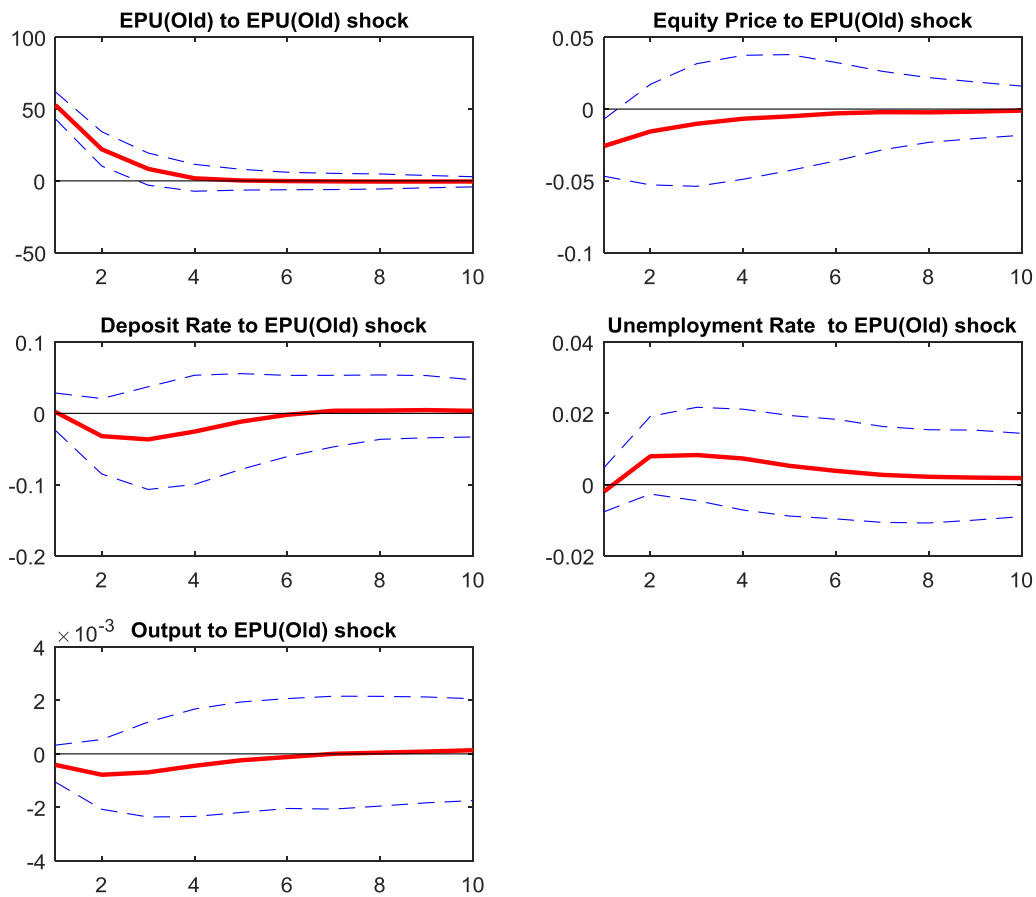
Note: The red solid lines denote the median impulse response functions. The dashed lines denote 5 and 95% error bands, estimated using Monte Carlo simulation (with 100 simulations). Each period is a quarter.

Figure 8: Real GDP Response to an EPU Shock, with Alternative Specifications



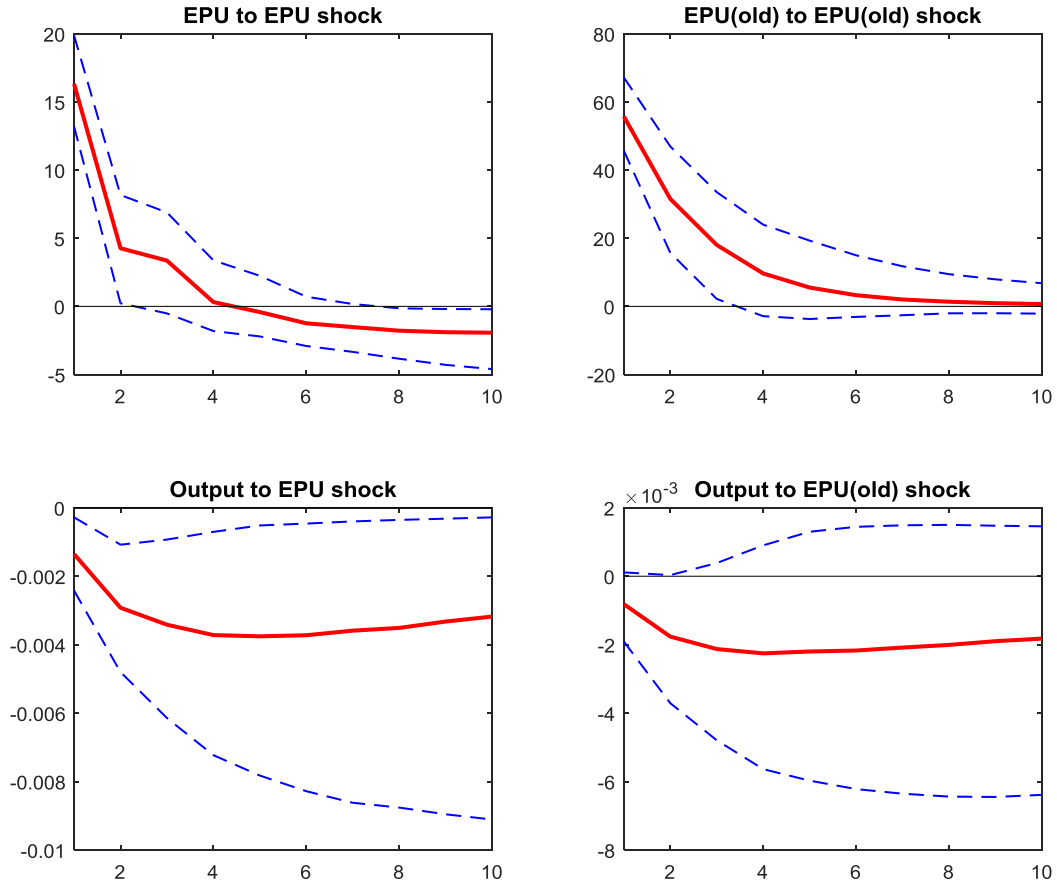
Note: The benchmark specification is the same as in Figure 7. The other cases depart from the benchmark as indicated.

Figure 9: Impulse Responses to a One-standard-deviation Innovation in Old China EPU
Index



Note: The red solid lines denote the median impulse response functions. The dashed lines denote 5 and 95% error bands, estimated using Monte Carlo simulation (with 100 simulations). Each period is a quarter.

Figure 10: Impulse Responses to a One-standard-deviation Innovation in the China EPU Index in a Bivariate VAR Model with the EPU Index and Real GDP

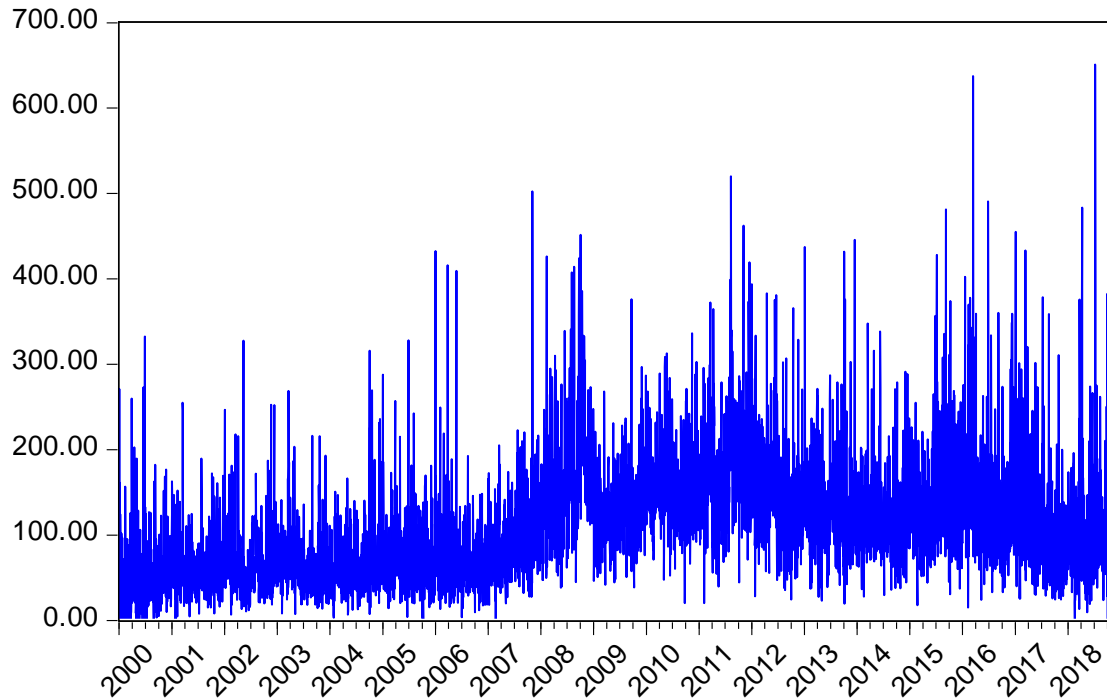


Note: The left panels use the EPU index constructed in this paper; the right panels use the old EPU index constructed by BBD. The red solid lines denote the median impulse response functions. The dashed lines denote 5 and 95% error bands, estimated using Monte Carlo simulation (with 100 simulations). Each period is a quarter.

Appendix

A.1 Daily EPU Index and Category-specific Policy Uncertainty Indices

Figure A1: Daily China Economic Policy Uncertainty Index



Note: The figure shows the daily China EPU index in the sample period, from 1st January 2000 to 31st October 2018. In 114 newspapers in mainland China, we search for articles which contain at least one keyword in each of the three criteria, namely (1) Economy, (2) Uncertainty, and (3) Policy in Table 1. We scale the number of articles in each day by the number of articles that meets criterion (1) for the same day. We then standardize the series to have a standard deviation of unity during the period from 1st January 2000 to 31st December 2011. We compute the simple average of the daily series across all newspapers and normalize it to have an average value of 100 in the period from 1st January 2000 to 31st December 2011.

Table A1: Term Sets for Policy Category Uncertainty Indices

A. Fiscal Policy

English	Chinese
fiscal policy	财政政策
tax	税
public debt	国债
local government debt	地方债
military spending	军费
public investment	中央投资/公共投资
government investment	政府投资
government spending	政府购买
transfer payment	政府转移支付
public infrastructure	公共项目工程/国家基础建设

B. Monetary Policy

English	Chinese
monetary policy	货币政策
macroeconomic control	宏观调控
People's Bank of China/PBOC	人民银行/央行
open market operation	公开市场操作
reserve requirement	存款准备金
raising/lowering the reserve requirement ratio	降准/下调存款准备金率/上调存款准备金率
repo/reserve repo	正回购/逆回购
monetary liquidity/capital liquidity	货币流动性/资本流动性
interest rate	利率
raising/lowering interest rate	加息/减息
money supply	货币供应
lending facility	借贷工具/借贷便利工具
inflation/deflation	通货膨胀/通货紧缩
quantitative Easing/QE	量化宽松/QE
quantitative Tightening/QT	量化紧缩/QT

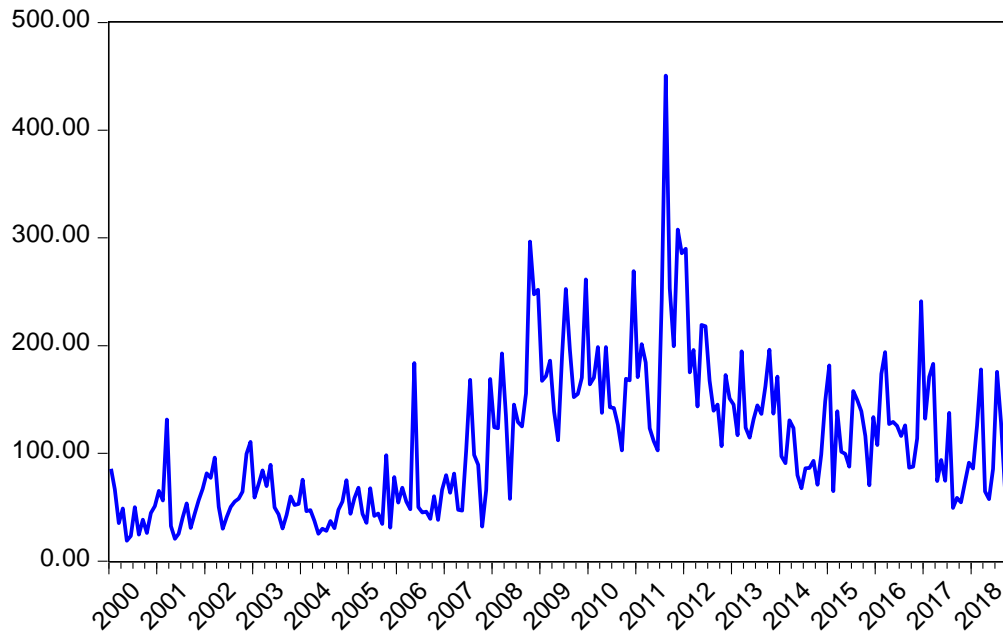
C. Trade Policy

English	Chinese
trade policy	贸易政策
General Agreement on Tariffs and Trade/GATT	关税及贸易总协定/关税总协定/GATT
World Trade Organization/WTO	世界贸易组织/世贸/WTO
Free Trade Agreement/FTA	自由贸易协定/FTA
investment agreement	投资协定
trade frictions	贸易摩擦
trade surplus/trade deficit	贸易顺差/贸易盈余/贸易逆差/贸易赤字
tariff	关税
trade barrier	贸易壁垒
anti-dumping	反倾销
import/export permission	进口许可/出口许可进出口许可
import/export embargo	进口禁令/出口禁令/进出口禁令
import/export quota	进口配额/出口配额/进出口配额

D. Exchange Rate and Capital Account Policy

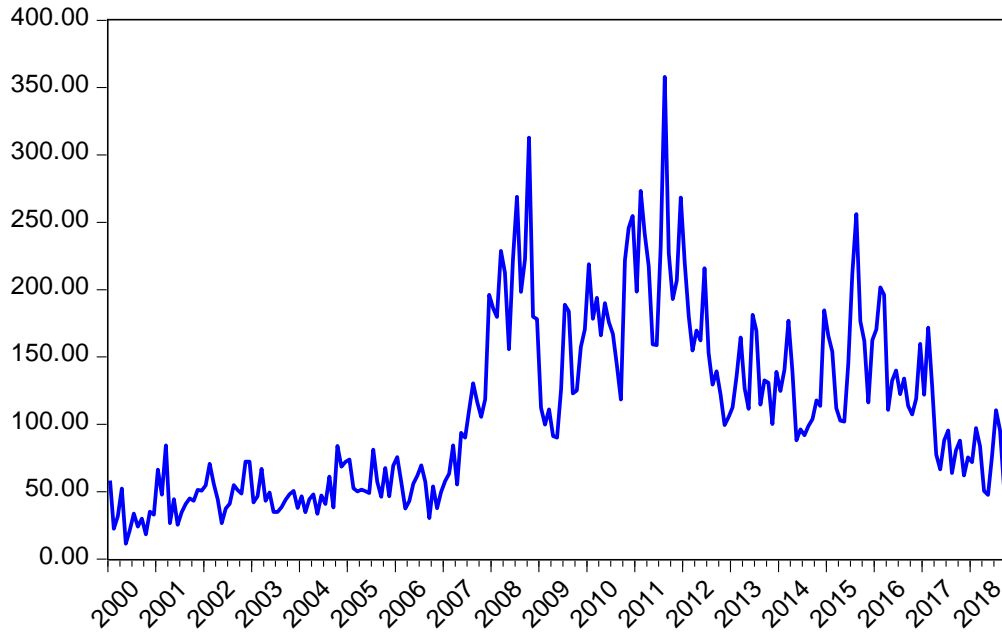
English	Chinese
exchange rate	汇率
foreign exchange	外汇
Foreign Exchange Administration/SAFE	外汇管理局/外管局
capital control	资本管制
appreciation/depreciation	升值/贬值
capital account	资本账户
cross-border capital flow	跨境资金流动/跨境资本流动
international balance of payment	国际收支
foreign debt/bills	对外债务/对外债权

Figure A2: Fiscal Policy Uncertainty Index



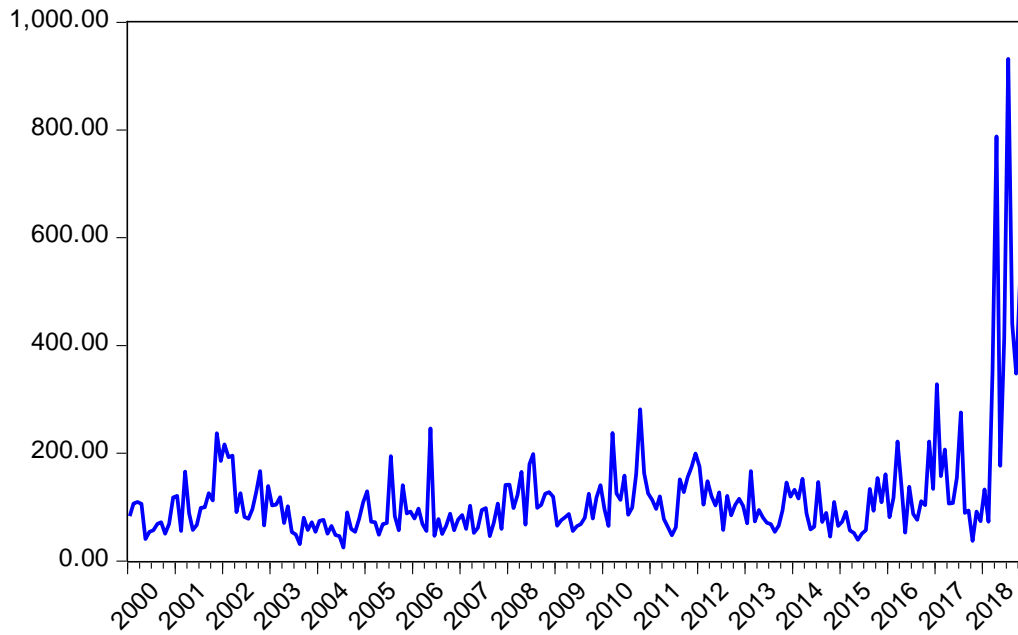
Note: The figure shows the fiscal policy uncertainty index from January 2000 to October 2018. In 114 newspapers in mainland China, we search for articles which contain at least one keyword in each of the four criteria, namely (1) Economy, (2) Uncertainty, and (3) Policy in Table 1 and fiscal policy terms in Table A1. We scale the number of articles in each month by the number of articles that meets criterion (1) for the same month. We then standardize the series to have a standard deviation of unity during the period from January 2000 to December 2011. We compute the simple average of the monthly series across all newspapers and normalize it to have an average value of 100 in the period from January 2000 to December 2011.

Figure A3: Monetary Policy Uncertainty Index



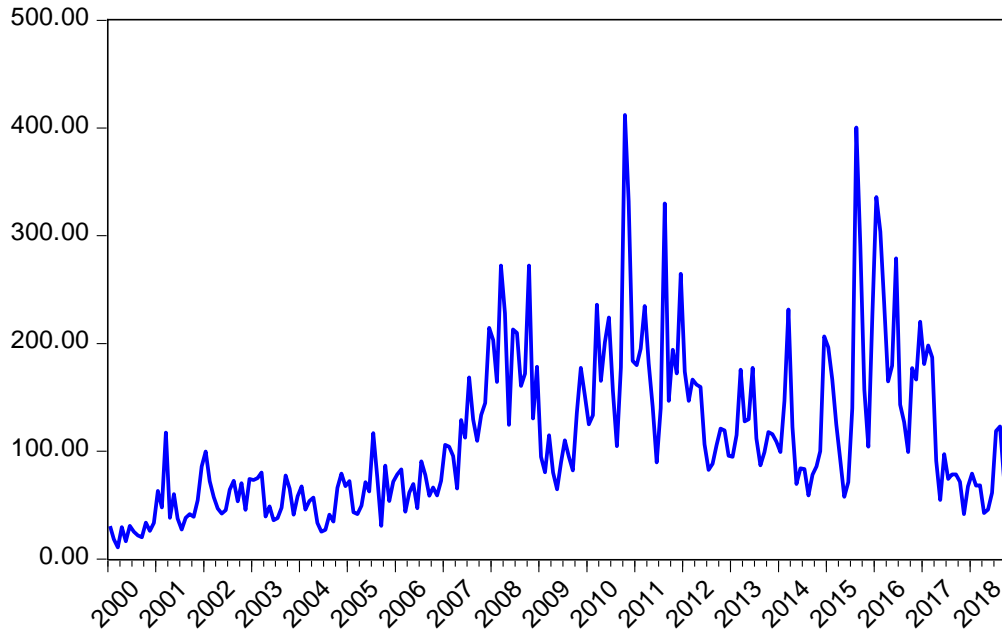
Note: The figure shows the monetary policy uncertainty index from January 2000 to October 2018. In 114 newspapers in mainland China, we search for articles which contain at least one keyword in each of the four criteria, namely (1) Economy, (2) Uncertainty, and (3) Policy in Table 1 and monetary policy terms in Table A1. We scale the number of articles in each month by the number of articles that meets criterion (1) for the same month. We then standardize the series to have a standard deviation of unity during the period from January 2000 to December 2011. We compute the simple average of the monthly series across all newspapers and normalize it to have an average value of 100 in the period from January 2000 to December 2011.

Figure A4: Trade Policy Uncertainty Index



Note: The figure shows the trade policy uncertainty index from January 2000 to October 2018. In 114 newspapers in mainland China, we search for articles which contain at least one keyword in each of the four criteria, namely (1) Economy, (2) Uncertainty, and (3) Policy in Table 1 and trade policy terms in Table A1. We scale the number of articles in each month by the number of articles that meets criterion (1) for the same month. We then standardize the series to have a standard deviation of unity during the period from January 2000 to December 2011. We compute the simple average of the monthly series across all newspapers and normalize it to have an average value of 100 in the period from January 2000 to December 2011.

Figure A5: Exchange Rate and Capital Account Policy Uncertainty Index



Note: The figure shows the exchange rate and capital account policy uncertainty index from January 2000 to October 2018. In 114 newspapers in mainland China, we search for articles which contain at least one keyword in each of the four criteria, namely (1) Economy, (2) Uncertainty, and (3) Policy in Table 1 and exchange rate and capital account policy terms in Table A1. We scale the number of articles in each month by the number of articles that meets criterion (1) for the same month. We then standardize the series to have a standard deviation of unity during the period from January 2000 to December 2011. We compute the simple average of the monthly series across all newspapers and normalize it to have an average value of 100 in the period from January 2000 to December 2011.

A.2 List of 114 Newspapers

Table A2: List of 114 Newspapers

Anhui Commercial News	Information Daily	Shantou Te Qu Evening Post
Anhui Daily	Information Times	Shanghai Morning Post
Bandao Metropolis	Jiang Nan City Daily	Shantou City Daily
Beijing Daily	Jiang Nan Evening News	Shanxi Daily
Beijing Daily Messenger	Jiang Nan Times	Shenyang Daily
Beijing Evening News	Jianghuai Morning Post	Shenyang Evening News
Beijing Morning Post	Jiangxi Daily	Shenzhen Evening News
Beijing Times	Jiefang Daily	Shenzhen Special Zone Daily
Beijing Youth Daily	Jinan Daily	Shijiazhuang Daily
Changjiang Daily	Jinling Evening News	Sichuan Daily
Changsha Evening Newspaper	Kunming Daily	Southern Metropolis Daily
Chengdu Business Daily	Lanzhou Daily	Strait News
Chengdu Evening News	Lanzhou Evening News	The Beijing News
China Youth Daily	Lanzhou Morning Post	The First
Chongqing Evening News	Liao Shen Evening News	The Mirror
Chongqing Morning Post	Liaoning Daily	Tianjin Daily
Chuncheng Evening News	Luzhong Morning Post	Today Evening Post
Chu Tian Golden News	Modern Evening Times	Wen Hui Daily
Chu Tian Metropolis Daily	Modern Life Daily	Western China Metropolis Daily
Dahe Daily	Morning Express	Wuhan Evening News
Daily Sunshine	Morning Post	Wuhan Morning Post
Dalian Daily	Nan Fang Daily	Wuxi Daily
Dalian Evening News	Nanguo Morning News	Xi'an Daily
Dazhong Daily	Nanjing Daily	Xi Bu Business
Dianchi Morning News	New Express Daily	Xi'an Evening News
Du Shi Shi Bao	Ningxia Daily	Xihai Dushi Bao
Fujian Daily	Nong Cun Da Zhong	Xining Evening News
Gansu Daily	Oriental Morning Post	Xinmin Evening News
Guangming Daily	Peninsula Morning	Yangcheng Evening News
Guangxi Daily	People's Daily	Yangcheng Evening News (Dongguan)
Guangzhou Daily	People's Daily Overseas Edition	Yangcheng Evening News (Foshan)
Haikou Evening News	Qianjiang Evening News	Yangcheng Evening News (Shenzhen)
Hainan Daily	Qilu Evening News	YangTse Evening News
Harbin Daily	Qingdao Daily	Yanzhao Evening News
Hefei Evening News	Qinghai Daily	Yinchuan Evening News
Henan Business Daily	San Qin Du Shi Bao	Youth Daily
Henan Daily	Sanxia Evening News	Yunnan Daily
Hubei Daily	Shantou Daily	Zhejiang Daily

A.3 Additional Robustness Checks

Apart from the media bias index, we partition the 114 papers in two other ways. First, we split the newspapers by ownership type into Party Dailies, Party Evenings and Subsidiaries, following the classification of Qin et al. (2018).¹⁹ Qin et al. (2018) find that Party Dailies tend to produce most biased contents, whereas Subsidiaries least. Among our dataset, we have 39 Party Dailies, 12 Party Evenings and 63 Subsidiaries. Table A3 displays the correlations of the indices constructed using these three types of newspapers and shows very high similarity.

Table A3: Correlations by Newspaper Ownership Type

	(1)	(2)	(3)	(4)	(5)
(1) Benchmark Index	1.00				
(2) 114-newspaper Index	0.96	1.00			
(3) Party Dailies Index	0.91	0.95	1.00		
(4) Party Evenings Index	0.92	0.95	0.88	1.00	
(5) Subsidiaries Index	0.94	0.99	0.90	0.93	1.00

Note: This table shows the correlation matrix among our benchmark index, 114-newspaper index, party dailies index, party evenings index, and subsidiaries index from January 2000 to October 2018. These indices are constructed by the authors. All correlations are significantly different from zero at the 1 per cent level.

Second, Qin et al. (2018) and Yuan (2016) provide evidence that lower-level governments produce less-biased newspapers. We classify the newspapers according to the rank of the supervising Chinese Communist Party Committee (CCPC) into National, Province and Prefecture newspapers and construct an EPU index for each type of newspaper. Our sample has 4 Central, 71 Provincial and 39 Prefectural newspapers. The resulting correlations, reported in Table A4, again show high similarity, which means that media censorship is not important in our context.

¹⁹ Party Dailies are government official mouthpiece administered by the Publicity Department of the CCPC. Party Evenings (including Evenings and Metros) are directly owned by CCPCs but are less controlled in terms of both editorial policies and managerial autonomy. Subsidiaries are owned by parent newspapers and are more commercial in nature.

Table A4: Correlations by Supervising CCPC Rank

	(1)	(2)	(3)	(4)	(5)
(1) Benchmark Index	1.00				
(2) 114-newspaper Index	0.96	1.00			
(3) Central Index	0.81	0.79	1.00		
(4) Provincial Index	0.96	0.99	0.79	1.00	
(5) Prefectural Index	0.88	0.95	0.68	0.91	1.00

Note: This table shows the correlation matrix among our benchmark index, 114-newspaper index, central index, provincial index, and prefectural index from January 2000 to October 2018. These indices are constructed by the authors. All correlations are significantly different from zero at the 1 per cent level.

A.4 Sentiment Analysis

To compare the sentiment of news reported by mainland and Hong Kong media, we conduct sentiment analysis using news texts in two regions. Specifically, we study the sentiment of news articles towards six events related to mainland China and international crisis, namely China accession to WTO, share-trading reform, subprime mortgage crisis, European debt crisis, RMB exchange rate reform and the unsuccessful launch of circuit-breaker mechanism. Following Luk et al. (2018), we use the following 10 Hong Kong Chinese-language newspapers: *Wen Wei Po*, *Sing Pao*, *Ming Pao*, *Oriental Daily*, *Hong Kong Economic Journal*, *Sing Tao Daily*, *Hong Kong Economic Times*, *Apple Daily*, *Hong Kong Commercial Daily*, and *Ta Kung Pao*. The newspaper articles are available at *Wisers Information Portal*. Our sentiment analysis is conducted with the following steps:

- (1) For the 10 mainland newspapers and for each event, we search for articles from 2000 to 2018 that contain at least one keyword in each of criteria (1) - (3) listed in Table 1, together with at least one keyword for the event (keywords are listed in Table A5). We download the full text of these news articles.
- (2) For the 10 Hong Kong newspapers, we do a similar search, but include an additional criterion that the article must contain the regional term “Mainland China”, as shown in Table A5. This ensures that the news refers to mainland China. We download the full text of these news articles.
- (3) We use *Jieba*, a Chinese text segmentation module in *Python*, to segment text into words.²⁰
- (4) Words in the text are then partitioned into three groups, namely positive, negative and others. We use the *Commendatory and Derogatory Meaning of Chinese Words Dictionary* (Li, 2011). There are 5567 positive terms and 4468 negative terms in the dictionary.
- (5) We calculate the sentiment value by:

$$\textit{sentiment value} = \frac{\#positive\ words - \#negative\ words}{\#positive\ words + \#negative\ words}.$$

²⁰ We set the segmentation mode as accurate.

Table A5: Additional Keyword Terms for Annotated Events and Article Counts

Event	Region	Keyword Terms in Chinese	Article Counts
China Accession to WTO	Mainland China	中国加入 WTO/中国入世/中国加入世 贸组织/中国加入世界贸易组织	535
	Hong Kong	(中国/内地/大陆) and (中国加入 WTO/中国入世/中国加入世贸组织/ 中国加入世界贸易组织)	1221
Share-trading Reform	Mainland China	股权分置	685
	Hong Kong	(中国/内地/大陆) and (股权分置)	359
Subprime Mortgage Crisis	Mainland China	次贷危机/次级房屋借贷危机	2286
	Hong Kong	(中国/内地/大陆) and (次贷危机/次级 房屋借贷危机)	375
European Debt Crisis	Mainland China	欧债危机/欧洲主权债务危机	2554
	Hong Kong	(中国/内地/大陆) and (欧债危机/欧洲 主权债务危机)	4515
RMB Exchange Rate Reform	Mainland China	人民币汇率改革/人民币汇改	302
	Hong Kong	(中国/内地/大陆) and (人民币汇率改 革/人民币汇改)	563
Circuit- breaker Mechanism	Mainland China	熔断机制	169
	Hong Kong	(中国/内地/大陆) and 熔断机制	397

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