

Economic Policy Uncertainty in China Since 1949: The View from Mainland Newspapers

By Steven J. Davis*, Dingqian Liu[§] and Xuguang S. Sheng[§]

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Abstract: We quantify economic policy uncertainty (EPU) in China since 1949, as filtered through the lens of two leading mainland newspapers. Like Baker, Bloom and Davis (BBD), we use scaled frequency counts of newspaper articles that contain selected terms to quantify EPU. Unlike BBD, we rely on natural language processing tools to help select policy-relevant terms. Our evidence suggests that mainland newspapers yield a reasonable proxy for EPU in China since the mid 1990s and possibly earlier. Our index is highly elevated during the Korean War, rises sharply in 1979 amidst tensions over market-based reforms and responds to many other domestic and foreign developments that include Ronald Reagan's election as U.S. President in 1980, political battles over the role of market forces in 1986-1987, German reunification in 1990, the Global Financial Crisis of 2008-2009, and, especially, rising trade policy tensions in 2017-2018. In VAR models fit to data since 1992, surprise increases in our EPU index foreshadow deteriorations in China's economic performance. Our trade policy uncertainty index for China skyrockets in 2018. Contemporaneously, Chinese firms with high sales to the U.S. saw large negative equity returns and large increases in return volatilities relative to other Chinese firms.

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* William H. Abbot Distinguished Service Professor of International Business and Economics at the University of Chicago Booth School of Business, Senior Fellow at the Hoover Institution, and Research Associate of the National Bureau of Economic Research.

Webpage: <http://faculty.chicagobooth.edu/steven.davis/>.

[§] Department of Economics, American University.

I. Introduction

We quantify policy-related economic uncertainty in China over the past 70 years, as filtered through the lens of two leading mainland newspapers: the *Renmin Daily* and the *Guangming Daily*. In designing our newspaper-based measures, we aim to encompass uncertainty about *who* will make economically relevant policy decisions, *what* policy actions will be undertaken and *when*, and the economic *effects* of policy actions (or inaction). We construct monthly measures of overall economic policy uncertainty and trade policy uncertainty in China from 1949 onwards.

Recent Chinese history offers fertile ground for the study of policy uncertainty, its economic effects, and its coverage in state-controlled newspapers. After World War II, the Communists and Nationalists resumed their civil war for control of China. The Communists prevailed on the mainland, establishing the People's Republic of China in October 1949. Later episodes of intense political turmoil, social conflict and economic upheaval include the Great Leap Forward of 1958-62 (the Party's moves to collectivize agriculture and force-march the industrialization process) and the Cultural Revolution of 1966-76 (characterized by large-scale purges within the Communist Party, violent struggles in the broader society, a virtual halt to higher education, and the forcible relocation of millions of urban youth to rural areas).¹ From late 1978, China began opening to the outside world and shifting to a more market-oriented economy. Policy reforms led to an extraordinary forty-plus years of rapid growth, the largest rural-to-urban migration in human history, China's emergence as one of the two largest national economies, and recent tensions with the United States that may presage a longer-term strategic rivalry.²

Against this extraordinary backdrop, questions abound about the extent, nature and effects of policy uncertainty. We use the output of our measurement efforts to cast light on several questions: Do mainland newspapers provide a reliable basis for assessing economic uncertainty in China? How has policy uncertainty in China moved over time, and what do those movements portend for later economic performance? How has trade policy uncertainty behaved over time, and

¹ Among many other sources on the Great Leap Forward and the Cultural Revolution, see the edited volumes by MacFarquhar and Fairbank (1987, 1991).

² For broad treatments of Chinese economic reforms and the development process since the late 1970s, see Brandt and Rawski (2008), Chow (2015) and Yueh (2013). On China's great migration during its economic transformation, see Zhang and Song (2003).

how important has it been as a source of overall policy uncertainty in China? Finally, how do the stock returns of Chinese firms react to trade policy uncertainty?

To construct our economic policy uncertainty (EPU) index for China, we follow Baker, Bloom and Davis (2016) in using scaled frequency counts of newspaper articles that contain selected terms about economics, policy and uncertainty. We differ in our approach to the selection of terms. They rely on human readings of 12,000 randomly sampled articles to populate a list of candidate policy terms. They then select the permutation of candidate terms that minimizes the sum of false positives and false negatives in computer-automated classifications compared to human classifications.³ We instead use tools from natural language processing (NLP) to help select our policy-related terms. The NLP approach is much less labor intensive than the Baker et al. approach, which requires thousands of person hours to execute at scale.

Our China EPU index is highly elevated during the Global Financial Crisis of 2008-09 and especially in 2017 and 2018 as U.S.-China conflicts over trade and commercial policies intensified. In these and other respects, our index is broadly similar to the China EPU index in Baker et al. (2013) from 1995 onwards, the first year covered by their index. They rely on the *South China Morning Post*, Hong Kong's leading English-language newspaper, to construct their index. Since Hong Kong has a free press tradition, we regard this broad similarity as evidence that our EPU measure based on mainland newspapers offers a reasonable proxy for movements in economic policy uncertainty in China since the mid 1990s and possibly earlier.⁴

Partly on this basis, we investigate the dynamic relationship of policy uncertainty to China's aggregate economic performance since 1992. In VAR models fit to quarterly data, surprise increases in policy-related economic uncertainty foreshadow deteriorations in China's economic performance. This finding is in line with similar results for several other countries,⁵ and it

³ BBD use this procedure to select the "Policy" terms for their newspaper-based Economic Policy Uncertainty Index. Their approach to selecting terms in "Economy" and "Uncertainty" is similar in spirit but much less formal. We also take an informal approach to selecting our "Economy" and "Uncertainty" terms.

⁴ Some expressed concerns about how Alibaba's acquisition of the *South China Morning Post* would affect its coverage of politically sensitive issues and developments on the Chinese mainland. However, we see no evidence that Alibaba's acquisition led to less coverage of economic uncertainties in mainland China. In fact, our China EPU index rose sharply after the acquisition, reaching historic peaks in 2018.

⁵ A partial list includes Colombo (2013) for the European Union, Baker et al. (2016) for the United States and a panel of twelve countries, Arbatli et al. (2017) for Japan, Moore (2017) for Australia, Hardouvelis et al. (2018) for Greece, and Ghirelli et al. (2019) for Spain.

reinforces our view that mainland newspapers are useful for assessing policy-related uncertainty and its effects since 1992.

In contrast, our newspaper-based EPU index appears to offer an incomplete and tilted barometer of economic policy uncertainty in China in earlier decades. We reach this conclusion for multiple reasons. First, articles about economic matters accounted for a smaller share of all articles before the 1990s, and were much fewer in number than in more recent decades. Second, among mainland newspaper articles published before 2000 that discuss economics, less than 1% mention policy uncertainty – despite great economic upheaval during much of the earlier period. Third and related, politically sensitive developments associated with the Great Leap Forward and the Cultural Revolution leave little trace in our policy uncertainty measures. The obvious inference is that state-controlled newspapers ignored or greatly downplayed the economic uncertainties associated with these developments due to their politically sensitive nature. Nevertheless, other sources of policy-related economic uncertainty leave clear tracks in our China EPU Index, even before 1978. Examples include the Korean War in the early 1950s, and the Vietnam War in the mid 1960s. For the period from 1949 to 1978, our China EPU Index may be most useful as a tool for exploring which sources of policy-related economic uncertainty received attention in state-controlled newspapers, and which did not.

Our paper relates to several literatures. First, many recent studies use text-based methods to quantify economic uncertainty and related concepts. In this respect, we borrow from and build on the newspaper-based approach of Baker, Bloom and Davis (2016). The index developed by Baker et al. (2013) is the earliest antecedent to our China EPU Index. Unlike Baker et al. (2013), we rely on mainland newspapers and use NLP methods to help select policy-related terms. We also use NLP methods to devise an index of trade policy uncertainty for China. In work contemporaneous to ours, Huang and Luk (2018) apply BBD methods to construct policy uncertainty indexes for China using ten mainland newspapers. Notably, our China EPU index starts in 1949, whereas the indexes of Baker et al. (2013) and Huang and Luk (2018) start in 1995 and 2000, respectively. See Datta et al. (2017) for an extensive survey of text-based and other approaches to measuring economic uncertainty and related concepts. PolicyUncertainty.com provides monthly newspaper-based EPU indices for more than 20 countries and dozens of other text-based measures of economic uncertainty.

Second, there is a broader literature on the effects of policy uncertainty. Friedman (1968), Rodrik (1991), and Higgs (1997) offer early contributions. In more recent work, Brogaard and Detzel (2015) find that policy uncertainty reduces asset returns, Handley and Limao (2015) find that uncertainty related to trade policy delays firm entry, BBD (2016) and Gulen and Ion (2016) find negative responses of corporate investment to newspaper-based indexes of policy uncertainty, Yulio and Yook (2016) find evidence that political uncertainty deters or delays foreign direct investment. BBD and Hassan et al. (2019) find that higher policy uncertainty slows employment growth and raises stock price volatility for American firms. Hassan et al. also find that firms respond to higher policy uncertainty by raising their lobbying expenditures and directing it towards policy matters that they see as the source of elevated uncertainty. BBD (2016) and Arbatli et al. (2017) are among several recent studies that find that higher policy uncertainty foreshadows lower investment in aggregate time-series models. On the theoretical side, Born and Pfeifer (2014) and Fernandez-Villaverde et al. (2015) study policy uncertainty in DSGE models, finding moderately negative effects, while Pastor and Veronesi (2012, 2013) model the links among aggregate fluctuations, policy uncertainty, and stock market volatility.

Third, there is a now-vast literature on the economic effects of uncertainty more generally. Dixit and Pindyck (1994) provide an outstanding analysis of investment under uncertainty when investment decisions are costly to reverse. Early work on investment under uncertainty is largely theoretical. More recently, empirically oriented research on uncertainty and its relationship to aggregate and firm-level outcomes has expanded rapidly. See Bloom (2014).

The next section explains how we construct our China EPU index. Section II considers the behavior of our China EPU index over time and compares it to other policy uncertainty measures. Section IV develops our trade policy uncertainty index for China and investigates its relationship to firm-level stock prices and return volatilities. Section V considers how China's aggregate economic performance evolves in the wake of Cholesky-identified innovations in economic policy uncertainty. Section VI offers concluding remarks.

II. Measuring Economic Policy Uncertainty in China

1. Newspaper Text Sources

Our EPU index for China relies on the complete set of articles published by two leading mainland newspapers from October 1949 to the present. We obtained electronic copies of articles in the *Renmin Daily* for 1949 to 2006 from the National Library of China and for 2007 to 2016 from the newspaper's own archives at <http://data.people.com.cn>. From 2017 onwards, we scrape raw text files of articles from the paper's website at <http://paper.people.com.cn>. We obtained electronic copies of articles in the *Guangming Daily* for 1949 to 2007 from the U.S. Library of Congress. From 2008 onwards, we scrape raw text files of articles from the paper's website at <http://epaper.gmw.cn/gmrb>.

2. Mechanics of Index Construction

To construct our EPU index for China, we first obtain monthly counts of articles that contain at least one term in each of three term sets: **E**conomics, **P**olicy, and **U**ncertainty. Table 1 reports the terms in each set using Chinese characters and the corresponding English translations. In a second step, we scale the raw monthly EPU counts by the number of total articles for the same newspaper and month. Third, we divide the sample into three periods: the era of central planning (1949-1978), the reform and opening-up period (1979-1999), and the globalization era (2000 onwards). In addition to their distinct economic characteristics, newspaper practices differ markedly in each period, as we show shortly. In a fourth step, we standardize each newspaper's monthly series of scaled frequency counts to have a unit standardization. We perform this standardization operation separately in each period, using data from 2000 to 2018 for the globalization era. Fifth, we compute the simple average of the standardized series over newspapers by month. In a final step, we normalize each period's index value to an average of 100. For the globalization era, we normalize to 100 from 2000 to 2018. These mechanics follow Baker, Bloom and Davis (2016).

3. Term Set Selection Methods

Like BBD, we use judgement and informal auditing to select the terms in our **E** and **U** sets. We differ from BBD in our approach to the selection of terms in our **P** set. They rely on human readings of 12,000 randomly sampled articles to populate a list of candidate policy terms. They

then select the permutation of candidate terms that minimizes the sum of false positives and false negatives in computer-automated classifications compared to human classifications. We instead use tools from natural language processing (NLP) to select a candidate list of policy-related terms, which we then prune on a judgmental basis. The NLP approach is much less labor intensive than the Baker et al. approach, which requires thousands of person hours to execute at scale.]

The text sources we use to develop a candidate list of policy-relevant terms are the *Annual Government Work Reports* (政府工作报告), which are available for 50 individual years since 1954 (1954-1960, 1964, 1975, 1978-2018).⁶ This annual report is delivered by the Premier of China to the public. The report reviews the economic policy and its impact in the past year and discusses the outlook for the economic and social development in the coming year. As a preliminary step, we segment the Chinese character strings in these reports into individual words, phrases and names. In a second step, we apply a standard NLP algorithm to identify highly relevant terms. In a third step, we judgmentally prune this list of terms. We now describe the process in greater detail.

In written Chinese, the smallest text unit is a character that typically represents one syllable of a spoken word or a whole word. Chinese sentences are written as a continuous stream of such characters. (In contrast, the smallest text unit in English and other Latin languages is an alphabet letter, letters are strung together to form words, and words in a sentence are separated by spaces.) New words and named entities (organizations, persons, locations, and so on) are formed by particular character sequences. There can be more than one way to render a particular sequence of Chinese characters into specific words, phrases and entities. To deal with this matter, we first slice the Chinese-language document into a bag of words and multi-word names and phrases following the algorithm of Sun, Wang and Li (2012). We tried two Chinese word segmentation packages in Python, *jieba* and *pkuseg*, which yielded very similar results.

After this word segmentation operation, we apply the *TextRank* algorithm of Mihalcea and Tarau (2004) to identify policy-relevant words and phrases (hereafter, “terms”). *TextRank* is related to the algorithm of Brin and Page (1998) for ranking webpages. It assigns a value to each term based on its overall correlation with other terms in the same underlying document or library.

⁶ See <http://english.gov.cn/govtworkreport2019/> for more information about these reports.

Using this algorithm, we identified highly relevant terms in each *Annual Report*, and we then considered the union of these high-relevancy term sets. In a final step, we judgmentally pruned this list to remove non-policy terms (e.g., “the economy”) and terms with high potential for false positives. The **P** term set reported in Table 1 is the result.

We will consider three modifications and alternatives to our current approach for selecting terms in the **P** set. First, we plan to experiment with allowing the **P** set to vary across the three eras described above. Second, we are working with other NLP algorithms for term set selection. Third, as a robustness check, we plan to construct an expert-driven choice of **P** terms by consulting authoritative books and articles that discuss economic policy developments in China.

4. A Preliminary Look at the Data

Table 2 summarizes some basic features of our text corpus. Daily article counts and the share of articles devoted to economic matters are both low in the Central Planning Era (1949-1978). The number of articles per day rises sharply in the Reform and Opening Up Period (1978-1999) and rises further in the Globalization Era (2000 onwards). Economics also receives discussion in a greater share of the articles in our newspapers after 1978. Figures A.1 to A.3 provide time-series data corresponding to the statistics reported in rows (a), (b) and (d) of Table 2.

The evidence in Table 2 tells us that newspaper coverage shifted to economic matters after 1978 and has devoted greater attention to economic policy uncertainty in the Globalization Era. In view of these patterns and the tremendous economic and social changes in China since 1949, we divide our sample in the three periods delineated before.

III. The Behavior of Our Economic Policy Uncertainty Index

1. EPU in Three Eras

To better understand the key events associated with many spikes, we separate the EPU index into three episodes: the Centrally Planned Economy (1949-1978), the Reform and Opening-up (1979-1999), and the Globalization Era (2000-2018). We normalize the index to have an average value of 100 for each sample period, respectively. We read 2,866 EPU-related articles and identify the major events leading to jumps in our EPU index. To successfully translate those events

in Chinese into English, we refer to the well-known handbook - The Cambridge History of China (volumes 14 and 15). Figures 1-3 plot the EPU index with English annotations and Figures A5-A7 in the appendix label the key events with Chinese annotations.

During the Centrally Planned Economy (Figure 1), most of jumps in the EPU index are associated with domestic events, such as land reform for collective ownership, reflection for the first five-year plan for social and economic development, and the beginning of Cultural Revolution. We also see spikes that coincide with two wars – Korean War and Vietnam War.

For the Reform and Opening-up episode, as shown in Figure 2, the index reflects key domestic policy changes from the centrally planned economy to the market economy, including the contradiction between market and excessive centralization, the political battle over the role for market forces, price reform, and the declaration of Chinese enterprise law. It also shows clear spikes that coincide with key international events such as Regan election, German unification, concerns about Eurozone, and the US-Japan trade dispute on autos.

Figure 3 plots the evolution of China EPU index during the Globalization Era. In contrast to the previous two episodes, almost all of the spikes since 2000 are caused by international events, e.g. Iraq invasion, Latin American & Caribbean elections, U.S. subprime mortgage crisis and Europe debt crisis. Notably, the index reaches its historical high levels during the last two years because of huge uncertainty surrounding Brexit, the rising populism in major European countries, and Trumpian policy, especially trade policy.

2. Comparisons to Other China EPU Indexes

We compare our index with two other EPU indexes available for China: the index of Baker, Bloom and Davis (2016), and the index of Huang and Luk (2018).

Using a similar methodology, Baker, Bloom and Davis (2016) propose a policy uncertainty index for China based on a Hong Kong English newspaper *South China Morning Post* (SCMP) since 1995. As shown in Figure 4, both indexes tend to move together, and the correlation between them is 0.83. There are some important divergences, however. For example, both indexes jump during U.S. subprime mortgage and financial crisis during March to October 2008. For the following global financial crisis in 2009, our uncertainty index surges again, but the SCMP-based

index remains at low levels. To understand these differences, note that our mainland China newspapers are Chinese government mouthpieces and may thus reflect policy makers' own uncertainty. By contrast, the SCMP-based index reflects more of an outsider perspective on aspects of China EPU that intersect with foreign-editor interests and concerns. In that respect, the external index is conceptually distinct. For an insightful discussion of the newspaper industry in China that includes efforts to quantify the extent and nature of political bias in mainland Chinese newspapers and an analysis of how commercial pressures constrain bias in newspaper content, see Qin, Strömberg and Wu (2018).

In work contemporaneous to ours, Huang and Luk (2018) also apply BBD methods to construct a China EPU index using ten mainland newspapers since 2000. Before 2017, their index moves closely with our EPU index. During 2017-18, however, their index remains at low levels, despite the huge uncertainty surrounding Brexit and Trumpian policy, especially the trade conflict with China. One possible explanation the discrepancy is that, when constructing the overall EPU index, they scale the raw EPU articles by the total number of articles that contain "E" terms, rather than the total number of articles as in our measure and in BBD. To explore this possibility, we reconstruct our index by rescaling the raw EPU articles using the total number of "E" articles in both *Renmin Daily* and *Guangming Daily*. The rescaled and reconstructed series are almost identical to our reported EPU measure, with the correlations of 0.96-0.97. Thus, this possibility can be safely ruled out. Another possible explanation lies in the quality of their online data source, WiseNews. For ten newspapers used in their study, there exist inconsistencies between online and printed versions of some newspapers and missing articles on certain days/months. By contrast, we carefully check the articles in the printed version of two mainland China newspapers and fill in the missing values using various sources.

3. Comparison to Other Uncertainty Measures

The next draft will compare our China EPU Index to realized stock price volatility in China and perhaps to other proxies for economic uncertainty in China.

IV. Measuring Uncertainty for Narrower Policy Categories: Trade Policy Uncertainty

1. Index Construction and Its Properties

Since Donald Trump took office, he has upended U.S. trade policy, including withdraws from the Trans-Pacific Partnership (TPP), a refusal to affirm new WTO judges, tariff hikes on steel and other goods, frequent rhetorical attacks on major trading partners, and a wrong-headed obsession with bilateral trade deficits. The rhetorical attacks and capricious nature of the Trumpian approach to tariff policy also invites retaliation. Tit-for-tat tariff hikes between the United States and China are well underway, leading to a tremendous, Trumpian upsurge in anxiety and uncertainty about trade policy and its economic fallout; see, e.g. Davis (2018).

Using similar methods, we develop trade policy uncertainty index for China by specifying more restrictive criteria for those articles that contain our triple of terms about the ‘Economy’, ‘Uncertainty’, and ‘Trade Policy’. To generate suitable terms for our Trade Policy term set, we take the same approach as in developing our **P** term set. Now, however, we apply our NLP methods to the *Semi-Annual Reports on China’s Foreign Trade* (中国对外贸易形势报告) from 2003 to 2018, published by The Ministry of Commerce of the People’s Republic of China. The spring report evaluates the achievements of China’s foreign trade progress in the previous year and analyzes the current international trade environment. The fall report reviews the current year’s trade policy and describes the global trade outlook for the next year.

Figure 5 plots the trade policy uncertainty index for China since January 2000. Besides the spikes that coincide with those in EPU, trade-specific shocks and policy initiatives are clearly visible. For instance, the index increases in March 2001 during China accession to WTO, more than doubles its historical average when Trump takes office and withdraws from the TPP, and surges during the recent escalation of trade policy tensions between U.S. and China.

Trade policy concerns have been a tiny source of uncertainty for the Chinese economy in recent decades except in (i) the period around China accession to WTO and (ii) the period since Donald Trump’s election as U.S. President. Since U.S.-China trade frictions escalated in March 2018, trade policy gets attention in half of all articles about economic policy uncertainty in mainland China’s leading newspapers; see Table 4 and Figure A.4. Trade policy concerns loom

much larger in China, Japan and other trade-sensitive economies, compared to U.S. According to Davis (2018), questions about “recently announced tariff hikes and concerns about retaliation” in the July 2018 Survey of Business Uncertainty suggest an effect on U.S. domestic business investment in 2018-19 in the range of minus 3-4%. Considering the larger dependence of Chinese economic growth on international trade than U.S., recent trade policy battle will have much bigger direct near and medium effects on domestic investment and output growth in China.

2. Trade Policy Uncertainty and the Stock Return Behavior of Chinese Firms

In Progress

Figure 6: China Stock Market Performance in 2018 by Exposure to U.S. Sales. This figure to show the monthly returns of listed firms sorted by the share of their revenues from sales to the U.S.

Figure 7. Equity Returns in 2018 for Chinese Firms by U.S. Revenue Share

Show a scatter plot of (a) firm-level equity returns from the end of 2017 to the end of 2018 on the vertical scale against (b) the firm’s share of revenues from the U.S. for 2018 (or most recently available year).

Regress firm-level equity returns on TPU interacted with U.S. revenue share as follows:

- Let R_{it} = equity returns of firm i in month t . (Compute from closing price at the end of $t-1$ to closing price at the end of t .)
- Let RV_{it} = realized volatility returns for firm i in month t . (Compute as standard deviation of daily returns within month t .)
- Let TPU_t = Trade Policy Uncertainty index value in month t .
- Let US_i = U.S. revenue share of firm i in 2018 or most recently available year.
- Using monthly data from 2015 to the most recently available month (into 2019, if we have data), run the following regression:

$$R_{it} = F_i + F_t + \beta US_i TPU_t + \varepsilon_{it}$$

Figure 8. Firm-Level Volatility Change from 2015 to 2018 and U.S. Revenue Share

Show a scatter plot of (a) the change from 2018 to 2015 in realized firm-level equity returns volatility against (b) the firm’s share of revenues from the U.S. for 2018 (or most recently available year).

Regress firm-level volatility on TPU interacted with U.S. revenue share as follows

$$RV_{it} = F_i + F_t + \beta US_i TPU_t + \varepsilon_{it}$$

Try adding lagged values of $US_i TPU_t$ in the realized volatility regressions as well. (Lagged values aren’t likely to matter in the returns regression, but they may in the volatility regressions.)

V. Policy Uncertainty and Aggregate Economic Performance

We consider VAR models that yield output responses to Cholesky-identified EPU innovations. Specifically, we estimate VAR models using data on real GDP growth, inflation, monetary policy rate, stock market return and EPU. We perform careful transformations and normalization of the original series, as documented in Table 5. As aptly pointed out by Higgins, Zha and Zhong (2016), the impact of interest rates (e.g. the 7-day repo rate in the national interbank market or 1-year benchmark deposit rate) on China aggregate economy is relatively muted, while changes in M2 growth have considerably larger impact. Following their suggestion, we use M2 growth as monetary growth rate for China, rather than the interest rate as commonly used for U.S. and other developed economies. Our sample for the baseline VAR model runs from 1992Q1 to 2017Q3 for quarterly data. We use one lag in all VAR specifications based on the Akaike and Schwarz information criteria. Our specifications rely on standard Cholesky decompositions to identify shocks, with China EPU ordered last unless noted otherwise.⁷

Figure 9(a) plots the impulse response function of real GDP (solid line with diamonds) to a unit standard deviation policy uncertainty shock. Real GDP displays a rapid fall of around 5% within 4 quarters, and takes about 3 years to recover from the shock. The 90% error bands (dashed lines) are plotted around this, showing that this decline is statistically insignificant. For comparison to a first-moment shock, the response to a 1% impulse to the M2 growth rate is also plotted (solid line). Following a positive monetary policy shock, real GDP increases, reaches its maximum after 3 quarters and recovers after 3 years, displaying a similar persistence pattern as in response to a policy uncertainty shock.

Figures 9(b) and 9(c) repeat the same exercise, when using the EPU index of Baker, Bloom and Davis (2016) and Huang and Luk (2018), respectively. We see similar impact of policy uncertainty shocks, albeit more statistically significant. Other researchers who use newspaper-based EPU indices in time-series analyses also find that policy uncertainty shocks foreshadow deteriorations in macroeconomic outcomes – examples include the IMF (2013), Colombo (2013), Caggiaono et al. (2014), Klössner and Sekkel (2014) Nodari (2014), and Moore (2017). For other

⁷ Our results are robust to the ordering of the variables, e.g. by placing China EPU first.

time-series analyses that investigate the effects of policy uncertainty on China's economic performance, see Arouri and Roubaud (2016), and Huang and Luk (2018).

VI. Concluding Remarks

We construct monthly indexes of economic policy uncertainty and trade policy uncertainty in China from October 1949 onwards, drawing on a text corpus of more than 3 million articles published in two leading mainland China newspapers. Compared to the existing measure through the eyes of foreign editors, our new index reflects the subjective uncertainty faced by Chinese policy makers. *To be continued.*

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Table 1. Term Sets for Economic Policy Uncertainty in China

Category	English Terms	In Chinese Characters
Uncertainty	uncertain/uncertainty/ not certain/unsure/ not sure/hard to tell/ unpredictable/unknown	不确定/不明确/不明朗/未明/ 难料/难以预计/难以估计/ 难以预测/难以预料/未知
Economics	economy/business	经济/商业
Policy	fiscal/monetary/ China Securities Regulatory Commission/ China Banking Regulatory Commission/ Ministry of Finance/ The People's Bank of China/ National Development and Reform Commission / Opening-up/ Reform/ Ministry of Commerce/ legislation/tax/ national bonds/government debt/ central bank/ Ministry of Commerce/ tariff/governmental deficit	财政/货币/证监会/银监会/财 政部/人民银行/国家发改委/ 开放/改革 /商务部/法律/法规 /税收/国债/政府债务/央行/外 经贸部/关税/政府赤字

Table 2. Articles by Newspaper and Era

	1949-1978: Central Planning		1979-1999: Reform and Opening Up		2000-2018: Globalization	
	<i>Renmin</i>	<i>Guangming</i>	<i>Renmin</i>	<i>Guangming</i>	<i>Renmin</i>	<i>Guangming</i>
(a) Articles Per Day	46	29	93	54	109	75
(b) Percent that contains a term in E	21.70%	16.75%	34.56%	23.18%	34.17%	30.47%
(c) Percent of E articles that contain a term in U	0.86%	0.93%	0.46%	0.84%	2.27%	3.06%
(d) Percent of E articles that contain a term in U and a term in P	0.36%	0.43%	0.41%	0.57%	1.92%	2.36%

Notes: Row (a) reports the mean number of articles per day for the indicated newspaper and era. Row (b) reports the percentage of all articles that contain at least one term in **E**. Among articles that contain at least one term in **E**, row (c) reports the percent that contain at least one term in **U**, and row (d) reports the percent that contain at least one term in **U** and in **P**.

Table 3. Term Sets for Trade Policy Uncertainty in China

Category	English Terms	In Chinese Characters
Uncertainty	uncertain/uncertainty/ not certain/unsure/ not sure/hard to tell/ unpredictable/unknown	不确定/不明确/不明朗/未明/ 难料/难以预计/难以估计/ 难以预测/难以预料/未知
Economics	economy/business	经济/商业
Trade Policy	import tariffs/ import duty/ import barrier/ WTO/ world trade organization (2)/ trade treaty/ trade agreement/ trade policy/ trade act/ Doha round/ Uruguay round/ GATT/ General Agreement on Tariffs and Trade/ dumping/ protectionism/trade barrier/ export subsidies	进口关税/进口税/进口壁垒/ WTO/世界贸易组织/世贸组织/ 贸易条约/贸易协定/贸易政策/ 贸易法/多哈回合/乌拉圭回合 /GATT/关贸总协定/倾销/ 保护主义/贸易壁垒/出口补贴

Table 4. Articles about Trade Policy Uncertainty as a Percent of All EPU Articles, Selected Times Periods for China, Japan and the United States

Time Period	United States	Japan	China
1987-2015	4%	8%	16%
2000-2015	2%	7%	18%
NAFTA: January 1992 to June 1995	11%	11%	10%
China WTO Accession: Jan 2000 to Dec 2002	3%	5%	32%
November 2016 to December 2018	9%	20%	39%
March-December 2018	15%	27%	48%
January-July 2019	12%	29%	42%
<i>NB</i> : Trade Volume as Percent of GDP, 2010-16			

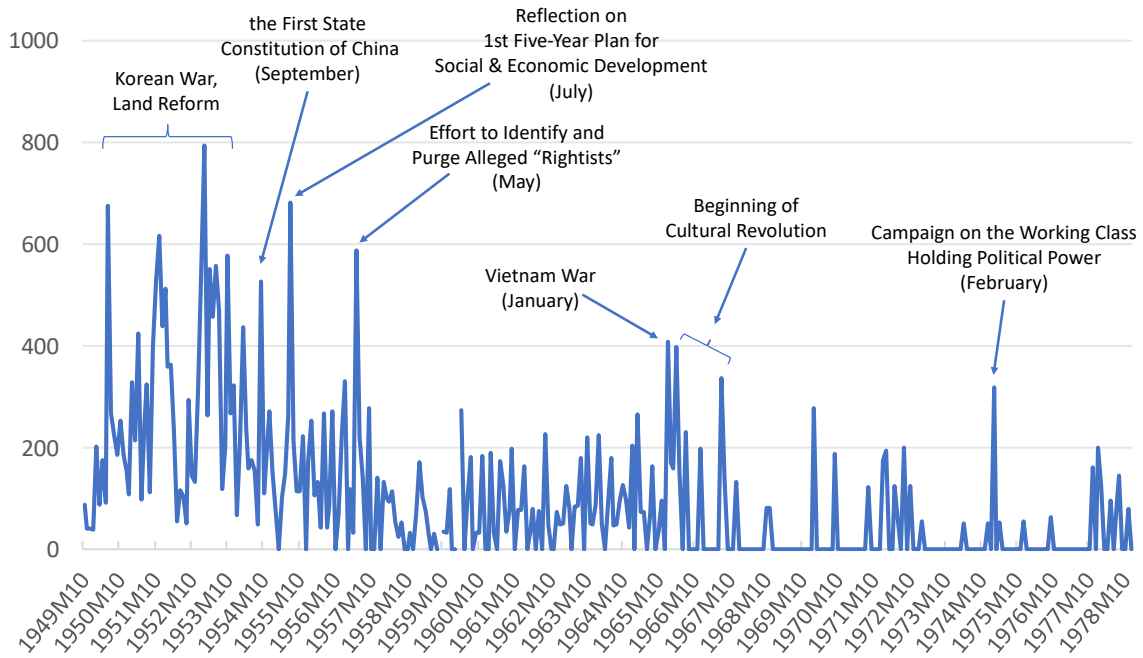
Note: For China, the table reports 100 times the ratio, (number of TPU articles)/(number of EPU articles), using article counts from the *Renmin Daily* and *Guangming Daily*. See Tables 1 and 3, respectively, for the terms that define EPU and TPU articles. For Japan and the United States, the table reports the percent of EPU articles that discuss trade policy matters. Data for Japan are from Arbatli et al. (2019). Data for the United States are updates of results in Baker, Bloom and Davis (2016). Data on the volume of trade in goods and services as a percent of GDP are from the World Bank, downloaded from <https://data.worldbank.org/indicator/ne.trd.gnfs.zs> on 5 April 2019.

Table 5. Variables Included in VAR

Variable	Transformation	Source Name	Source
Real GDP growth	1 st difference	logrealGDP_nipa	Atlanta FED
Inflation	1 st Difference of log(CPI)	CPI	Atlanta FED
Monetary Policy Rate	1 st Difference, unit standard deviation	logM2	Atlanta FED
Stock Market Return	$\frac{close\ price_{M3} - close\ price_{M1}}{close\ price_{M1}}$	SSE Composite Index	Tushare
EPU	Unit standard deviation	EPU	Authors' Calculation

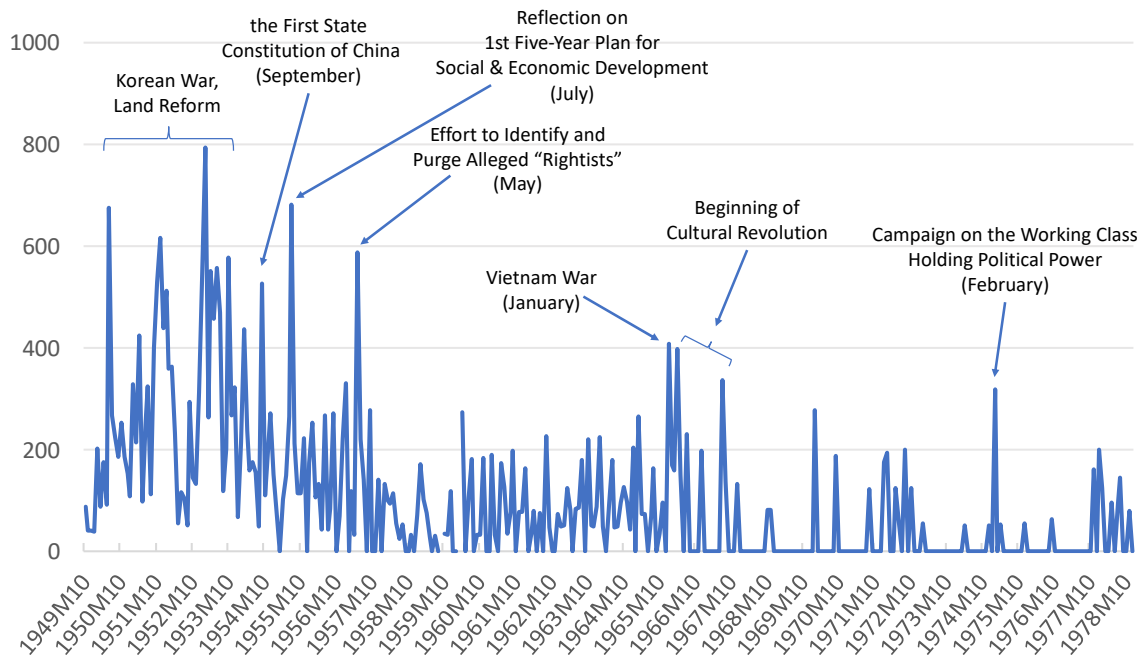
Note: Tushare is an open source package of Python, widely used in Quantitative Analysis of Finance in China.

Figure 1. Economic Policy Uncertainty in China: Centrally Planned Economy (1949-1978)



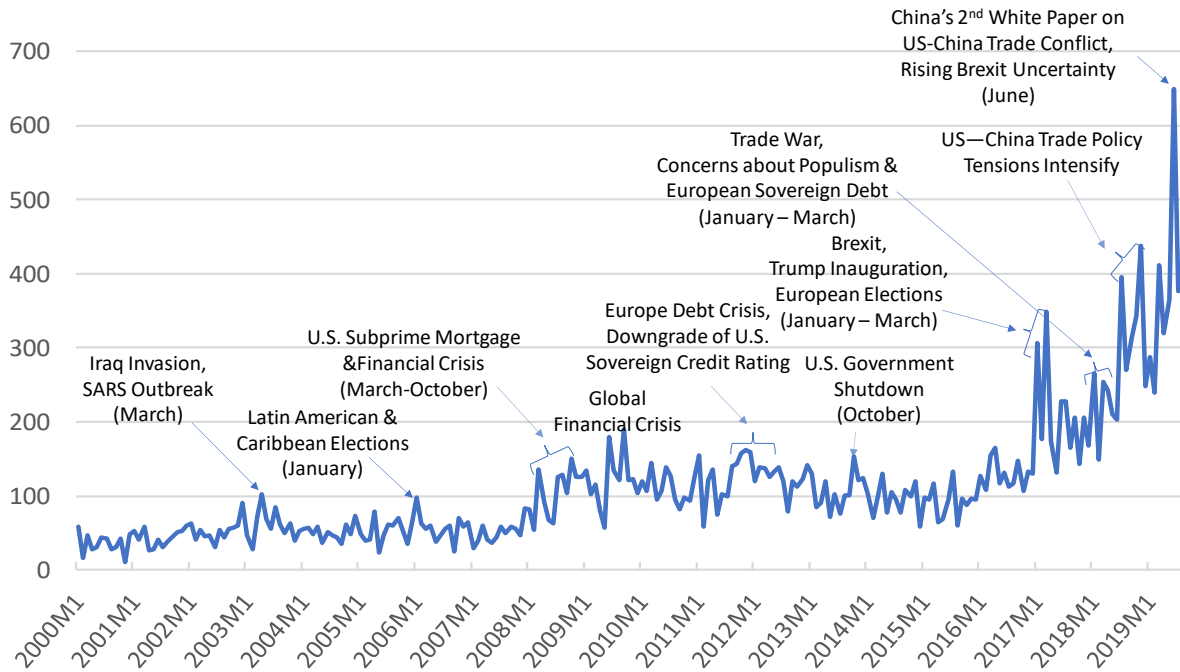
Note: Index reflects scaled monthly counts of articles containing at least one keyword in each of three categories: (i) Economic (ii) Policy and (iii) Uncertainty as specified in Table 1. The series is normalized to mean 100 from October 1949 to December 1978 and based on queries run on January 4, 2019 for the *Renmin Daily* and *Guangming Daily*.

Figure 2. Economic Policy Uncertainty in China: Reform and Opening-up (1979-1999)



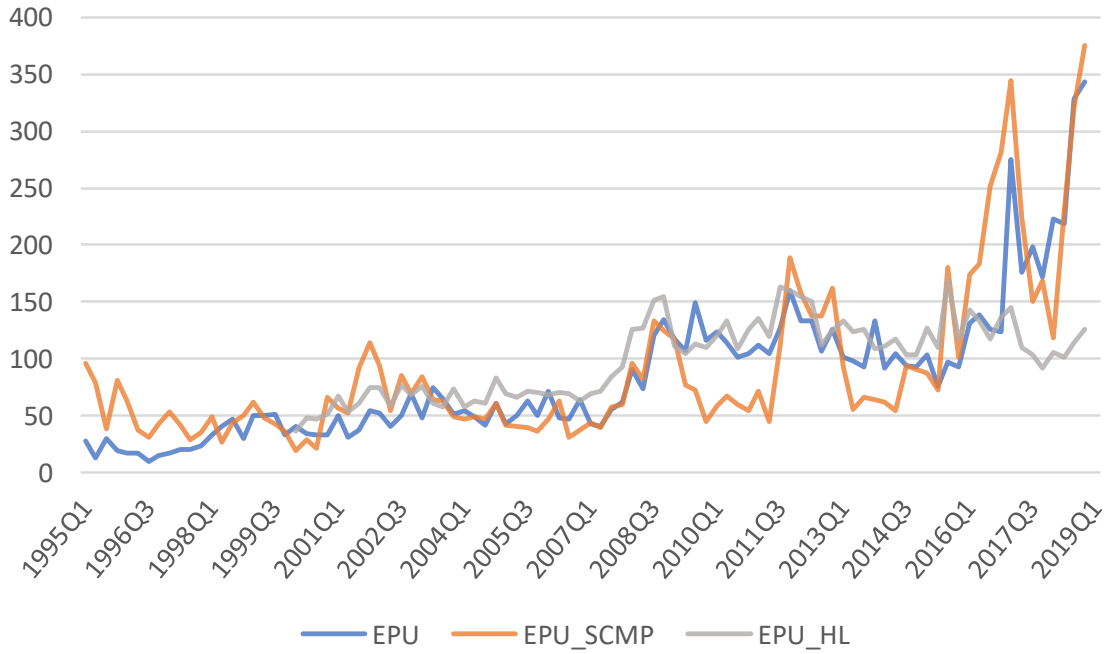
Note: Index reflects scaled monthly counts of articles containing at least one keyword in each of three categories: (i) Economic (ii) Policy and (iii) Uncertainty as specified in Table 1. The series is normalized to mean 100 from January 1979 to December 1999 and based on queries run on January 4, 2019 for the *Renmin Daily* and *Guangming Daily*.

Figure 3. Economic Policy Uncertainty in China: Globalization Era, January 2000 to July 2019



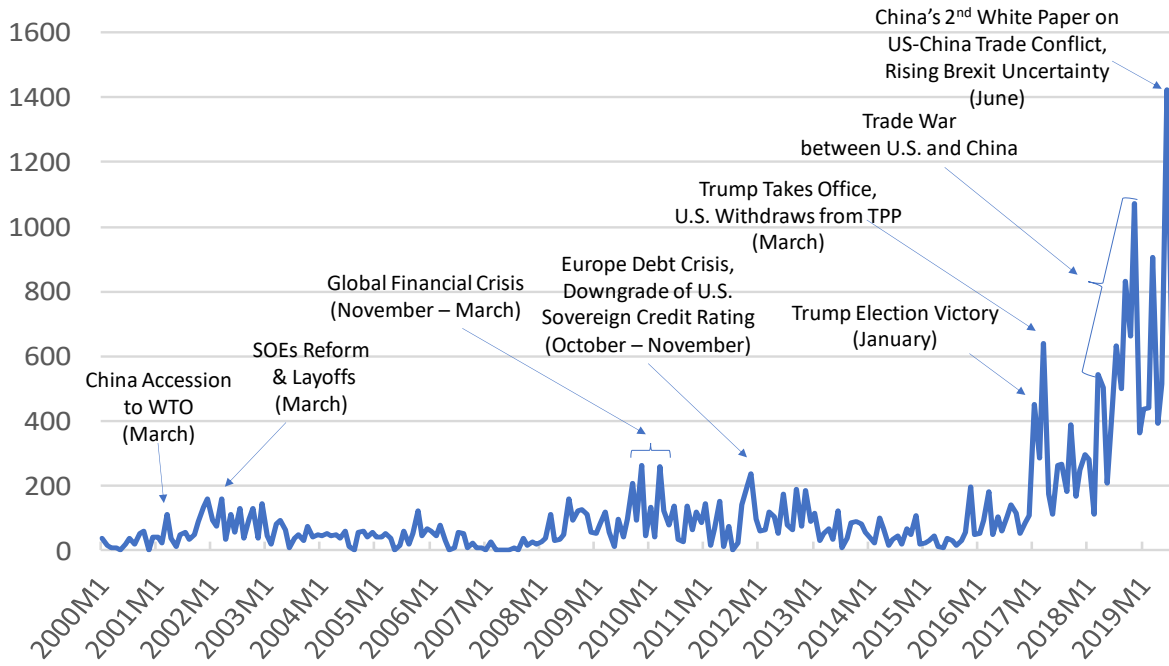
Note: Index reflects scaled monthly counts of articles containing at least one keyword in each of three categories: (i) Economic (ii) Policy and (iii) Uncertainty as specified in Table 1. The series is normalized to mean 100 from January 2000 to December 2018 and based on queries run on January 4, 2019 for the *Renmin Daily* and *Guangming Daily*.

Figure 4. Comparison of China EPU Indexes



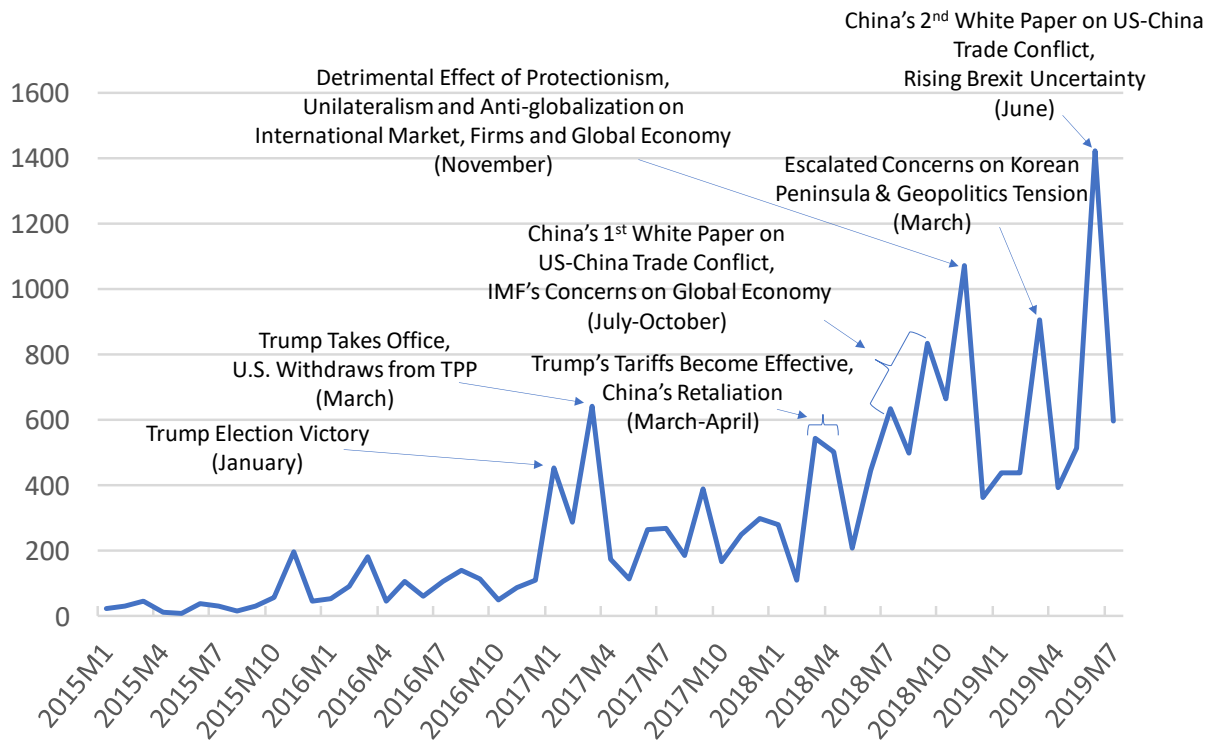
Note: Index, labelled “EPU” is our policy uncertainty index based on the *Renmin Daily* and *Guangming Daily*. Index, labelled “EPU_SCMP,” is constructed by Baker, Bloom and Davis (2016), based on a Hong Kong English newspaper *South China Morning Post*. Index, labelled “EPU_HL,” is constructed by Huang and Luk (2018), based on ten mainland Chinese newspapers from WiseNews. Each series is normalized to mean 100 from 2000 to 2018.

Figure 5.A. China Trade Policy Uncertainty Index, January 2000 to July 2019



Note: Index reflects scaled monthly counts of articles containing at least one keyword in each of three categories: (i) Economic (ii) Trade Policy and (iii) Uncertainty as specified in Table 2. The series is normalized to mean 100 from January 2000 to December 2018 and based on queries run on XXXX for the *Renmin Daily* and *Guangming Daily*.

Figure 5.B. China Trade Policy Uncertainty Index, January 2015 to July 2019



Note: Index reflects scaled monthly counts of articles containing at least one keyword in each of three categories: (i) Economic (ii) Trade Policy and (iii) Uncertainty as specified in Table 2. The series is normalized to mean 100 from January 2000 to December 2018 and based on queries run on XXXX for the *Renmin Daily* and *Guangming Daily*.

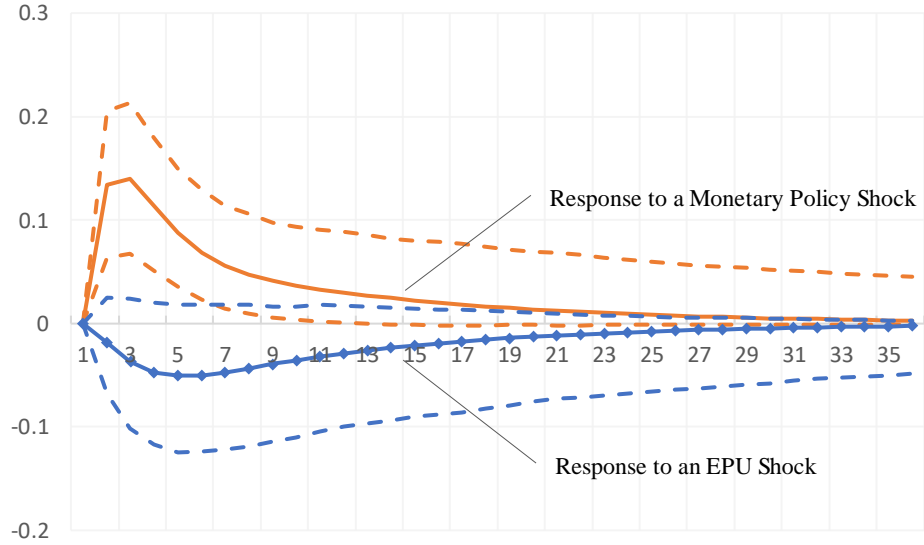
Figure 6. China Stock Market Performance in 2018

Figure 7. Equity Returns in 2018 for Chinese Firms by U.S. Revenue Share

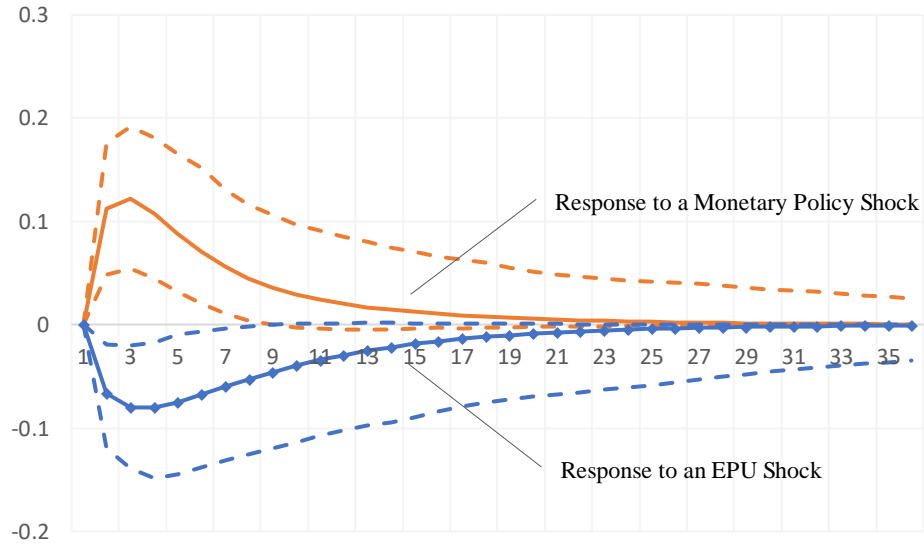
Figure 8. Firm-Level Volatility Change from 2015 to 2018 and U.S. Revenue Share

Figure 9. Estimated Impact of EPU on GDP Growth

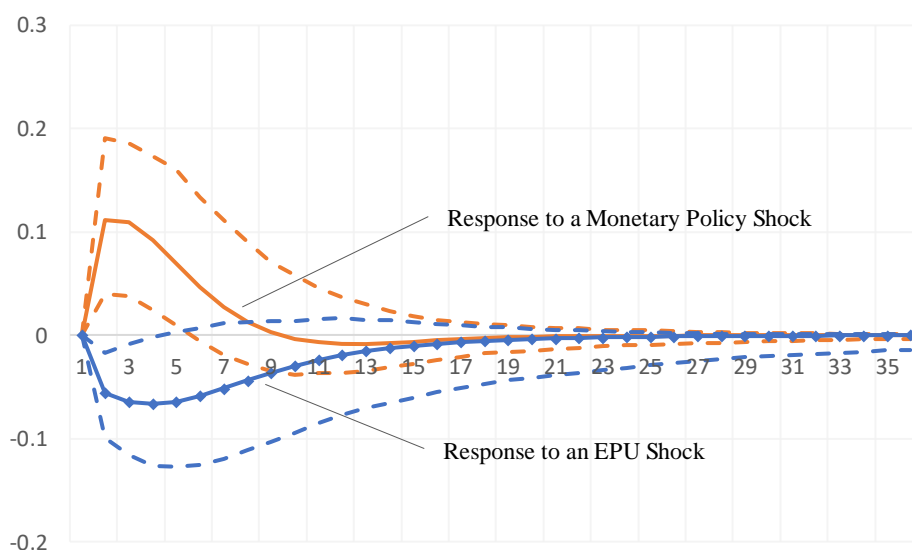
(a) Impact of EPU (1992Q1-2017Q3)



(b) Impact of EPU_SCMP (1995Q1-2017Q3)



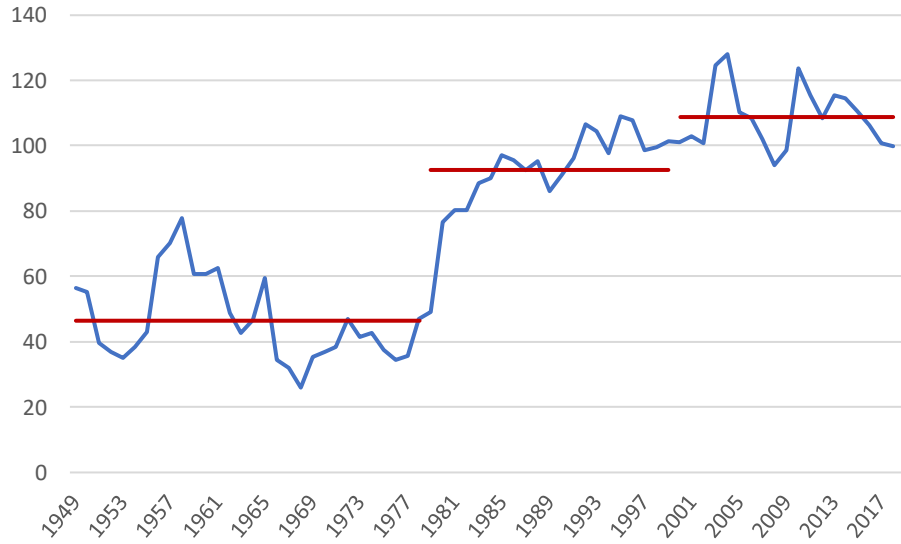
(c) Impact of EPU_HL (2000Q1-2017Q3)



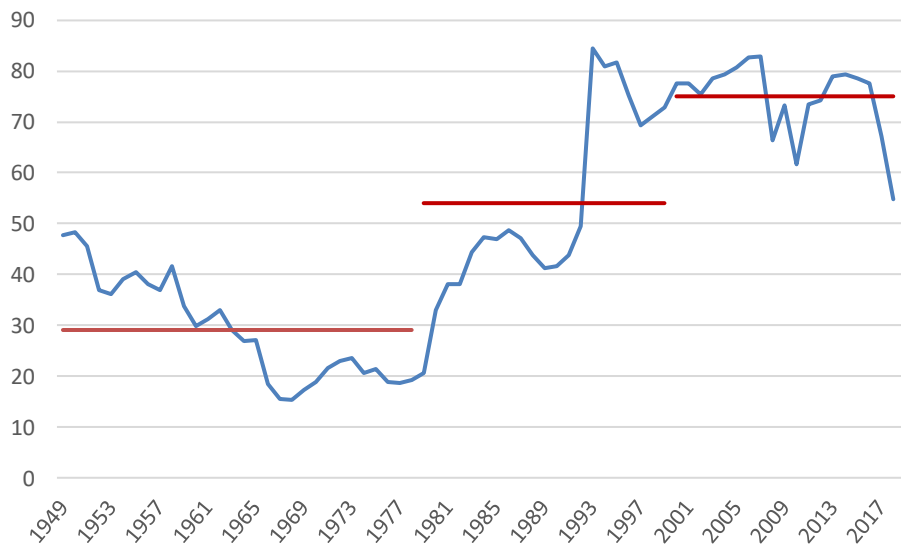
Note: Dashed lines are 90% error bands around the response to monetary policy and economic policy uncertainty shocks. EPU is our policy uncertainty index based on the *Renmin Daily* and *Guangming Daily*. EPU_SCMP is constructed by Baker, Bloom and Davis (2016), based on a Hong Kong English newspaper *South China Morning Post*. EPU_HL is constructed by Huang and Luk (2018), based on ten mainland Chinese newspapers from WiseNews. Both monetary policy and economic policy uncertainty shocks are normalized to have unit standard deviation.

Appendix Materials

Figure A.1. Articles Per Day by Newspaper and Year

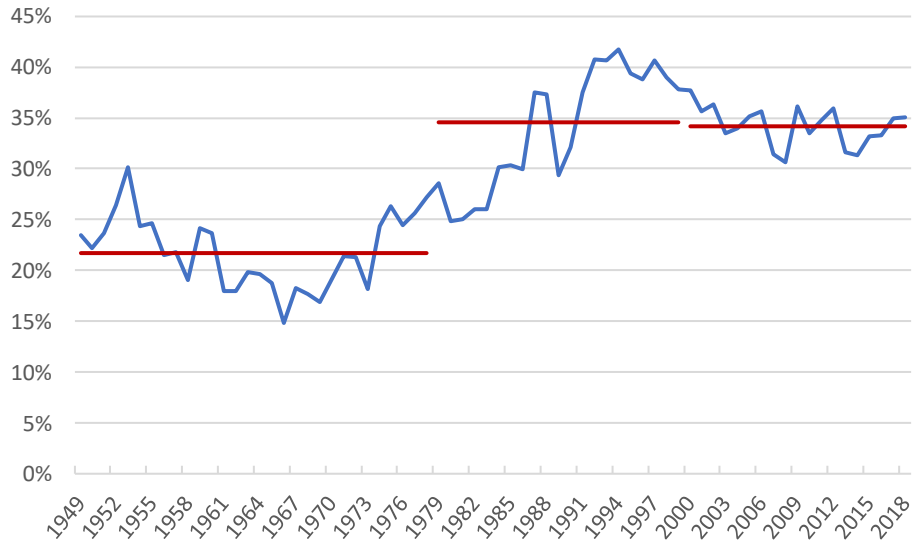


Renmin Daily

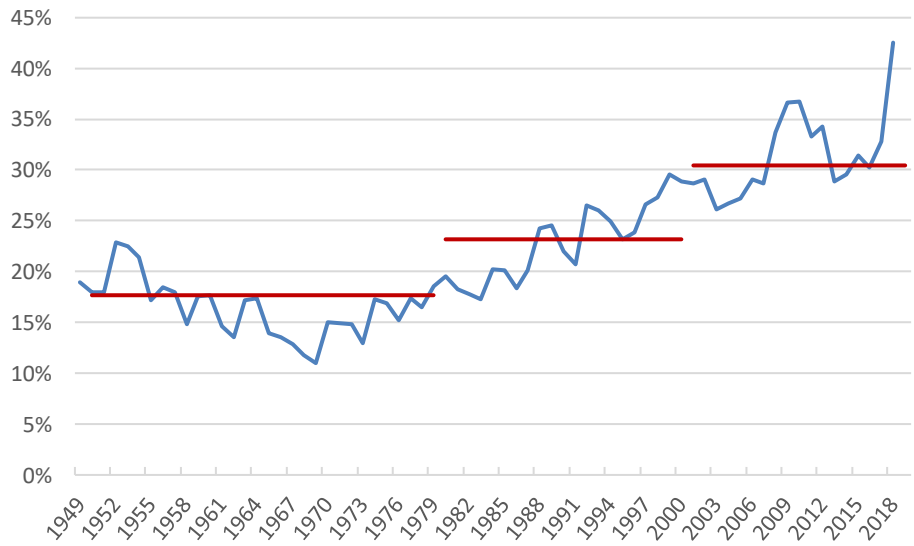


Guangming Daily

Figure A.2. Percent of Articles that Contain a Term in **E**



Renmin Daily



Guangming Daily

Figure A.3. Percent of **E** Articles that Contain a Term in **U** and a term in **P**

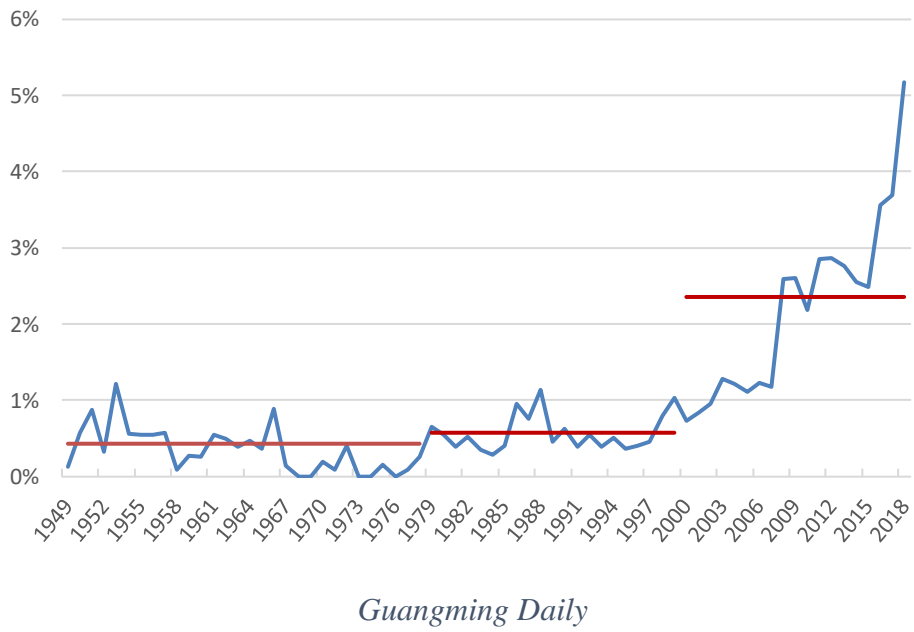
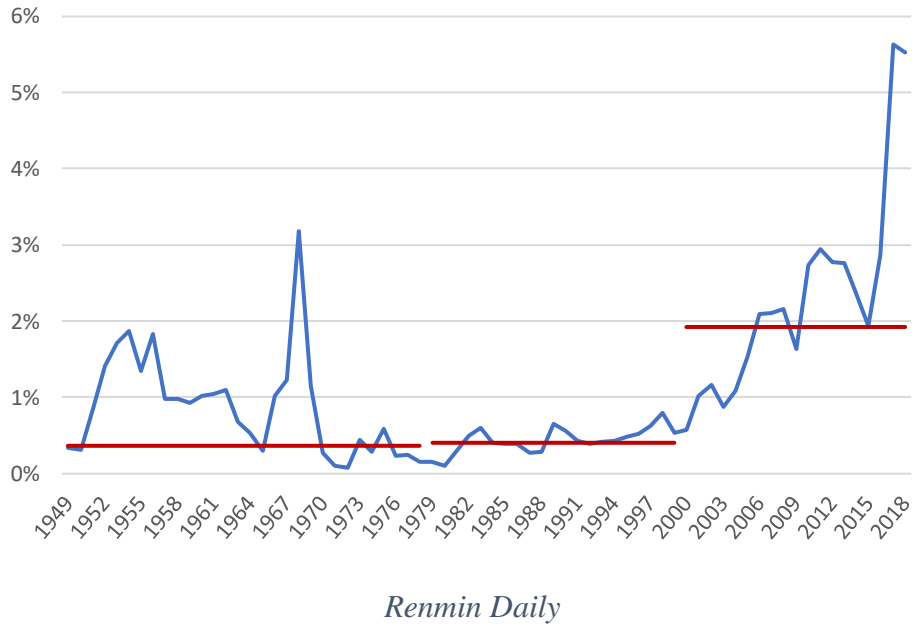
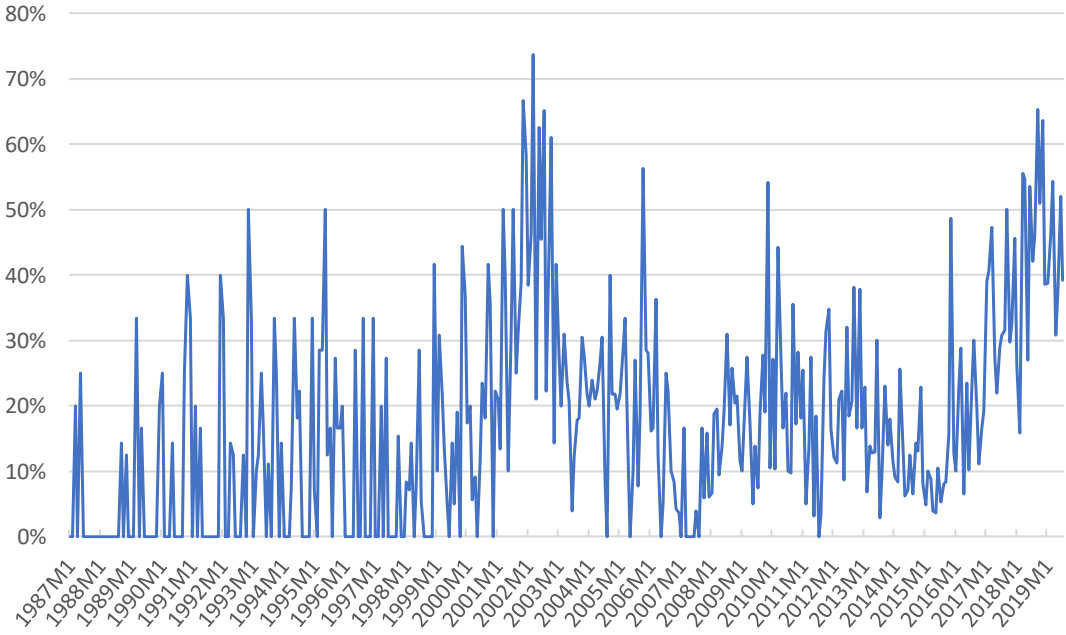
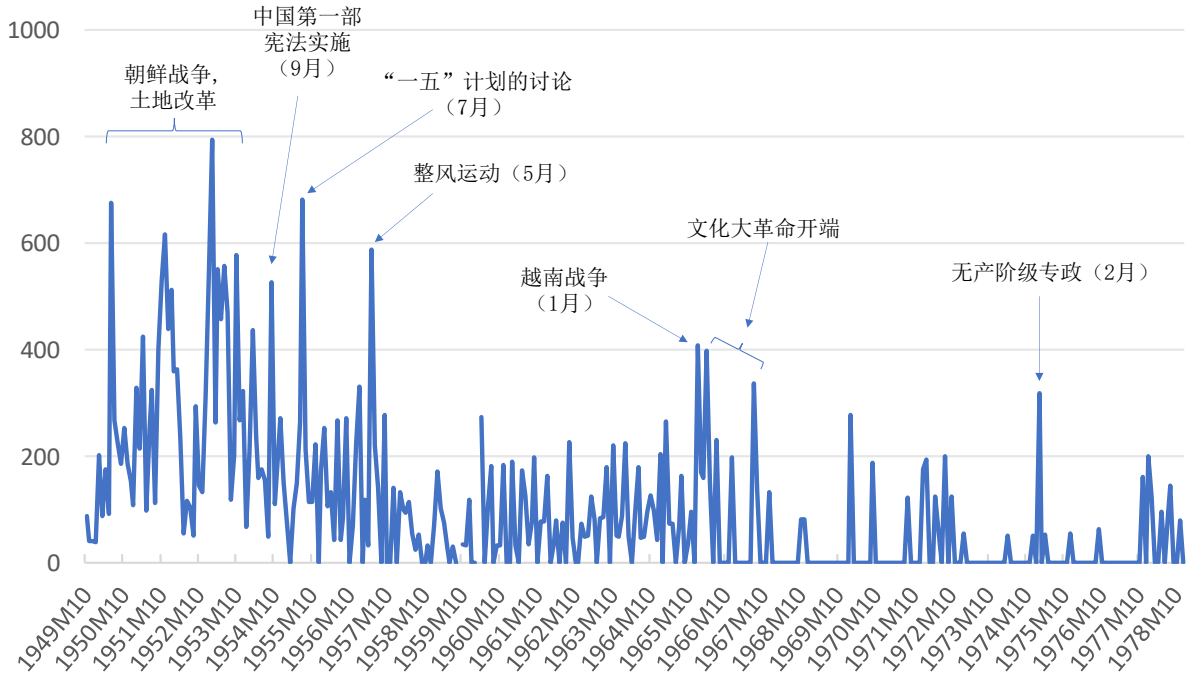


Figure A.4. Ratio of Trade Policy Uncertainty Articles to EPU Articles, Monthly, 1987 to 2019



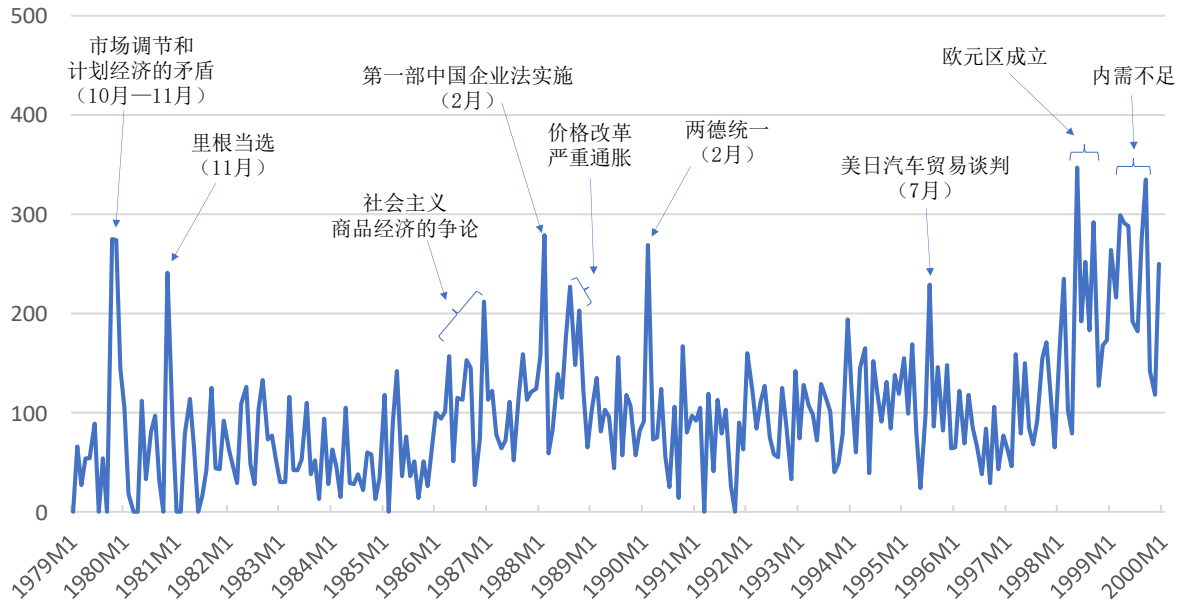
Note: This chart plots 100 times the ratio: (number of TPU articles)/(number of EPU articles). Article counts are from the *Renmin Daily* and *Guangming Daily*. See Tables 1 and 3, respectively, for the terms we use to define EPU and TPU articles.

A. 5. 中国经济政策不确定性：中央计划经济时期（1949-1978）



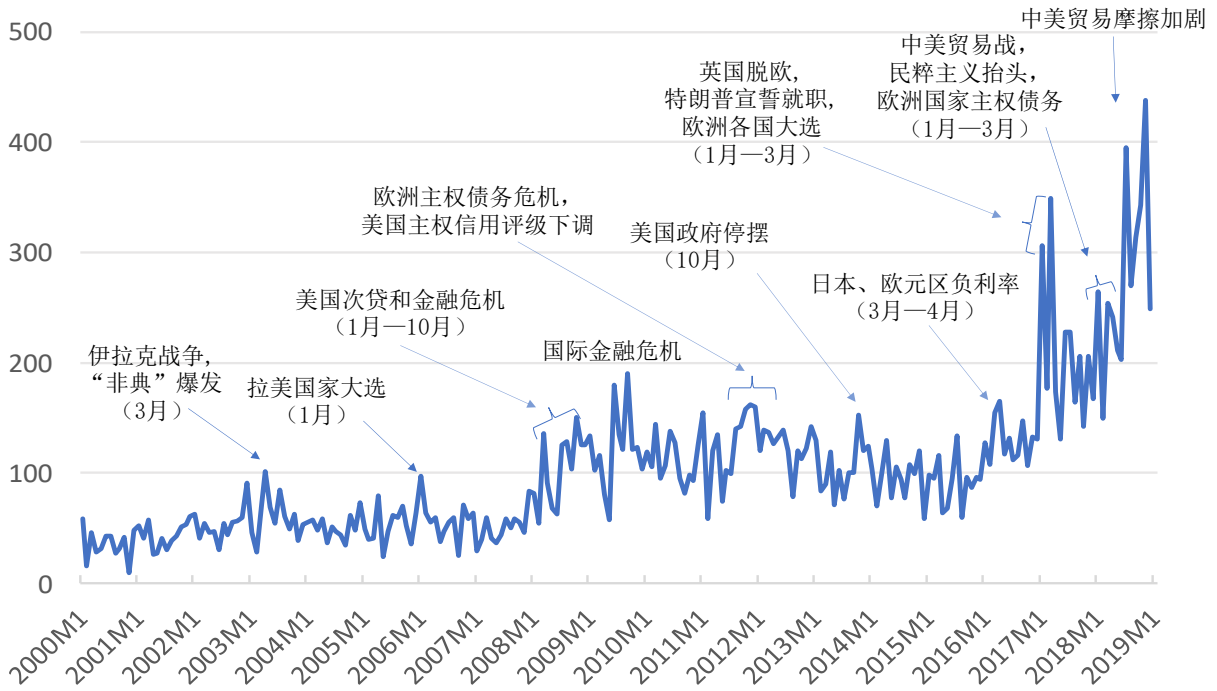
注解：本指数基于对 1949 年 10 月至 1978 年 12 月《人民日报》和《光明日报》每篇文章的机器算法查询。其反映了每月同时含有以下三个类别中至少一个关键词的文章数，与当月总文章数的相对比值。这三个类别是：1) 经济，2) 政策，3) 不确定性，每类别的关键词如表 1 所示。最后查询时间为 2019 年 1 月 4 日，指数已标准化为均值 100。

A. 6. 中国经济政策不确定性：改革开放时期（1979-1999）



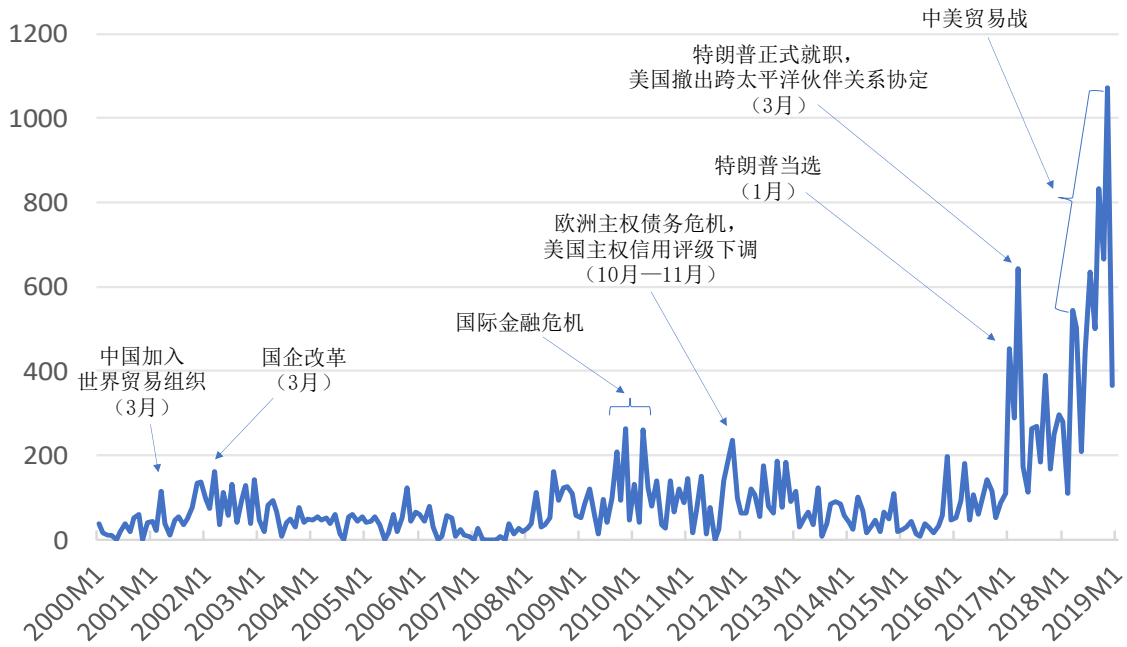
注解：本指数基于对 1979 年 1 月至 1999 年 12 月《人民日报》和《光明日报》每篇文章的机器算法查询。其反映了每月同时含有以下三个类别中至少一个关键词的文章数，与当月总文章数的相对比值。这三个类别是：1) 经济，2) 政策，3) 不确定性，每类别的关键词如表 1 所示。最后查询时间为 2019 年 1 月 4 日，指数已标准化为均值 100。

A. 7. 中国经济政策不确定性：全球化时代（2000-2018）



注解：本指数基于对 2000 年 1 月至 2018 年 12 月《人民日报》和《光明日报》每篇文章的机器算法查询。其反映了每月同时含有以下三个类别中至少一个关键词的文章数，与当月总文章数的相对比值。这三个类别是：1) 经济，2) 政策，3) 不确定性，每类别的关键词如表 1 所示。最后查询时间为 2019 年 1 月 4 日，指数已标准化为均值 100。

A. 8. 中国贸易政策不确定性指数： 2000-2018



注解：本指数基于对 2000 年 1 月至 2018 年 12 月《人民日报》和《光明日报》每篇文章的机器算法查询。其反映了每月同时含有以下三个类别中至少一个关键词的文章数，与当月总文章数的相对比值。这三个类别是：1) 经济，2) 贸易政策，3) 不确定性，每类别的关键词如表 2 所示。最后查询时间为 2019 年 1 月 4 日，指数已标准化为均值 100。