Online Appendix for

"Corporate Trade War Uncertainty and Patent Bubble"

Appendix A1 Constructing the measure: trade war uncertainty (TWU)

This appendix explains how we construct a firm-level, time-varying measure of managers' perceived trade war uncertainty (i.e., TWU) using the word embedding model. Our machine learning approach involves four steps. First, we employ 12 seed words that define the trade war based on our reading of 200 randomly selected MD&A statements of annual reports, including *trade war*, *trade protectionism*, *unilateralism*, *trade dispute*, *trade barrier*, *trade policy*, *trade friction*, *economic sanction*, *anti-dumping*, *anti-subsidy*, *tariff*, and *additional tariff*. Second, we employ the *word2vec* model to identify the synonyms for each seed words based upon its context. We begin with representing all words as respective numeric vectors, and then theoretically compute the cosine similarity (Mikolov et al., 2013) between each seed word and any other words to quantify their associations and select the top 30 words with the closest associations as preliminary synonyms (i.e., the highest cosine similarity between their word vectors) for each seed word. Afterwards, we manually inspect all the preliminary synonyms and eliminate words that are not applicable by carefully studying its context in MD&A narratives. To illustrate, the method categorizes words such as *trade dispute*, *trade barrier*, *trade war*, *trade protectionism* and *additional tariff* as top synonyms of the seed word *trade friction*, and the similarity between the seed word and its synonyms ranges from 0.476 to 0.752, as shown in Panel A of Appendix A2. Continuing with this Panel, we can see that top synonyms of the seed word *trade barrier* include *trade friction*, *trade protectionism*, *technological barrier*, *anti-dumping* and *economic sanction*. Our final *Trade War Dictionary* consists of 51 Chinese keywords (but only 46 keywords after being translated into English because there are 5 Chinese keywords sharing the same English expressions), which are listed in Panel B of Appendix A2.[1]

Third, we develop an *Uncertainty Dictionary* in the same way. Following Kravet and Muslu (2013) and our reading of 200 randomly selected MD&A statements of annual reports, we first use 14 uncertainty- or risk-related seed words such as *uncertainty*, *risk*, and *loss* (see Panel C of Appendix A2 for more details). Then we employ the *word2vec* model to obtain the top 30 synonyms for each seed word and manually eliminate words that do not fit. This leads to a final *Uncertainty Dictionary* of 288 Chinese keywords (only 205 keywords after being translated into English), as shown in Panel D of Appendix A2.

Finally, we construct TWU by counting the number of occurrences of uncertainty-related keywords surrounding at least one trade-war-related keyword in the same sentence, scaled by total number of words in the MD&A document:

$$TWU_{i,t} = \frac{\sum_{w=1}^{D_{it}} \{\mathbf{1}[w \in \mathbb{R}] \times \mathbf{1}[|w - p| \in Same\ Sentencne]\}}{S_{i,t}}$$

Where the subscripts i and t denote firm and year, respectively. $D_{i,t}$ ($S_{i,t}$) is the total number of words (sentences) in the MD&A document and $w = 0, 1, 2, \dots, D_{i,t}$ are the words embedded in the MD&A. $\mathbf{1}[\bullet]$ is the indicator function. $\mathbb{R}$ is the set of uncertainty-related keywords; p is the position of the closest trade war-related keywords (i.e., $p \in Keywords^{trade\ war}$). Therefore, terms in the numerator count the number of keywords associated with discussion of risk-related and trade war-related topics that occur within the same sentence. Since our TWU measure is built on the firm-specific MD&A section of annul reports

[1] The reason that our expanded dictionary only consists of 51 keywords is because many synonyms of the seed words usually overlap with each other. For example, as reported in Panel A of Appendix A2, we can observe that there are 9 synonyms that belong to both of *trade friction* and *trade barrier*.

disclosures, this variable it thus dynamically and accurately captures the intensity of trade war uncertainty perceived by top managers of individual firms. For expositional purposes, we multiply the measure by 10^2.

Appendix A2 Examples, seed words, and the final dictionaries

In this appendix, Panel A shows some examples of synonyms of trade war-related seed words. Panel B reports the list of both trade war-related seed words and the final *Trade War Dictionary*. Panels C and D present the list of uncertainty-related seed words and the *Uncertainty Dictionary*, respectively. It's worth noting that, in Panels B and C, we include the Chinese pinyin for each keyword in the bracket. Due to the space limitation, for brevity, we do not incorporate the Chinese pinyin for each keyword.

Panel A Two examples of synonyms of trade war-related seed words

Seed word= ***trade friction***		Seed word= ***trade barrier***	
Synonym (fit)	**Similarity**	**Synonym (fit)**	**Similarity**
trade dispute	0.752	*non-tariff barrier*	0.769
trade barrier	0.680	*trade friction*	0.680
trade war	0.660	*tariff barrier*	0.650
trade protectionism	0.604	*trade policy*	0.625
trade policy	0.600	*nontariff*	0.610
trade sanction	0.599	*trade protectionism*	0.609
non-tariff barrier	0.577	*import restriction*	0.596
anti-dumping	0.571	*technological barrier*	0.579
protectionism	0.562	*protectionism*	0.571
additional tariff	0.558	*trade sanction*	0.560
anti-subsidy	0.538	*trade dispute*	0.535
tariff barrier	0.530	*anti-subsidy*	0.524
Sanction	0.495	*restrictive policy*	0.516
political crisis	0.486	*anti-dumping*	0.491
		economic sanction	0.478
		sanction	0.462

Panel B List of seed words and the Trade War Dictionary

Seed words	***trade war*** (mao4yi4zhan4), ***trade protectionism*** (mao4yi4bao3hu4zhu3yi4), ***trade dispute*** (mao4yi4zheng1duan1), ***unilateralism*** (dan1bian1zhu3yi4), ***trade barrier*** (mao4yi4bi4lei3), ***trade policy*** (mao4yi4zheng4ce4), ***trade friction*** (mao4yi4mo2ca1), ***economic sanction*** (jing1ji4zhi4cai2), ***anti-dumping*** (fan2qing1xiao1), ***anti-subsidy*** (fan2bu3tie1), ***tariff*** (guan1shui4), ***additional tariff*** (jia1shui4)
The dictionary	***trade war*** (mao4yi4zhan4), ***trade protectionism*** (mao4yi4bao3hu4zhu3yi4), ***trade dispute*** (mao4yi4zheng1duan1), ***unilateralism*** (dan1bian1zhu3yi4), ***trade barrier*** (mao4yi4bi4lei3), ***trade policy*** (mao4yi4zheng4ce4), ***trade friction*** (mao4yi4mo2ca1), ***economic sanction*** (jing1ji4zhi4cai2), ***anti-dumping*** (fan2qing1xiao1), ***anti-subsidy*** (fan2bu3tie1), ***tariff*** (guan1shui4),

	additional tariff (jia1shui4); ***import tariff*** (jin4kou3shui4; jin4kou3guan1shui4), ***tariff rate*** (guan1shui4lv4; guan1shui4shui4lv4), ***anti-dumping tariff*** (fan3qing1xiao1shui4; fan3qing1xiao1guan1shui4), ***export rebate rate*** (chu1kou3tui4shui4lv4), ***tariff policy*** (guan1shui4zheng4ce4), ***retaliatory tariff*** (cheng2fa2xing4guan1shui4), ***anti-subsidy tariff*** (fan2bu3tie1shui4; fan2bu3tie1guan1shui4), ***impose*** (jia1zheng1), ***import restriction*** (jin4kou3xian4zhi4), ***tariff quota*** (guan1shui4pei4e2), ***import linkage tax*** (jin4kou3huan2jie2shui4), ***non-tariff barrier*** (fei1guan1shui4bi4lei3), ***tariff barrier*** (guan1shui4bi4lei3), ***sanction*** (zhi4cai2), ***U.S. government*** (mei3guo2), ***export control*** (chu1kou3xian4zhi4), ***Donald Trump*** (te4lang3pu3), ***nontariff*** (fei1guan1shui4), ***global trade*** (quan2qiu2mao4yi4), ***international situation*** (guo2ji4ju2shi4), ***economic and trade cooperation*** (jing1mao4he2zuo4), ***exchange control*** (wai4hui4guan3zhi4), ***economic and trade relation*** (wai4mao4guan1xi4), ***foreign capital policy*** (wai4zi1zheng4ce4), ***trade sanction*** (mao4yi4zhi4cai2), ***U.S. department of commerce*** (mei3guo2shang1wu4bu4), ***dumping margin*** (qing1xiao1fu2du4), ***embargo*** (jin4yun4), ***political situation*** (zheng4zhi4ju2shi4; zheng4zhi4xing2shi4), ***political crisis*** (zheng4zhi4wei1ji1), ***protectionism*** (bao3hu4zhu3yi4), ***technological barrier*** (ji4shu4bi4lei3), ***restrictive policy*** (xian4zhi4xing4zheng4ce4), ***foreign trade policy*** (wai4mao4zheng4ce4)

Panel C List of uncertainty-related seed words

Seed words	***uncertainty*** (bu4que4ding4xing4), ***risk*** (feng1xian3), ***possible*** (ke3neng2), ***volatile*** (bo1dong4), ***volatility*** (bo1dong4xing4), ***float*** (fu2dong4), ***fluctuation*** (qi3fu2), ***crisis*** (wei1ji1), ***loss*** (kui1sun3), ***lose*** (sun3shi1), ***challenge*** (tiao3zhan4), ***negative*** (fu4mian4), ***varies*** (bian4shu4), ***potential*** (huo4jiang1)

Panel D List of all uncertainty-related keywords in Uncertainty Dictionary

risk	*uncertainty*	*weakness*	*financial cost*	*market volatility*	*default risk*	*inflationary pressure*
problem	*possibility*	*adverse change*	*double dip*	*economic dispute*	*subprime crisis*	*repayment pressure*
possible	*constraint*	*adverse effect*	*capital risk*	*drastic fluctuation*	*ups and downs*	*significant disadvantage*
likely	*confronted*	*general risk*	*business risk*	*compliance risk*	*integrated risk*	*environmental pressure*
potential	*devaluation*	*adverse factor*	*float*	*significant impact*	*customer risk*	*fluctuation in prices*
might	*upheaval*	*credit risk*	*relative risk*	*predicament*	*strategic risk*	*financial constraint*
cause	*instability*	*legal dispute*	*internal risk*	*investment failure*	*country risk*	*out of production*
lose	*failure*	*disadvantage*	*external risk*	*concentration risk*	*competitive risk*	*unusual fluctuations*
loss	*threaten*	*debt dispute*	*collapse*	*environmental risk*	*downward trend*	*complicated and changeable*
slump	*lawsuit*	*operational risk*	*risk exposure*	*potential risk*	*bad debt*	*global financial crisis*

pressure	*inflation*	*risk control*	*huge amount*	*liquidity risk*	*contract risk*	*cash flow constraint*
volatile	*decline*	*market risk*	*guarantee risk*	*poor management*	*upward pressure*	*continued depression*
volatility	*limitation*	*uncontrollable*	*policy risk*	*management risk*	*economic recession*	*European debt crisis*
litigation	*standstill*	*financial crisis*	*debt crisis*	*litigation cost*	*huge risk*	*loss of technical secret*
crisis	*defeat*	*financial risk*	*climate change*	*pending litigation*	*financing risk*	*imbalance between supply and demand*
varies	*unclear*	*investment risk*	*hard to judge*	*market rate*	*rapid fluctuation*	*periodic fluctuation*
difficulty	*inversion*	*deteriorate*	*risk warning*	*volatility risk*	*economic fluctuation*	*currency devaluation*
downturn	*emergency*	*negative effect*	*heavy loss*	*force majeure*	*downside risk*	*suspension of listing risk*
recession	*spite*	*major risk*	*security risk*	*marketing risk*	*political risk*	*appreciation pressure*
depression	*fluctuation*	*overcapacity*	*excess loss*	*insolvency risk*	*audit risk*	*fluctuation in exchange rate*

challenge	*idle cost*	*unpredictable*	*quality risk*	*transaction exposure*	*inherent risk*	*staying at a high level*
indemnity	*seasonality*	*price inflation*	*technical risk*	*systematic risk*	*fraud risk*	*successive losses for years*
penalty	*pessimistic*	*financial loss*	*firm risk*	*procurement risk*	*inventory risk*	*stock market risk*
uncertain	*default*	*recovery risk*	*out of business*	*exchange rate risk*	*risk premium*	*stock price volatility*
negative	*price risk*	*brain drain*	*bad debt risk*	*interest rate risk*	*financial pressure*	*internal control risk*
serious	*dilemma*	*natural hazard*	*industry risk*	*continue to decline*	*asset bubble*	*risk of decision-making*
dispute	*periodicity*	*cost escalation*	*loan risk*	*capital consumption*	*tax risk*	
hard	*shock*	*unfavorable*	*cost inversion*	*dynamic risk*	*supply tension*	
surge	*legal risk*	*operating cost*	*currency risk*	*settlement risk*	*energy crisis*	
barrier	*risk factor*	*project risk*	*litigation cost*	*economic risk*	*financing pressure*	

Appendix A3 Validations of trade war uncertainty

In this section, we use the newly developed measure of firm-level TWU to document some empirical patterns and verify that it truly captures managerial perspective of trade war uncertainty, including content validity, convergent validity, time-series patterns and industry variation, as well as determinants model and variance decomposition.

(1) Content validity

Content validity refers to the degree to which a measure captures the domain of which it is intended (Nunnally and Bernstein, 1994). Similar with Short et al. (2010), we assess the content validity of our TWU by providing the actual contents of how these trade war uncertainty terms are used in the firms' MD&A disclosures and by an assessment of the measure by experts. We provide these contents in Table A1 and show the preliminary validity of our TWU measure indeed captures trade war uncertainty.

Example 1. R&T Plumbing Technology Co., Ltd. (Ticker 002790)-2019	
(1)	In 2019, the world economy **continues to decline**, the situation in **global trade** has intensified and the growth rate has slowed significantly. Under a complex and changeable situation such as the rise of **unilateralism** and **trade protectionism** in various countries, the escalation of **trade frictions**, the surge of **non-tariff** measures, the geopolitical tension, and the World Trade Organization's reform **disputes**, **international trade** is moving forward with heavy burdens, but the U.S-China **trade disputes** reach the first phase of the economic and trade agreement at the end of the year and suspended the escalation after many rounds of negotiations. (***In Chinese*:** 2019 年，世界经济**持续下行**，**全球贸易**紧张局势加剧并且增速显著放缓，在各国**单边主义**和**贸易保护主义**抬头、**贸易摩擦**升级、**非关税**措施激增、地缘政治局势紧张、 世界贸易组织陷入改革纷争等**复杂多变**的形势下，**国际贸易**负重前行，但中美**贸易争端**经过多轮谈判于年底达成第一阶段经贸协议并暂停升级。)
(2)	Once the **trade policies** of these countries and regions undergo major changes or the economic situation **deteriorates**, or major **trade frictions** or **disputes** occur between China and other countries, it **may** affect the company's downstream customers in these countries, which in turn affects the company's product exports. (***In Chinese*:** 一旦这些国家和地区的**贸易政策**发生重大变化或经济形势**恶化**，或我国与这些国家或地区之间发生重大**贸易摩擦**或**争端**等情况，将**可能**影响到公司在这些国家和地区的下游客户对公司产品的需求，进而影响公司产品出口。)
Example 2. UE Furniture Co., Ltd. (Ticker 603600)-2019	
(1)	Events such as the covid-19 and the U.S.-China **trade war may** lead to global economic **weakness** or even **recession**, and decline in domestic and foreign market demand, which will **adversely affect** the company's continued business growth. (***In Chinese*:**全球新冠疫情、中美**贸易战**等事件**可能**导致全球经济**疲软**甚至**衰退**，国内外市场需求下降，进而对公司业务持续增长产生**不利影响**。)
(2)	To effectively hedge the impact of **adverse factors** such as the U.S.-China **trade war**, our company continues to promote cost reduction and efficiency enhancement, and to improve the overall profitability. (***In Chinese*:** 公司持续推进降本增效工作，努力提高整体盈利水平，有效对冲中美**贸易战**等**不利因素**影响。)
Example 3. Xi'an Longi Silicon Materials Co., Ltd. (Ticker 601012)-2013	
(1)	Although the installed volumes in China and Japan has increased significantly, it is **difficult** to get rid of the demand from the European and American markets in a short period of time.

	The photovoltaic industry in China are still facing severe international **trade barriers** and **uncertain risks** brought by **changes** in **trade policies**. (***In Chinese*:** 虽然中国、日本等市场装机量大幅增加，但短时期内**难以**摆脱欧美市场需求，中国光伏产业仍将面对严峻的国际**贸易壁垒**形势及**贸易政策变化**带来的**不确定风险**。)
(2)	Our company will vigorously strengthen the development of the domestic market to reduce the impact of international **trade dispute**s and **uncertain trade policie**s on the company, but the outcomes are **uncertain**. (***In Chinese*:** 公司将大力加强国内市场的开拓，以减少国际**贸易争端**及**不确定性贸易政策**对公司的影响，但结果具有**不确定性**。)
Example 4. Jiangsu Dagang Co., Ltd. (Ticker 002077)-2018	
(1)	Some of Aike Semiconductor's customer fund collections are affected by many factors such as the U.S.-China **trade war** and the country's prevention of **financial risks**, which in turn leads to delayed accounts receivables, a **negative shock** on trade volumes, and further results in **heavy losses**. (***In Chinese*:** 中美**贸易战**、国家防范**金融风险**等多因素的影响，艾科半导体部分客户资金回款受到影响，艾科半导体应收账款回笼延期，且业务量也受到较大**冲击**，致使经营业绩出现较大**亏损**。)

Table A1. Examples of trade war uncertainty disclosures in the MD&A section of annual reports

(2) Convergent validity

Consistent with Harrison et al. (2019), we evaluate the convergent validity (i.e., assessment of correlations between two measures of the similar construct) by examining the correlations between our TWU and an aggregate newspaper-based measure of economic policy uncertainty (EPU) constructed by Baker et al. (2016). EPU is a monthly time-series measure, calculated as the weighted average of four components of policy uncertainty: uncertainty captured by news coverage, uncertainty about future changes in federal tax policies, the degree of forecasters' disagreement about future monetary and fiscal policies. As such, EPU reflects a macro-level public perception of economic policy uncertainty. We compute the annual EPU as the average of monthly indexes within a year. Table A2 provides the results of Pearson correlations. We find that our measure of TWU at the firm level is positively and significantly correlated with the indicator of policy uncertainty at the macro level. This finding has two implications. On the one hand, TWU is a function of the macro economic policy uncertainty. On the other hand, because the correlation is low, it suggests that our firm-specific measure of TWU and EPU capture different aspects of policy uncertainty.

	TWU	EPU
TWU	1.000	
EPU	0.223	1.000

Table A2. Correlation with economic policy uncertainty

Note: Variable definitions are presented in Appendix 1. A correlation coefficient in bold indicates a significance level of 1% or less.

(3) Time-series patterns and industry variation

We further calculate the time-average of the measure across firms in each year and plot it over time in Figure A1. The dynamics for TWU reveal an overall downward trend between 2007 and 2011, suggesting that the world was in a period of trade globalization. This is in line with the evidence provided by Witt (2019) that foreign direct investment globalization has peaked between 2007 and 2011. Figure A1 also shows an upward trend between 2012 to 2017, which is in line with the ongoing trade de-globalization (Witt, 2019). Moreover, we observe that TWU has rocketed up since 2018, which is consistent with the pattern of the latest and ongoing round of trade war between the U.S. and China.

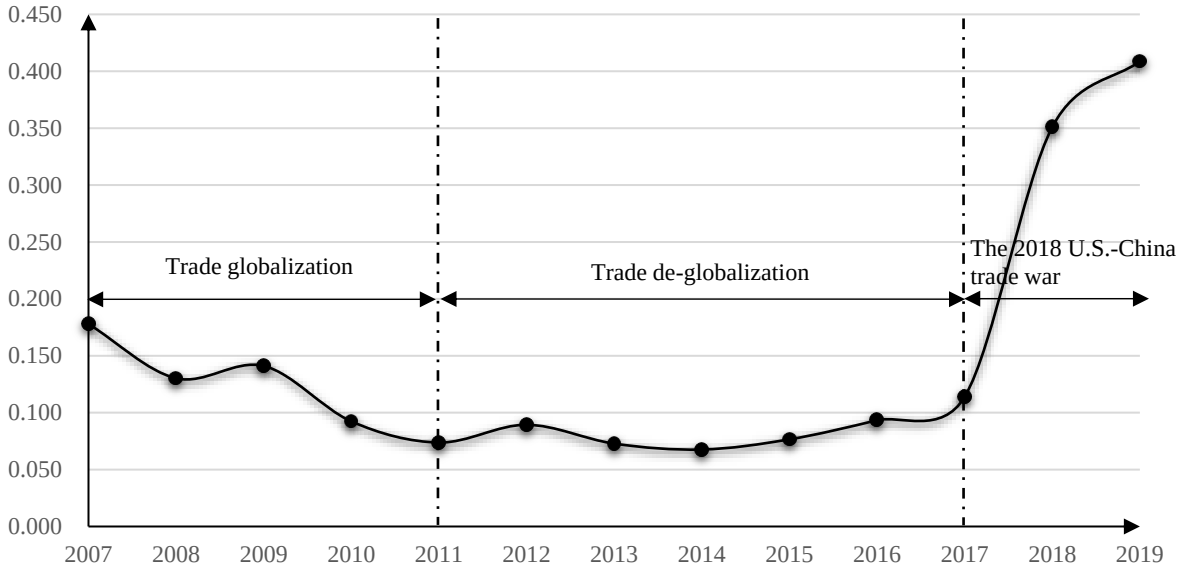

Figure A1 Time-series variation in the measure of trade war uncertainty

We further probe the variation of the TWU measure across industries (one-digit CSRC industrial code). For each industry, we compute the equal-weighted average of the firm-level measure across all sample years. The results are presented in Figure A2. We find that firms in the Manufacturing industry and Wholesale and retail trade industries show highest level of trade war uncertainty. These findings also line up with the current nature of the U.S.-China trade war.

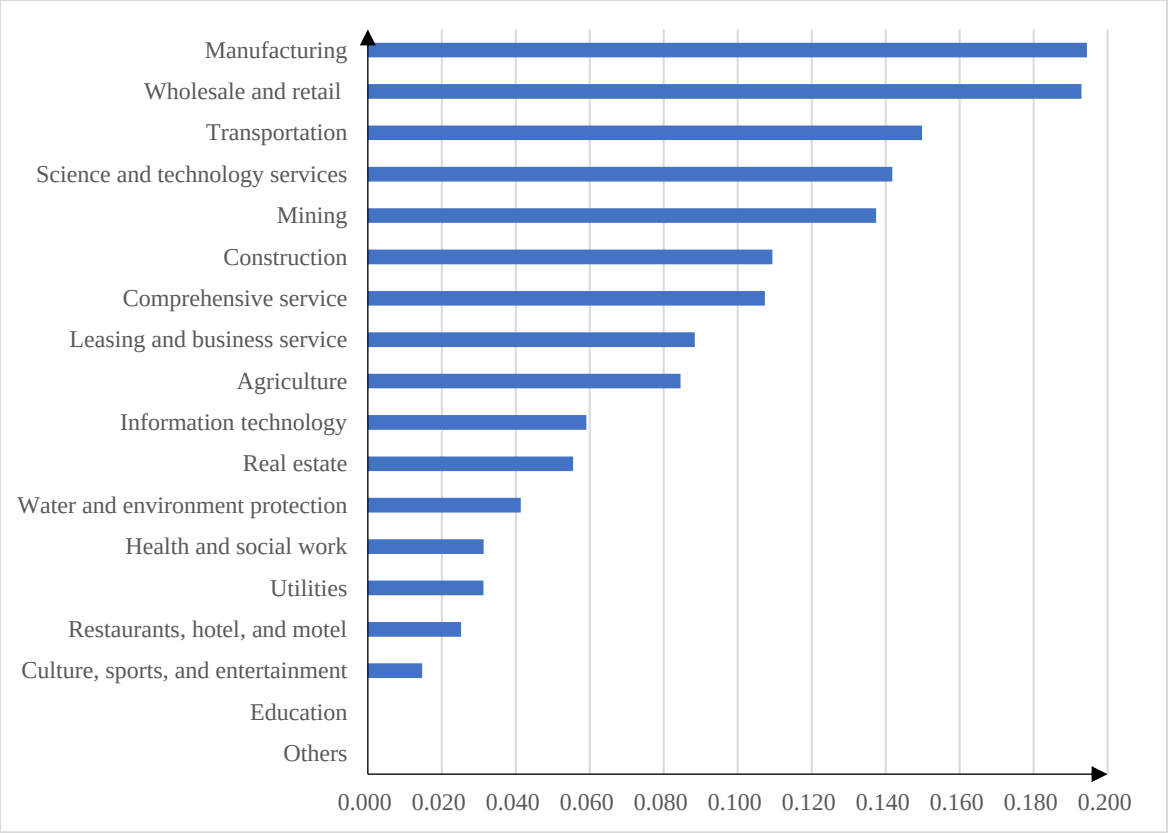

Figure A2 Industry variation in the measure of trade war uncertainty

(4) Determinants of trade war uncertainty

To advance our understanding of the properties of trade war uncertainty at the firm level, we further explore the determinants that might affect TWU. We control for the aggregate policy uncertainty, firm fundamental characteristics, growth opportunities, and volatility of business as determinants of TWU, formulated in the following regression model:

$$TWU_{i,t} = \alpha_0 + \alpha_1 Size_{i,t} + \alpha_2 Growth_{i,t} + \alpha_3 Loss_{i,t} + \alpha_4 Coverage_{i,t} + \alpha_5 BM_{i,t}$$
$$+\alpha_6 RetVol_{i,t} + YearFE + IndustryFE + \varepsilon_{i,t}.$$

Where the subscripts *i* and *t* denote firm and year, respectively. *TWU* is our measure of firm-level trade war uncertainty. We control for several firm fundamental characteristics including: firm size (*Size*) because it reflects numerous aspects of a firm's operational and business environment, defined as the natural logarithm of total assets; financial performance since negative performance usually represents greater uncertainty (Hayn, 1995), measured by sales growth (*Growth*) (Zheng et al., 2015) and financial losses (*Loss*) (Muslu et al., 2015), defined as the change in year-to-year total sales over last year's value, and a dummy variable equal to one if the firm reports negative earnings, respectively; analyst coverage (*Coverage*) as it captures a firm's information uncertainty/asymmetry (Derrien and Kecskes, 2013; Frankel and Li, 2004), calculated as the number of analysts issuing estimates during a fiscal year before the earnings announcement. In addition, we employ book-to-market ratio (*BM*) as the proxy for growth opportunities because mature firms are more likely to face less uncertain operating environments (Li, 2008). BM is defined as book value divided by market capitalization. Since uncertainty increases with the level of volatility of business (Andersen, 1996), we include firm-specific stock return volatility (*RetVol*), computed as the standard deviation of the monthly stock returns over the fiscal year. Appendix 4 provides detailed definitions of the variable. To control for the unobservable inter-temporal and cross-industry variations, we include year and industry fixed effects (i.e., one-digit CSRC industrial code). We cluster standard errors at the firm and year level to mitigate the concern of potential autocorrelation problems (Petersen, 2009).

We present the estimation results in Table A3. We find that firms with larger size, worse performance, higher information asymmetry, less growth opportunities and more volatile business have greater exposures to trade war uncertainty, as evidenced by positive and significant coefficients on *Size*, *BM*, *RetVol* along with negative and significant coefficients on *Growth* and *Coverage*.

	(1) TWU
Size	0.018***
	(5.52)
Growth	-0.019***
	(-4.57)
Loss	0.003
	(0.34)
Coverage	-0.001***
	(-5.20)
BM	0.072***
	(4.39)
RetVol	0.024
	(0.46)
Constant	-0.248***
	(-3.73)
Year FE	YES
Industry FE	YES
Observations	26,062
R2	0.098

Table 3. Determinants of trade war uncertainty

Note: Variables are defined in Appendix 1. T-statistics are given in parentheses based on robust standard errors are clustered at the firm and year level. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

(5) Variance decomposition of trade war uncertainty

We next turn towards analyzing the extent to which our developed measure of TWU captures firm-level trade war uncertainty. To achieve this objective, we conduct a deep analysis of variance decomposition by examining how much of the variance in TWU can be explained by observable attributes (i.e., determinants of TWU) and various sets of fixed effects. Variance decomposition is a well-established and widely accepted approach proposed and applied by economists such as Hassan et al. (2019) and Li et al. (2020) to probe the contributions of a measure at varying (e.g., aggregate-, industry-, or firm-) level of analysis. In particular, we estimate TWU along several specifications and summarize all their R^2 values to capture the portion of the variance in TWU that is accounted for by observable variables. Table A4 in the Online Supplement summarizes the estimated results. Column (1) reports regressions with fixed effects but no other control variables. Column (2) further controls for a set of firm characteristics as specified in Table A3. The last column shows the maximal improvement in R^2. Our main focus is the results of Columns (2) and (3). We find that, firm characteristics explain 2.8% of the variance in TWU. Time and industry fixed effects account for an additional 4.9% and 2.1% (= 7.0%-4.9%), respectively. Results further show that the interaction of time and industry fixed effects only explain 1.3% (= 8.3%-7.0%) of the variance. As a consequence, we can

observe that firm characteristics combined with various sets of fixed effects only capture 11.1% of the variance in measured TWU, leaving most of the variance (88.9%) at the firm level. To further decompose this firm-level variance, we show that firm and time fixed effects only account for another 43.8% portion. This result suggests that even specified with all the controls and the finest fixed effects, the model only explains 46.6% of the variance in TWU. In other words, the residuals capture the remaining 53.4% of the variance that are not explained by time or firm fixed effects (i.e., within-firm variation). These findings offer further evidence that our measure of TWU is truly idiosyncratic at the firm level.

	R2		
	(1)	(2)	(3)
Controls	None	Firm attributes	Improvement in R2
No FE	0.000	0.028	
Year	0.073	0.077	0.049
Year + Industry	0.092	0.098	0.070
Year + Industry + Year * Industry	0.105	0.111	0.083
Firm-level variation	0.895	0.889	
Firm		0.430	0.402
Firm + Year		0.466	0.438
Residual		0.534	

Table 4. Variance decomposition of trade war uncertainty

Note: The table reports the results on the R^2 from a projection of TWU on various sets of fixed effects. Column (1) corresponds to regressions with no other control variables but fixed effects. Column (2) controls for a set of firm attributes as specified in Table 3. The last column shows the maximal change in R^2.

Appendix A4 Robustness checks

Alternative measures

	PtGR (t)	InvGR (t)	NonGR (t)	Inv/Total (t)	Non/Total (t)
	Total	Invention	Non-Invention	Invention	Non-Invention
TWU (t-1)	0.151***	-0.019	0.159***	-0.026***	0.026***
	(5.46)	(-1.06)	(5.38)	(-3.15)	(3.15)
ROA	0.186**	0.100**	0.162***	-0.071	0.071
	(2.22)	(2.27)	(2.94)	(-1.04)	(1.04)
Size	0.463***	0.409***	0.400***	0.025***	-0.025***
	(32.22)	(34.54)	(25.28)	(6.63)	(-6.63)
Lev	0.037***	0.014***	0.042***	-0.080***	0.080***
	(3.56)	(3.08)	(2.89)	(-3.73)	(3.73)
Growth	-0.110***	-0.042**	-0.125***	0.042***	-0.042***
	(-4.46)	(-2.38)	(-4.99)	(3.76)	(-3.76)
Age	-0.171***	-0.087***	-0.180***	0.024***	-0.024***
	(-9.57)	(-6.35)	(-9.34)	(4.93)	(-4.93)
RDI	0.022***	0.029***	0.010***	0.010***	-0.010***
	(7.28)	(9.07)	(3.86)	(11.88)	(-11.88)
PPE	-0.827***	-0.456***	-0.827***	0.061**	-0.061**
	(-9.10)	(-6.33)	(-8.41)	(2.41)	(-2.41)
BM	-0.225***	-0.436***	-0.007	-0.098***	0.098***
	(-3.82)	(-9.30)	(-0.12)	(-5.89)	(5.89)
Capital	-0.211	0.421**	-1.124***	0.450***	-0.450***
	(-0.89)	(2.22)	(-4.26)	(6.42)	(-6.42)
IO	-0.007	0.001	-0.000	0.004	-0.004
	(-0.15)	(0.04)	(-0.00)	(0.29)	(-0.29)
EPU	-0.674***	-2.632***	0.455***	-0.092***	0.092***
	(-10.54)	(-58.57)	(6.72)	(-5.45)	(5.45)
Constant	-7.201***	-6.776***	-6.590***	-0.045	1.045***
	(-25.76)	(-29.12)	(-21.41)	(-0.65)	(15.10)
Industry FE	YES	YES	YES	YES	YES
Observations	12,821	12,821	12,821	12,821	12,821
R2	0.178	0.311	0.154	0.077	0.077

Table 5. Alternative measures

Note: This table reports the estimation results of a set of robustness checks. Variable definitions are defined in the Appendix 1. T-statistics are given in parentheses based on standard errors clustered at the firm and year level and robust to heteroscedasticity. *, ** and *** denote significance based on two-tailed t-tests at the 10%, 5% and 1% level, respectively.

The exogenous shock: Difference-in-differences analysis

In this subsection, we perform a difference-in-differences approach by relying on the 2018 U.S.-China trade war as a quasi-natural experiment to alleviate the potential endogeneity concern that omitted variables correlated with both TWU and innovation output might bias our findings. We predict that the positive effect of *TWU* on non-invention patents will be exacerbated by the unprecedented 2018 trade war.

$$NonAP_{i,t} = \beta_0 + \beta_1 TWU_{i,t-1} * Post_{i,t-1} + \beta_2 TWU_{i,t-1} + \beta_3 Post_{i,t-1} + \sum Controls_{i,t} + Ind\ FE + \varepsilon_{i,t}. \quad (4)$$

To verify this prediction, we first code the dummy variable *POST2018* equal to one for the periods after year 2018, and zero otherwise. Then we include its interaction with *TWU* in the baseline analysis and report the corresponding results in Table 4. The coefficient of $TWU_{i,t-1} * Post2018_{i,t-1}$ is the DID estimate that captures the causal effect of the U.S.- China trade war on firm strategic innovation output. We find the coefficient for the interaction term $TWU_{i,t-1} * Post2018_{i,t-1}$ is positive and statistically significant at less than the 10% level (coefficient= 0.129, t-statistic= 1.85), implying that our documented strategic innovation behavior under TWU is boosted by the 2018 U.S.-China trade war.

	NonAP (t)
TWU (t-1) * Post (t-1)	0.129*
	(1.85)
TWU (t-1)	0.115**
	(2.15)
Post (t-1)	0.015
	(0.30)
Cons, Control, Ind FE	YES
Observations	12,821
R2	0.153

Table 6. The exogenous shock: Difference-in-differences test results

Note: This table reports the estimation results of the DID analysis. Variable definitions are defined in the Appendix 1. T-statistics are given in parentheses based on standard errors clustered at the firm and year level and robust to heteroscedasticity. *, ** and *** denote significance based on two-tailed t-tests at the 10%, 5% and 1% level, respectively.

Appendix A5 Shortened pre-trade war period

	PtAP(t)	InvAP(t)	NonAP(t)
TWU(t-1)	0.161***	0.051	0.224***
	(4.88)	(1.58)	(5.71)
ROA	2.608***	2.122***	2.051***
	(9.57)	(8.25)	(6.49)
Size	0.463***	0.496***	0.362***

	(25.97)	(28.69)	(17.51)
Lev	0.661***	0.555***	0.747***
	(7.72)	(6.71)	(7.62)
Growth	-0.171***	-0.062	-0.250***
	(-4.05)	(-1.51)	(-5.13)
Age	-0.144***	-0.083***	-0.216***
	(-7.29)	(-4.39)	(-9.35)
RDI	0.056***	0.077***	0.023***
	(16.47)	(21.90)	(6.11)
PPE	-0.686***	-0.589***	-0.689***
	(-6.68)	(-5.90)	(-5.86)
BM	-0.167**	-0.319***	0.032
	(-2.43)	(-4.78)	(0.40)
Capital	-0.043	0.755***	-1.406***
	(-0.15)	(2.66)	(-4.06)
IO	-0.088*	-0.079	-0.036
	(-1.68)	(-1.58)	(-0.58)
EPU	0.060	-0.066	0.213***
	(0.91)	(-1.03)	(2.75)
Cons	-7.631***	-9.226***	-6.000***
	(-22.61)	(-28.01)	(-15.28)
Ind FE	YES	YES	YES
observations	10,055	10,055	10,055
R2	0.217	0.242	0.152

Table 7. Shortened pre-trade war period

Note: This table reports the estimation results of the sample period between 2013 to 2019. All variables are defined in the Appendix 1. T-statistics are given in parentheses based on standard errors clustered at the firm and year level and robust to heteroscedasticity. *, ** and *** denote significance based on two-tailed t-tests at the 10%, 5% and 1% level, respectively.

Appendix A6 Incorporate industry-year-average subsidy

	PtAP(t)	InvAP(t)	NonAP(t)	Subsidy(t+1)
TWU(t-1)	0.146***	0.045	0.185***	
	(5.08)	(1.60)	(5.28)	
NonAP(t)				0.012***
				(3.54)
ROA	2.119***	1.487***	1.731***	0.833***
	(8.97)	(6.63)	(6.26)	(6.71)

Size	0.457***	0.489***	0.364***	-0.065***
	(30.49)	(33.66)	(20.88)	(-10.60)
Lev	0.512***	0.393***	0.632***	0.166***
	(7.06)	(5.60)	(7.52)	(4.90)
Growth	-0.154***	-0.052	-0.231***	-0.018
	(-4.08)	(-1.42)	(-5.24)	(-1.12)
Age	-0.113***	-0.072***	-0.172***	0.027***
	(-6.59)	(-4.34)	(-8.58)	(3.67)
RDI	0.054***	0.073***	0.023***	0.024***
	(17.98)	(23.64)	(6.93)	(12.79)
PPE	-0.714***	-0.599***	-0.745***	0.026
	(-8.05)	(-7.00)	(-7.28)	(0.65)
BM	-0.133**	-0.316***	0.085	0.143***
	(-2.29)	(-5.57)	(1.26)	(5.19)
Capital	-0.240	0.563**	-1.421***	0.253**
	(-1.01)	(2.47)	(-5.05)	(2.18)
IO	-0.053	-0.047	-0.029	0.079***
	(-1.16)	(-1.08)	(-0.54)	(3.68)
EPU	0.054	-0.085	0.252**	-1.485***
	(0.60)	(-0.96)	(2.39)	(-29.48)
IndyearSub	-2.240	-2.814	-0.094	32.956***
	(-0.37)	(-0.48)	(-0.01)	(13.54)
Cons	-7.472***	-8.959***	-6.088***	1.618***
	(-26.25)	(-32.29)	(-18.37)	(14.42)
Ind FE	YES	YES	YES	YES
observations	12,821	12,821	12,821	10,676
R2	0.217	0.237	0.152	0.256

Table 8. Control industry-year-average subsidy

Note: This table reports the estimation results after controlling industry-year-average subsidy. IndyearSub is calculated as the industry-year average of subsidy received by firm in the year *t* deflated by total assets. Other variables are defined in the Appendix 1. T-statistics are given in parentheses based on standard errors clustered at the firm and year level and robust to heteroscedasticity. *, ** and *** denote significance based on two-tailed t-tests at the 10%, 5% and 1% level, respectively.

Appendix A7 Correlation matrix

	PtAP(t)	InvAP(t)	NonAP(t)	TWU(t-1)	ROA	Size	Lev	Growth	Age	RDI	PPE	BM	Capital	IO	EPU	Subsidy(t+1)
PtAP(t)	1															
InvAP(t)	0.835***	1														
NonAP(t)	0.853***	0.503***	1													
TWU(t-1)	0.077***	0.035***	0.089***	1												
ROA	0.072***	0.066***	0.029***	-0.015*	1											
Size	0.326***	0.320***	0.273***	0.074***	-0.055***	1										
Lev	0.140***	0.120***	0.153***	0.046***	-0.376***	0.539***	1									
Growth	0.000	0.020**	-0.024***	-0.046***	0.295***	0.003	0.022**	1								
Age	0.089***	0.098***	0.062***	0.054***	-0.214***	0.473***	0.353***	-0.123***	1							
RDI	0.087***	0.179***	-0.038***	-0.055***	-0.001	-0.261***	-0.321***	-0.025***	-0.204***	1						
PPE	-0.053***	-0.069***	-0.014	0.086***	-0.156***	0.166***	0.166***	-0.097***	0.193***	-0.292***	1					
BM	0.101***	0.050***	0.149***	0.103***	-0.310***	0.485***	0.379***	-0.098***	0.110***	-0.289***	0.184***	1				
Capital	-0.013	0.00600	-0.037***	0.006	0.135***	-0.039***	-0.028***	0.080***	-0.233***	-0.032***	0.276***	-0.001	1			
IO	0.105***	0.093***	0.101***	0.030***	0.092***	0.425***	0.233***	-0.015*	0.211***	-0.260***	0.191***	0.101***	0.046***	1		
EPU	0.078***	0.062***	0.079***	0.197***	-0.031***	0.079***	-0.0140	-0.035***	0.053***	0.165***	-0.093***	0.151***	-0.109***	-0.121***	1	
Subsidy(t+1)	0.009	0.053***	-0.030***	-0.047***	0.058***	-0.144***	-0.070***	-0.021**	-0.063***	0.128***	-0.002	-0.142***	0.078***	0.0130	-0.432***	1

Table 9. Correlation matrix

Note: This table reports the Pearson's correlation matrix. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

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